THE DEEP RATIONALITY OF DARK CONSUMPTION

Alcohol And Cigarette Use As Sexual Signaling Behavior

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1. **THEORETISCHE INLEIDING**

Mensen stellen vaak ongezond consumptiegedrag dat negatieve gevolgen met zich meebrengt, zoals onder de zonnebank gaan, ongezond eten en sigaretten roken. Veel gezondheidscampagnes hebben reeds geprobeerd om mensen te overtuigen deze schadelijke gedragingen niet meer te stellen door te wijzen op de risico’s die met het gedrag gepaard gaan (Saad, 2006, 2007, 2013). Maar ondanks deze pogingen blijft het aantal jongeren dat sigaretten rookt en grote hoeveelheden alcohol drinkt hoog (e.g. Center for Behavioral Health Statistics and Quality, 2015; Johnston, Bachman, & Schulenberg, 2012; Rosiers et al., 2014). Meer zelfs, sommige gezondheidscampagnes bleken zelfs een tegenovergesteld effect te hebben, waarbij jongvolwassenen eerder geneigd waren om meer te roken en te drinken na het zien van de campagne (Ringgold, 2002; Wolburg, 2006). Dit alles wijst erop dat het rook- en drinkgedrag van jongvolwassenen niet altijd het gevolg is van een gebrek aan kennis over de gevaren en risico’s die hiermee samenhangen. Daarom was het doel van dit proefschrift om te onderzoeken of sigaretten- en alcoholgebruik bij jongvolwassenen geen diepere rationaliteit heeft vanuit een evolutionair psychologisch perspectief.

Volgens evolutionaire psychologie is de menselijke geest gevormd via natuurlijke selectie (gericht op overleving) en seksuele selectie (gericht op voortplanting) op dezelfde manier dat ons lichaam is geëvolueerd tot zijn huidige vorm. Net zoals ons lichaam bestaat uit organen met zeer specifieke functies, bestaat onze menselijke geest eveneens uit evolutionaire psychologische mechanismen, vaak ‘mentale organen’ genoemd. Ook deze mentale organen hebben een specifieke functie en zijn geëvolueerd als een adaptieve oplossing voor kenmerkende problemen in onze voorouderlijke omgeving (Buss, 2012; Confer et al., 2010; Durrant & Ellis, 2003). Evolutionaire psychologie is bijgevolg gericht op het zoeken naar ultimate verklaringen waarbij wordt getracht om de evolutionaire functie van psychologische mechanismen en gedragspatronen

Signalen zijn observeerbare gedragingen die een moeilijk waar te nemen kwaliteit willen communiceren naar de ontvanger(s) om zo hun overtuigingen en gedrag te beïnvloeden op een manier die voor de zender voordelig is. De ontvangers gebruiken deze signalen als een teken waar
ze hun gedrag op afstemmen (Donath, 2011; Maynard Smith & Harper, 2003). Dit betekent dat gedragingen opgemerkt moeten worden om te kunnen functioneren als een signaal. Hieruit volgde de eerste onderzoeksvraag: Trekt ongezond consumptiegedrag de aandacht van jongvolwassenen?

De menselijke seksualiteit kan worden gezien als een continuüm gaande van een meer kortetermijn georiënteerde seksualiteit tot een meer langetermijn georiënteerde seksualiteit. Mensen met een kortetermijn seksuele strategie zijn eerder gericht op losse seksuele contacten met verschillende partners (vrijblijvende seksualiteit), terwijl mensen met een langetermijn seksuele strategie eerder op zoek zijn naar een trouwe relatie met een vaste partner (toegewijde seksualiteit). Welke van deze strategieën mannen en vrouwen volgen hangt af van zowel persoonlijke kenmerken (bv. de eigen aantrekkelijkheid en status) als omgevingskenmerken (bv. mate van onzekerheid) (Buss & Schmitt, 1993; Simpson & Gangestad, 1991). Deze strategieën beïnvloeden ook welke kenmerken mensen aantrekkelijk vinden in potentiële partners. Bijvoorbeeld, vrouwen zoeken vooral indicatoren van genetische kwaliteit in kortetermijn seksuele partners, waardoor ze vaak aangetrokken worden door o.a. mannelijke kenmerken en dominantie. Mannen daarentegen gaan over het algemeen eerder op zoek naar indicatoren van jeugdigheid en vruchtbaarheid. In kortetermijn seksuele partners zoeken mannen echter ook naar indicatoren van seksuele beschikbaarheid en een open houding ten opzicht van losse seksuele contacten (e.g. Buss, 2012; Li, Bailey, Kenrick, & Linsenmeier, 2002; Li & Kenrick, 2006). Rekening houdend met deze voorkeuren gaan mensen vaak allerlei vormen van seksueel signaleringsgedrag vertonen om hun kwaliteiten te etaleren en hun aantrekkelijkheid te verhogen (Geary, 2006; Miller, 2009).

Zo heeft onderzoek bijvoorbeeld aangetoond dat fysiek risicogedrag bij jongvolwassenen kan functioneren als een kortetermijn seksueel signaal. Enerzijds toonden studies aan dat jonge mannen hun fysiek risicogedrag verhoogden in de nabijheid van vrouwen (Frankenhuis, Dotsch, Karremans, & Wigboldus, 2010; Pawlowski, Atwal, & Dunbar, 2008; Ronay & Hippel, 2010). Anderzijds vonden studies dat fysiek risicogedrag de aantrekkelijk van zowel mannen als vrouwen verhoogde, vooral als een kortetermijn seksuele partner. (Bassett & Moss, 2004; Sylwester & Pawłowski, 2011). Aangezien roken en (binge) drinken gezien kunnen worden als vormen van
fysiek risicogedrag, zouden ook deze middelen gebruikt kunnen worden door jongvolwassenen als een kortetermijn seksuele signaleringsstrategie. Hieruit volgde de tweede onderzoeksvraag: *Werkt ongezonde consumptie als een kortetermijn seksueel signaal?*

Naast een hoog fysiek risicogehalte heeft rook- en drinkgedrag natuurlijk nog andere aspecten, waaronder een financieel aspect door de kostprijs. Onderzoek rond *conspicuous consumption*, waarbij geld op een opzichtige manier wordt gespendeerd aan statusvolle producten, heeft reeds aangetoond dat geld dat opzichtig wordt uitgeven gezien wordt als een teken van een kortetermijn seksuele strategie, maar ook een teken van status en geld in zowel jonge mannen als jonge vrouwen. Gebaseerd op deze bevindingen zou de derde onderzoeksvraag nagaan of de financiële kost een invloed heeft op de signaleringsfunctie van rook- en drinkgedrag: *Beïnvloedt de financiële kost de werking van ongezond consumptiegedrag als een kortetermijn seksueel signaal?*

**2. Samenvatting van de voornameste bevindingen**

**2.1. Trekt ongezond consumptiegedrag de aandacht van jongvolwassenen?**

Door de grote hoeveelheid prikkels die we dagelijks moeten verwerken zijn onze hersenen zodanig geëvolutueerd dat we enkel de meest relevante informatie selecteren en verwerken. Aangezien dit zowel het geval is voor onze zintuigen (externe aandacht) als ons geheugen (interne aandacht), worden in hoofdstuk 2 twee studies besproken. Een eerste eye tracking studie maakte gebruik van visuele displays om te onderzoeken of jongvolwassenen meer visuele aandacht besteden aan drinkgedrag dan aan functioneel gedrag zonder een duidelijke symbolische functie. De resultaten toonden aan dat jongvolwassenen meer aandacht besteden aan leeftijdgenoten wanneer deze alcohol drinken, dan wanneer ze ander functioneel gedrag stellen. Enkel vrouwen waren iets minder geïnteresseerd in het drinkgedrag van andere vrouwen. De tweede studie focuste op interne aandacht en onderzocht de herinnering van zowel drinkgedrag als alcoholische dranken, eveneens aan de hand van visuele displays. De resultaten bevestigden dat drinkgedrag
ook beter wordt herinnerd dan functionele producten. Ook alcoholische drankjes werden beter herinnerd dan functionele producten, en zelfs beter dan non-alcoholische drankjes.

2.2. **WERKT ONGEZOND CONSUMPTIEGEDRAG ALS EEN KORTETERMIJN SEKSUEEL SIGNAAL?**

2.2.1. **ALCOHOL**

In hoofdstukken 3 tot 6 werd onderzocht of risicovol drankgebruik kan gebruikt worden als een kortetermijn seksueel signaal bij jongvolwassenen, waarbij zowel de ontvangerkant (alcoholgebruik als een teken) als de zenderkant (alcoholgebruik als een signaal) werd onderzocht. Hoofdstukken 3 tot 5 startten met het toelichten van een reeks survey studies waarin werd bevestigd dat er een duidelijke link is tussen het drinken van alcohol en binge drinken enerzijds, en het hebben van een meer kortetermijn georiënteerde seksuele strategie anderzijds. Bovendien toonden correlatiestudies aan dat hoe vaker jongvolwassenen alcohol consumenten en aan binge drinken deden, hoe vrijblijvender deze personen bleken te zijn in hun sexualiteit.

Deze studies werden opgevolgd in hoofdstuk 5, waarin werd onderzocht of kortetermijn seksuele motivaties jongvolwassenen aanzetten om grotere hoeveelheden alcohol te drinken. Hiervoor maakte het experiment gebruik van een priming techniek, waarbij deelnemers gevraagd werd om zich in te leven in een verhaal waarbij ze geïnteresseerd waren in ofwel een kortetermijn seksuele relatie ofwel een langetermijn romantische relatie met een aantrekkelijke persoon die ze ontmoetten op een avondje uit. De resultaten toonden aan dat zowel jonge mannen als jonge vrouwen geneigd waren om meer alcohol te drinken in een kortetermijn seksuele context dan een langetermijn romantische context, door de hogere motivatie om losse, seksuele contacten te hebben. Daarnaast toonde het experiment aan dat de context ook de perceptie van jongvolwassenen beïnvloedde, waarbij de hoeveelheid drankjes die als een hoog aantal werden beschouwd opmerkelijk hoger lag in de kortetermijn seksuele context dan in de langetermijn relatie context.

Om te onderzoeken of het drinkgedrag van jongvolwassenen ook een impact heeft op hoe ze worden gezien door leeftijdsgenoten, maakten hoofdstukken 3, 4 en 6 gebruik van een *factorial*
survey methodologie. Hierbij kregen deelnemers korte gedragsprofielen van personen te lezen waarin de alcoholconsumptie van de hoofdpersonages werd gemanipuleerd. Hoofdstuk 3 en 4 toonden aan dat mannen die frequent alcohol dronken gezien werden door vrouwen als meer kortetermijn seksueel georiënteerd dan mannen die zich beperkten tot occasioneel drinken of nooit dronken. Vrouwen daarentegen werden gezien als meer vrijblijvend in hun sexualiteit van zodra ze alcohol dronken, ongeacht of hun alcoholgebruik occasioneel of frequent was. Hoofdstuk 6 toonde bovendien aan dat ook het aantal drankjes dat gedronken wordt op een specifiek moment de gepercipieerde seksuele strategie beïnvloedt. Hoe meer alcoholische drankjes jongvolwassenen dronken in een periode van twee uur tijd, hoe meer ze als kortetermijn seksueel georiënteerd werden gepercipieerd door leeftijdsgenoten, en dit tot het ‘officiële binge drinking niveau’ (6 alcoholische drankjes voor mannen, 4 alcoholische drankjes voor vrouwen in twee uur tijd).

Hoofdstukken 3, 4 en 6 onderzochten ook hoe het drinkgedrag van jongvolwassenen hun aantrekkelijkheid als een kortetermijn seksuele partner en als een langetermijn romantische partner beïnvloedde. De bevindingen van deze studies toonden aan dat stevig drinkgedrag voordelen met zich meebrengt op vlak van kortetermijn seksuele aantrekkelijkheid, maar dat het de langetermijn aantrekkelijk als een vaste partner in een romantische relatie eerder schaadt. Bijvoorbeeld, frequent drinken verhoogde een man zijn kortetermijn seksuele aantrekkelijkheid ten opzicht van nooit drinken, maar verlaagde zijn aantrekkelijkheid als vaste partner. Ook bij vrouwen werd een frequente drinker seksueel aantrekkelijker bevonden dan een niet drinker, terwijl een frequente drinker en niet drinker even aantrekkelijk werden bevonden voor een romantische, lange relatie. Jonge mannen en vrouwen die frequent alcohol dronken werden ook aantrekkelijker bevonden als een kortetermijn seksuele partner dan een langetermijn romantische partner. Hoofdstuk 6 voegde hieraan toe dat mannelijke en vrouwelijke binge drinkers eveneens aantrekkelijker werden bevonden voor kortetermijn seksuele contacten dan voor een langetermijn romantische relatie. Daarnaast toonde hoofdstuk 6 ook aan dat een hogere hoeveelheid drankjes de seksuele aantrekkelijkheid van jongemannen niet perse verhoogde, maar dat het wel zijn aantrekkelijkheid als een partner voor een romantische relatie verminderde. De seksuele aantrekkelijkheid van vrouwen steeg echter van zodra ze alcohol dronken, ongeacht de
hoeveelheid, terwijl hun aantrekkelijkheid voor een langetermijn relatie daalde wanneer ze heel grote hoeveelheden alcohol dronken.

Tot slot bevestigden hoofdstuk 3 en 4 dat frequent drinken weldegelijk beschouwd werd als fysiek risicogedrag door jongvolwassenen. De mate waarin jongvolwassenen het drinkgedrag van hun leeftijdgenoten als risicovol beschouwden beïnvloedde bovendien hoe kortetermijn georiënteerd en vrijblijvend seksueel deze leeftijdgenoten werden gezien. De mate waarin drinkgedrag als risicovol werd aanzien had ook een invloed op de aantrekkelijkheidsbeoordelingen, maar in mindere mate dan op de gepercipieerde seksuele oriëntatie. Hoofdstuk 6 toonde bovendien aan dat binge drinkers gezien werden als avontuurlijker, als personen met meer lef en meer als een risiconemer dan leeftijdgenoten die beperktere hoeveelheden alcohol dronken. Het drinken van hogere hoeveelheden alcohol had daarentegen geen positieve invloed op waargenomen fysieke kwaliteiten. Integendeel, mannelijke en vrouwelijke binge drinkers werden zelfs als vaker ziek gepercipieerd.

2.2.2. Sigaretten

De focus van dit proefschrift lag op alcoholgebruik bij jongvolwassenen, aangezien dit schadelijk gedrag een grotere alomtegenwoordigheid heeft dan het roken van sigaretten. Desalniettemin hebben hoofdstuk 3 en 4 verkend of sigarettengebruik ook een kortermijn seksuele signaalfunctie zou kunnen hebben. Resultaten van de survey studies bevestigden dat ook rookgedrag gelinkt is aan het hebben van een kortetermijn georiënteerde seksuele strategie. Jongvolwassen die sigaretten rookten werden ook gezien als personen die eerder kortetermijn seksueel georiënteerd waren in vergelijking met niet-rokers. Maar, in tegenstelling tot alcohol, had de rookfrequentie geen impact op hoe seksueel vrijblijvend jongvolwassenen werden ingeschat. Roken bracht ook enkele aantrekkelijkheidsvoordelen voor jongvolwassenen, maar wel in mindere mate dan alcoholgebruik. Bijvoorbeeld, frequent roken bij mannen werd slechts in lichte mate minder aantrekkelijk bevonden in een kortetermijn seksuele partner, maar werd als heel onaantrekkelijk gezien in een langetermijn romantische partner. In vrouwen daarentegen, werden occasioneel roken en niet roken even aantrekkelijk bevonden in een kortetermijn seksuele partner,
terwijl occasioneel rookgedrag de langetermijn aantrekkelijkheid van een vrouw als een relatiepartner duidelijk schaadde. Hoofdstuk 3 en 4 toonden ook aan dat rookgedrag gezien werd als een vorm van fysiek risicogedrag. Meer zelfs, hoe risicovoller roken werd beschouwd, hoe meer rokende jongvolwassenen als seksueel vrijblijvend werden gepercipieerd.

2.3. **BEÍNVLOEDT DE FINANCIËLE KOST DE WERKING VAN ONGEZOND CONSUMPTIEGEDRAG ALS EEN KORTETERMIJN SEKSUEEL SIGNAAL?**

Het zevende en laatste empirische hoofdstuk onderzocht of de kostprijs van drinkgedrag een impact heeft op de werking van alcohol als een seksueel signaal. In het eerste experiment werd deelnemers gevraagd een keuze te maken tussen twee visuele displays waarin dezelfde persoon werd getoond met een duur drankje (champagne) of een goedkoper drankje (wijn). De resultaten toonden aan dat jonge mannen en vrouwen met champagne gepercipieerd werden als meer kortetermijn seksueel georiënteerd, als hoger in status, en als over meer geld beschikkend dan wanneer ze gezien werden met een glas wijn. Jongvolwassenen met een glas champagne werden ook geprefereerd als kortetermijn seksuele partner, terwijl jongvolwassenen die wijn dronken aantrekkelijker werden bevonden als langetermijn relatiepartner. In het tweede experiment werd gevraagd om één van de visuele displays van experiment 1 te beoordelen. Dit experiment bevestigde dat champagne weldegelijk gezien wordt door jongvolwassenen als een teken van hoge status en geld, door de hogere financiële kost van het drankje. Een jonge vrouw met een glas champagne werd ook gezien als meer flirterig dan wanneer ze wijn dronk, terwijl een man die champagne dronk werd gezien als minder trouw in relaties. Tot slot onderzocht het derde experiment in hoofdstuk 7 of kortetermijn seksuele motiaties jongvolwassenen zouden aanzetten om meer geld te spenderen aan alcohol. Hierbij werd gebruik gemaakt van dezelfde priming techniek als in hoofdstuk 4. Opmerkelijk genoeg gaven jongvolwassenen niet aan een duurder drankje te verkiezen in een kortetermijn seksuele context. Maar, zowel mannen als vrouwen waren wel geneigd om meer geld uit te geven wanneer ze geïnteresseerd waren in losse, seksuele contacten met een aantrekkelijke persoon dan wanneer ze geïnteresseerd waren in een vaste relatie met die persoon.
3. DISCUSSIE EN CONCLUSIE

3.1. DISCUSSIE

De resultaten van de empirische hoofdstukken tonen aan dat stevig drinkgedrag kan functioneren als een kortetermijn seksuele signaleringsstrategie in zowel jonge mannen als vrouwen, net doordat het een risicovol gedrag is. De reden waarom jonge mannen en vrouwen dit gedrag gebruiken als signaal lijkt echter te verschillen. Tenslotte, kenmerken zoals moed, lef en risico’s durven nemen zijn kwaliteiten die voordelig zijn bij intraseksuele competitie tussen mannen onderling, om op die manier status te bekomen en hun dominantie te laten gelden (Daly & Wilson, 2001; Ellis et al., 2012). Doordat vrouwen aangetrokken door indicatoren van ‘goede genen’ in kortetermijn seksuele partners, zou dit kunnen verklaren waarom mannen risicovol drinken kunnen gebruiken als een signaal in kortetermijn seksuele contexten. Aangezien mannen eerder zoeken naar indicatoren van openheid voor losse seksuele contacten, kunnen vrouwen alcohol eerder gebruiken om te tonen dat ze niet afkerig zijn van risicogedrag, inclusief seksueel risicogedrag en vrijblijvende seksuele ontmoetingen. Maar, aangezien hoofdstuk 7 heeft geïllustreerd dat ook ander aspecten naast het fysiek risicogehalte een impact hebben op de signaleringsfunctie van alcohol, blijft toekomstig onderzoek naar de complexe symbolische functie van alcohol noodzakelijk.

Daarnaast lieten de resultaten van hoofdstuk 3 en 4 uitschijnen dat ook het roken van sigaretten zou kunnen functioneren als een kortetermijn seksueel signaal bij jonge mannen en vrouwen. Meer onderzoek blijft hier echter nodig, aangezien er bijvoorbeeld nog niet is geverifieerd of rokers sigaretten echt gebruiken als signaal in kortetermijn seksuele contexten. Bovendien wijzen de beperkte aantrekkelijkheidsvoordelen van roken op een mogelijke invloed van negatierene culturele normen, die de geschiktheid van rookgedrag als een seksueel signaal (zeker de laatste jaren) beïnvloeden. Toekomstig onderzoek zou rekening moeten houden met deze culturele normen, zowel op nationaal niveau als op lokaal niveau, en zowel voor rook- als drinkgedrag. Aangezien roken en drinken ook vaak door jongvolwassenen worden vermeld om contact te leggen, vriendschapsbanden te versterken en om in de groep te passen (e.g. Bancroft,
Zimpfer, Murray, & Karels, 2014; Cullen, 2010; de Visser et al., 2013), zou toekomstig onderzoek ook kunnen focussen op de werking van rook-en drinkgedag als sociaal signaal. Dit proefschrift heeft zich ook beperkt tot het onderzoeken van sigaretten- en (hoofdzakelijk) alcoholgebruik als seksueel signaal. Er is tot slot ook nog veel onderzoek nodig naar andere vormen van ongezond consumptiegedrag, zoals zonnebaadgedrag, risicovol rijgedrag, druggebruik, ongezonde eetpatronen, sportdoping, etc.

Tot slot, dit proefschrift heeft aangetoond dat rook- en drinkgedrag een kortetermijn seksuele signaalfunctie heeft doordat het risicovolle gedragingen zijn. Bijgevolg is het aannemelijk dat het benadrukken van de risico’s van roken en (binge) drinken in gezondheidscampagnes de geschiktheid van beide gedragingen als een seksueel signaal eerder verhogen. Ons proefschrift toont immers aan dat bepaalde jongvolwassenen roken en drinken, niet ondanks de risico’s maar net doordat er risico’s verbonden zijn aan het gedrag.

3.2. CONCLUSIE

Dit proefschrift is een eerste poging om de seksuele signaleringsfunctie van ongezond consumptiegedrag te verkennen. Maar ondanks de theoretische bijdragen blijft toekomstig onderzoek noodzakelijk om nog meer inzicht te vergaren in de complexe symbolische functie van ongezond consumptiegedag, en om tekortkomingen in de gevoerde onderzoeken aan te pakken. Dit proefschrift draagt bij aan onderzoek naar motivaties rond rook- en drinkgedrag, evenals onderzoek naar interpersoonlijke communicatie door middel van consumptiegedrag. Dit proefschrift kan eveneens inzichten verschaffen aan sociale marketing professionals en organisaties gericht op het verminderen van rook- en drinkgedrag van jongeren en jongvolwassenen.
4. REFERENCES


ENGLISH SUMMARY

1. THEORETICAL INTRODUCTION

Individuals engage in different forms of ‘dark consumption’ behavior that carry negative consequences, such as artificial sun bathing, consuming a high-fat diet, smoking cigarettes etc. Accordingly, many intervention campaigns have attempted to reduce these harmful behaviors by emphasizing the risks (Saad, 2006, 2007, 2013). However, despite these efforts, smoking behavior and heavy episodic drinking (i.e. binge drinking) still keep peaking during young adulthood (e.g. Center for Behavioral Health Statistics and Quality, 2015; Johnston, Bachman, & Schulenberg, 2012; Rosiers et al., 2014). Furthermore, some public health campaigns even appeared to have a boomerang effect, in which young adults increased their smoking and drinking behavior (Ringgold, 2002; Wolburg, 2006). These findings suggest that young adult smoking and drinking behavior is not always due to a lack of awareness about the risks of the behaviors. Therefore, this dissertation wanted to investigate if there is a deep rationality behind these dark consumption behaviors, using an evolutionary psychological perspective.

According to evolutionary psychology, the human mind evolved via natural (dealing with survival) and sexual (dealing with reproduction) selection in the same way that our body evolved. Consequently, the human mind consists of a collection of mental organs, called evolved psychological mechanisms. These mental organs have a specific function and evolved as an adaptive solution to recurrent problems in the ancestral environment (Buss, 2012; Confer et al., 2010; Durrant & Ellis, 2003). Accordingly, evolutionary psychologists search for ultimate explanations in which they attempt to understand the evolved function of psychological mechanisms and behavioral patterns (Saad, 2007; Scott-Phillips, Dickins, & West, 2011). Now, according to the evolutionary perspective, many behaviors that seem irrational at first sight, may have a rationality at a deeper, evolutionary level because they (directly or indirectly) enhanced individuals’ fitness. Fitness refers to individuals’ capacity to pass on their genes to future
generations, either directly by having children, or indirectly by helping relatives reproduce (Kenrick, Sundie, & Li, 2009). However, a wide range of behaviors can be considered deeply rational because they are helpful in increasing one’s fitness. For instance, behaving in an altruistic manner and sharing one’s resources to form alliances and friendships, or behaving in a risky manner to acquire status.

Given the high prevalence and the many harmful effects of cigarette and alcohol (ab)use, as well as other substances, evolutionary theorists studied the evolutionary basis of substance use and addiction. However, current evolutionary models and theories mainly focused on the functional and hedonic motives of users. For instance, the evolutionary reward model stresses that today’s highly concentrated doses of psychoactive substances hijack the reward system in the brain, creating false positive emotions (Russil Durrant, Adamson, Todd, & Sellman, 2009; Sullivan, Hagen, & Hammerstein, 2008). Other researchers suggest that individuals use psychoactive substances to improve fitness relevant behavior, for instance smoking to cope with stress or drinking to improve social interactions (Müller & Schuman, 2011). However, these evolutionary theories ignore that cigarette and alcohol use also has a signaling function, used by young adults to obtain self-presentational benefits (e.g. de Visser, Wheeler, Abraham, & Smith, 2013; Martin & Leary, 2001; O’Grady, Harman, Gleason, & Wilson, 2012). Consequently, in six empirical chapters this dissertation explored the signaling function of young adults’ cigarette and alcohol consumption, as these can be considered typical forms of dark consumption. These six chapters attempted to answer three research questions.

According to signaling theory, signals are perceivable actions that intend to communicate a difficult to observe quality, and affect the receivers’ beliefs and behavior in ways that benefit the signaler. Receivers, in turn, use these signals as cues to guide their future behavior (Donath, 2011; Maynard Smith & Harper, 2003). Consequently, to function as a signal, behaviors need to be noticed. This led to the first research question: Does dark consumption attract young adults’ attention?
In addition, human sexuality can be considered a continuum ranging from being sexually unrestricted and following a short-term oriented mating strategy, to being sexually restricted and following a more long-term oriented mating strategy. Depending on environmental circumstances and personal characteristics, both men and women pursue the two mating strategies (Buss & Schmitt, 1993; Simpson & Gangestad, 1991). However, depending on the mating strategy that is being followed, men and women search for different qualities in a partner. For instance, women search for indicators of genetic quality in short-term mating partners, such as masculine features and dominance. Men, on the other hand, are generally attracted to indicators of fertility and youth. However, in a short-term mating partner they also search for cues indicating sexual willingness (e.g. Buss, 2012; Li, Bailey, Kenrick, & Linsenmeier, 2002; Li & Kenrick, 2006). Consequently, to enhance their attractiveness, people engage in all types of sexual signaling, displaying qualities that correspond with these mating preferences (Geary, 2006; Miller, 2009). For instance, research on risk-taking suggests that physically risky behavior could be considered a sexual signal in young adults.

Indeed, studies showed that young men increased their physical risk-taking in the presence of young women (Frankenhuis, Dotsch, Karremans, & Wigboldus, 2010; Pawlowski, Atwal, & Dunbar, 2008; Ronay & Hippel, 2010). Moreover, physical risk-taking enhanced both young men’s and young women’s desirability as a short-term mating partner (Bassett & Moss, 2004; Sylwester & Pawłowski, 2011). Now, as smoking behavior and heavy (episodic) drinking behavior can be considered a form of physical risk-taking, these behaviors might also operate as sexual signals. Accordingly, the second and main research question states: Does dark consumption function as a short-term sexual signal?

However, in addition to physical riskiness, substance use also has a financial aspect due to the financial cost. Research already showed that spending money in a showy manner (i.e. conspicuous consumption) functions as a short-term mating cue, as well as a cue of status and resources in both young men and young women. Therefore the third research question wanted to explore if the expensiveness of dark consumption influences its signaling function: Does the financial cost affect the functioning of dark consumption as a short-term mating signal?
2. SUMMARY OF MAIN FINDINGS

2.1. DOES DARK CONSUMPTION ATTRACT YOUNG ADULTS’ ATTENTION?

As our attentional mechanisms evolved to select and process only the most relevant information, both via our external senses (external attention) and memory (internal attention), chapter 2 described two studies. An eye tracking study used visual displays to examine if young adults pay more visual attention to drinking behavior than to functional behavior without a clear signaling purpose. Results showed that young adults pay more attention to peers when they consume alcohol than when they engage in functional behavior. Only women were slightly less interested in female peers’ drinking behavior. The second study investigated young adults’ recall of both drinking behavior and alcoholic beverages, using both behavioral and product displays. Results confirmed that drinking behavior is also better remembered than non-symbolic functional behavior. Also the alcoholic beverages were better remembered than functional products and even better than non-alcoholic drinks.

2.2. DOES DARK CONSUMPTION FUNCTION AS A SHORT-TERM MATING SIGNAL?

2.2.1. ALCOHOL

Chapters 3 to 6 investigated if dark consumption could operate as a short-term mating signal, studying both the receiver side (dark consumption as a cue) and the sender side (dark consumption as a signal). As a first step in establishing a connection between risky drinking and having a short-term mating strategy, chapters 3 to 5 described survey studies showing that drinking alcohol in general, as well as engaging in binge drinking is linked to being more sexually unrestricted. Moreover, the more frequent young adults engaged in drinking behavior and binge drinking, the more sexually unrestricted these young adults appeared to be.

Additionally, chapter 5 investigated if short-term mating motivations actually trigger young adults’ into drinking a higher amount of alcohol on a night out. This experiment used a priming technique in which participants imagined being interested in either a short-term sexual or long-
term romantic relation with an attractive opposite-sex other. Results showed that young adults increased their drinking behavior in a short-term mating context compared to a long-term mating context, because of a higher willingness to pursue a short-term sexual relationship. Moreover, a short-term mating context also led young adults to perceive a larger amount of drinks as heavy, compared to a context in which they were interested in a long-term romantic relationship.

To study if young adults’ drinking behavior also affected how they are perceived by peers, chapters 3, 4 and 6 used a factorial survey methodology in which participants read short behavioral profiles manipulating the main characters’ drinking behavior. Results showed that a young man drinking alcohol frequently was perceived by women as more sexually unrestricted, compared to occasional and non-drinkers. Women, on the other hand, were perceived by men as more sexually unrestricted than non-drinkers independent of their drinking frequency. Moreover, up to the ‘official’ binge drinking level (6 drinks for men/ 4 drinks for women in 2 hours’ time), drinking a higher amount of alcoholic beverages on a night out also increased how sexually unrestricted young men and women were perceived to be.

Chapters 3, 4 and 6 also investigated how young adults’ drinking behavior affected their attractiveness as a short-term and long-term partner. These findings indicated that drinking alcohol in a harmful manner does bring short-term attractiveness advantages, while harming young adults’ long-term desirability. For instance, drinking frequently enhanced a young man’s sexual attractiveness compared to not drinking, but harmed his attractiveness as a romantic partner. Also in women, a frequent drinker was considered more attractive by men than a non-drinker, while frequent drinking brought no long-term attractiveness benefits. Moreover, both a young man and women drinking alcohol frequently were found more desirable as a short-term sexual partner than a long-term romantic partner. Chapter 6 confirmed that also male and female heavy episodic drinkers were preferred as short-term sexual partners than long-term romantic partners. Additionally, a high amount of alcoholic drinks did not affect a man’s short-term attractiveness compared to drinking less alcoholic beverages, but clearly harmed a man’s long-term attractiveness. In women, on the other hand, drinking any amount of alcohol increased a
woman’s sexual attractiveness, while drinking a very high amount of alcohol lowered her long-term attractiveness.

Finally, chapter 3 and 4 confirmed that frequent drinking was indeed considered physically risky behavior, in which the level of perceived riskiness affected how sexually unrestricted young adults were perceived to be. The perceived riskiness also affected the attractiveness ratings, yet to a lesser extent. Moreover, chapter 6 showed that heavy episodic drinkers were perceived as more risk-prone, adventurous and brave. However, drinking a higher amount of alcoholic beverages did not affect young adults’ physical qualities in a beneficial manner. On the contrary, young adults consuming a high amount of alcoholic drinks were perceived as less disease resistant.

2.2.2. Cigarettes

Because of the higher prevalence of drinking behavior among young adults, this dissertation focused on young adult drinking behavior. Nonetheless, chapters 3 and 4 also explored the short-term mating signaling function of cigarette use. Results of the survey studies confirmed that also male and female smokers were perceived as being more short-term oriented in their mating strategy. However, contrary to drinking behavior, a higher smoking frequency did not increase young adults’ perceived level of sexual unrestrictedness. In addition, smoking also seemed to bring some attractiveness benefits, but to a lesser extent that drinking behavior. For instance, male frequent smoking was only perceived as slightly less attractive as not smoking in a potential short-term mating partner, but was considered highly undesirable in a long-term romantic partner. In women, the short-term attractiveness of occasional smoking and not smoking did not differ, whereas occasional smoking harmed her desirability as a long-term romantic partner. Additionally, chapter 3 and 4 confirmed that cigarette use was also perceived as physically risky behavior. Moreover, smoking behavior functioned as a cue for a short-term oriented mating strategy because of the risky nature of the behavior.
2.3. **Does the Financial Cost Affect the Functioning of Dark Consumption as a Short-Term Mating Signal?**

The seventh chapter explored if the expensiveness of drinking behavior affected the functioning of alcohol as a short-term mating signal. In a first forced choice experiment using visual displays, participants indicated that a young adult drinking an expensive drink (champagne) was perceived as more short-term oriented as well as having more money and status, compared to a young adult drinking a less expensive drink (wine). A young adult drinking champagne was also found more attractive as a short-term sexual partner, whereas a young adult drinking wine was preferred as a long-term romantic partner. The second experiment confirmed that an expensive drink functions as a cue for status, resources and sexual willingness because of the expensiveness of the drink. Moreover, a young drinking champagne was perceived as more flirty, whereas a young man drinking champagne was perceived as less faithful. Finally, a third experiment used a priming technique to investigate if short-term mating motivations increased young adults’ expensive drinking behavior more than long-term mating motivations did. Remarkably, young adults did not prefer a more expensive first drink in a short-term mating condition, yet short-term mating motivations did increase the amount of money young adults were willing to spend on a night out.

3. **Discussion and Conclusion**

3.1. **Discussion**

Together these results suggest that risky drinking behavior could function as a short-term mating signaling strategy in both young men and women, because of the risky nature of the behavior. However, young men and women might engage in these harmful signaling behaviors for different reasons. After all, mental qualities such as risk-proneness and braveness are valuable in male intrasexual competition, to display dominance and acquire status (Daly & Wilson, 2001; Ellis et al., 2012). Given that women are attracted to indicators of good genes in a short-term mating partner, this might explain why men can use risky alcohol consumption as a short-term mating
As men search for cues of sexual willingness in short-term mating partners, women, on the other hand, might use alcohol to signal that they are open to other risk-taking behavior, including sexual risk-taking. However, as the final empirical chapter illustrated that also the financial cost of drinking behavior affected the functioning of drinking behavior as a short-term sexual signal, more research remains necessary to fully investigate the sexual signaling function of drinking behavior.

In addition, chapter 3 and 4 suggested that smoking cigarettes might also function as a short-term mating signaling system in both young men and young women. However, more research is necessary to verify if young adult smokers actually use their smoking behavior as a signal in short-term mating situations. Moreover, the fact that the short-term attractiveness benefits of smoking were limited to not harming a young adults’ sexual attractiveness might be linked to more negative cultural norms, affecting the suitability of the signal. Therefore, future research should take into account the cultural norms on smoking and drinking behavior, both on a local and national level. Moreover, as smoking and drinking behavior are often mentioned by young adults as a means for social bonding, to fit in and strengthen friendships (e.g. Bancroft, Zimpfer, Murray, & Karels, 2014; Cullen, 2010; de Visser et al., 2013), future research should also investigate the functioning of alcohol and cigarette use as a social signal, in addition to being a sexual signal. As this dissertation is limited to cigarette and (mainly) alcohol use, future research could also investigate the signaling function of other forms of dark consumption, such as sunbathing or unhealthy eating habits.

Finally, this dissertation indicated that smoking and drinking behavior function as a sexual signal not despite but because of the risky nature of the behaviors. Consequently, it is highly likely that emphasizing the dangers of cigarette and (heavy episodic) alcohol use in public health campaigns confirms the signaling value of these behaviors, potentially increasing the smoking and drinking behavior of sexually unrestricted young adults.
3.2. **CONCLUSION**

To conclude, this dissertation can be considered a first attempt in exploring the sexual signaling function of dark consumption. However, despite the theoretical contributions, future research remains necessary to further the understanding of the complex signaling function of dark consumption, and to address the limitations of the conducted studies. This dissertation contributes to motivational research on smoking and drinking behavior, as well as research on interpersonal communication through consumption behavior. This dissertation might also be of interest to social marketing professionals and institution targeting young adult drinking and smoking behavior.
4. REFERENCES


CHAPTER 1

THEORETICAL INTRODUCTION
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THEORETICAL INTRODUCTION.

1. DARK CONSUMPTION

Individuals tend to engage in a wide range of ‘dark consumption’. The concept of ‘dark consumption’ refers to risky consumption behaviors that carry (potentially very) negative consequences for the consumer (Saad, 2007). For instance, many people consume a high-fat diet, smoke cigarettes, drink large amounts of alcohol or engage in excessive artificial sun tanning. Each of these behaviors is linked to severe physical harm, including cardiovascular diseases, lung cancer, liver cirrhosis and malignant melanoma (Bjartveit & Tverdal, 2005; Gallagher, Spinelli, & Lee, 2005; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2015; Ronksley, Brien, Turner, Mukamal, & Ghali, 2011; WHO, 2014). To improve public health, many intervention strategies have attempted to curtail these forms of ‘dark consumption’, often using a social marketing approach (Saad, 2006, 2007, 2013).

Social marketing refers to the use of marketing techniques to influence behaviors of a target group, to benefit individuals or even of society as a whole (Lee & Kotler, 2011). The development of most social marketing campaigns is – often implicitly – guided by classic behavioral theories (Lee & Kotler, 2011; Lefebvre, 2000; Luca & Suggs, 2013; Paek, Bae, Hove, & Yu, 2011), including the theory of reasoned action (Ajzen & Fishbein, 1980), the theory of planned behavior (Azjen, 1991), the health belief model (Janz & Becker, 1984), the social cognitive theory (Bandura, 1986), the stages of change model (Prochaska & DiClemente, 1982) and the social norms theory (Berkowitz, 2004). Accordingly, many intervention campaigns have an economic-based viewpoint, assuming that people engage in ‘irrational’ behavior, characterized by harmful effects, because of a lack of awareness and knowledge of the deleterious effects (Saad, 2006, 2007, 2013). Evaluation studies following these interventions indicated that public health campaigns often succeeded in curbing unhealthy consumption practices (e.g. Dobinson et al., 2008; Gordon, McDermott, Stead,
& Angus, 2006; Kubacki, Rundle-Thiele, Pang, & Buyucek, 2015; Stead, Gordon, Angus, & McDermott, 2007).

However, not all campaigns seem to have been as successful. For instance, despite the many social marketing campaigns targeting cigarette and alcohol (ab)use, high levels of smoking and drinking are being persisted among young adults all over the world (Center for Behavioral Health Statistics and Quality [CBHSQ], 2015; Johnston, O’Malley, Bachman, Schulenberg, & Miech, 2014; Substance Abuse and Mental Health Services Administration [SAMSHA], 2014; WHO, 2014). Both smoking and heavy episodic drinking (i.e. binge drinking) even peak during young adulthood. Both are also engaged in more by young men than by young women, while campaigns are generally targeted at both sexes equally (CBHSQ, 2015; Health and Social Care Information Centre [HSCIC], 2016; Johnston, Bachman, & Schulenberg, 2012; SAMSHA, 2014). Moreover, some public health campaigns addressing young adults’ smoking and drinking behavior even appeared to have had boomerang effects with behavioral responses opposite to the initial goal of the campaign (see Ringgold 2002 for an overview). For instance, college student smokers responded rather negatively to a large-scale antismoking campaign, leading to anger, denial and even lighting up cigarettes (Wolburg, 2006). Similarly, when confronted with a widely used intervention program to reduce alcohol use, college students did not decrease their alcohol consumption and even reported drinking more alcohol (Wechsler et al., 2003).

The above findings suggest that the persistence of young adults’ smoking and drinking behavior is not always due to incomplete information or a lack of awareness about the risks. As a consequence, we believe that a fuller understanding of young adults’ smoking and drinking motivations is necessary to improve future social marketing campaigns. Therefore, this dissertation wishes to investigate why young adults engage in cigarette and alcohol consumption, despite the (known) risks. Moreover, as research indicates that emphasizing the risky consequences of cigarette and alcohol use in social marketing campaigns does not always suffice to convince young adults to reduce their harmful smoking and drinking behavior, this thesis explores if young adults may possibly engage in smoking and drinking behavior precisely because of the risky nature of these dark consumption behaviors. Finally, the age and sex pattern of
cigarette and alcohol use indicate that there might be underlying motives that surpass the risks, pointing towards a possible rationality at a deeper, ultimate, evolutionary level. Accordingly, this dissertation investigates young adults’ cigarette and alcohol consumption from an evolutionary psychological perspective.

2. EVOLUTIONARY PSYCHOLOGY

Evolutionary psychology is a discipline in the field of evolutionary behavioral sciences, merging insights of modern psychology and evolutionary biology. The evolutionary psychological perspective investigates the Darwinian bases of human behavior, examining the human mind from an evolutionary perspective (Buss, 2012; Colarelli & Dettmann, 2003; Saad, 2013).

2.1. EVOLVED PSYCHOLOGICAL MECHANISMS

Natural selection is the central mechanism of evolution, in which heritable traits that aid an organism’s survival are passed on to future generations. However, currently natural selection is often used as a term that includes both natural selection sensu stricto (referring to enhanced chances of survival) and sexual selection (referring to enhanced chances of sexual reproduction). Adaptations are the results of these evolutionary processes: inherited and reliably developing characteristics of species selected for because they helped solve survival and reproductive related problems present in the environment during the period of their evolution (Buss, 2012; Durrant & Ellis, 2003; Tooby & Cosmides, 1992). This process of natural selection has been used to explain the functioning of a wide range of anatomical and physiological traits (e.g. the umbilical cord). However, the core idea of evolutionary psychology is that also many psychological traits can be considered adaptations (Confer, Easton, et al., 2010; Durrant & Ellis, 2003; Saad, 2007).

According to evolutionary psychology, the human mind evolved via natural and sexual selection pressures in the same way our bodily organs evolved to their adaptive forms (Buss, 2012). Consequently, many of the components of human experience (e.g. perception, emotions, attitude formation, memory, decision-making) evolved in the same manner as - for example - our lungs
evolved to solve the specific survival problem of supplying oxygen to the body (Confer et al., 2010; Saad, 2007, 2013). Accordingly, evolutionary psychology views the human mind as a collection of evolved psychological mechanisms, often referred to as ‘mental organs’ or ‘mental modules’.

Similar to the function-specificity of our bodily organs, these mental modules are domain-specific algorithms, evolved as adaptive solutions to recurrent problems humans were confronted with in the ancestral environment (Barrett & Kurzban, 2006; Tooby & Cosmides, 1992). Furthermore, as adaptive behavior differs from domain to domain, and given that individuals face a wide variety of adaptive problems, the mind contains numerous problem-specific evolved psychological mechanisms (Durrant & Ellis, 2003). These evolved psychological mechanisms can be considered a set of procedures, activated by cues indicating a specific adaptive problem, leading to output (either physiological, informational or behavioral) in function of solving the adaptive problem (Buss, 2012).

Also, evolutionary psychology can be considered a truly interactionist framework, stating that genes interact with the environment in shaping human behavior on three levels (Buss, 2012; Confer et al., 2010). First of all, as evolution shapes unique adaptations through selection pressures within a given environment, the historical ancestral conditions (i.e. the Environment of Evolutionary Adaptedness, EEA) formed the evolved psychological mechanisms (i.e. the phylogenetic level; Saad, 2011; Tooby & Cosmides, 1992). In addition, a person’s developmental history (defined by local circumstances, culture, education etc.) triggers the development and functioning of the heritable mental adaptations (i.e. the ontogenetic level; Geary & Bjorklund, 2014; Machluf, Liddle, & Bjorklund, 2014). Finally, in specific situations, mental modules are activated – unconsciously – by environmental cues indicating adaptive threats or opportunities (i.e. the proximal level; Buss, 2012; Colarelli & Dettmann, 2003). Accordingly, depending on developmental and situational influences – among which previous experiences, abilities and life circumstances – people can react differently when the same psychological mechanism is activated (Saad, 2011). For instance, men can seek social status by showing off high status products (Hennighausen, Hudders, Lange, & Fink, 2016), by consuming proenvironmental ‘green’ products.
However, not all behavior is adaptive. As evolution is a slow process, the ancestral environment in which the human mind evolved (EEA) is radically different from our modern society. Indeed, humans are mostly adapted to Pleistocene environments, where people lived as hunter-gatherers on the East African savannas in small, cohesive groups. As a consequence, some of these evolved psychological mechanisms are maladaptive today (Buss, 1990; Frankenhuis & Del Giudice, 2012; Tooby & Cosmides, 1992). For instance, as caloric food was scarce in the EEA, we evolved a preference for sugar and fat. However, in today’s fast food society characterized by an abundance of sugar rich and fatty food, this creates an evolutionary mismatch leading to rising numbers of obesity (Barrett, 2007, 2010). Moreover, in addition to adaptations, the process of natural selection also results in byproducts and noise. Contrary to adaptations, solving problems of survival and reproduction due to their functional design, byproducts are coupled to adaptations without any functional design. For example, some consider reading and writing a (partial) byproduct of the human language acquisition device (Durrant & Ellis, 2003; Pinker, 1994). Noise, on the other hand, are the random effects produced by forces such as mutations (Buss, 2012; Colarelli & Dettmann, 2003). Lastly, we wish to stress that individual behavioral decisions motivated by evolved psychological mechanisms might not always lead to success, even within a ‘species-typical environment’. After all, mental modules evolved as the output solved adaptive problems better on average, compared to competing strategies (Buss, 2012; Frankenhuis & Del Giudice, 2012).

2.2. Ultimate perspective

Many research areas, including traditional psychology, focus on proximate explanations, addressing how behavioral mechanisms operate and identifying influencing factors (i.e. the ‘how’ question). Evolutionary psychology, on the other hand, is concerned with ultimate explanations, attempting to understand the evolved function of psychological mechanisms (i.e. the ‘why’ question). Accordingly, evolutionary psychologists strive to understand the ultimate, Darwinian
roots of behavioral patterns, identifying why cognitions, emotions and behavior evolved to their adaptive form (Bateson & Laland, 2013; Scott-Phillips, Dickins, & West, 2011). However, both types of explanations are complementary and necessary for a complete understanding of behavioral mechanisms (Confer et al., 2010; Saad, 2007). For instance, the ultimate explanation of human infants crying is that infants weep to elicit nursing, caring and protection. Alternatively, proximate explanations describe both the external triggers (e.g. physical separation of the caregiver) and internal mechanisms (Scott-Phillips et al., 2011).

2.3. DEEP RATIONALITY

According to the evolutionary perspective, people often make behavioral decisions that seem irrational at a superficial, proximate level, yet have a clear rationality at a deeper, evolutionary level (Kenrick, Sundie, & Li, 2009; Kenrick & Griskevicius, 2013). To reveal this deep rationality of behavioral actions and preferences, the ultimate function of human behavior needs to be taken into account: fitness maximization. Fitness refers to individuals’ capacity to pass on their genes to the next generation, either by having children themselves (i.e. direct reproduction) or by helping relatives reproduce (i.e. indirect reproduction) (El Mouden, Burton-Chellew, Gardner, & West, 2012; Kenrick et al., 2009). After all, aiding a relative with survival and reproduction also increases fitness, as relatives – such as children, siblings and cousins – share a large part of their genes (Hamilton, 1964). Accordingly, whereas traditional economic based theories of rationality explain behavioral and resource decisions as maximizing utility in the sense of (proximate) expected satisfaction, deep rationality focuses on the (ultimate) evolutionary adaptive value, stating that behavior in function of enhanced utility is in fact behavior in search of fitness enhancement (Kenrick et al., 2009).

All mental modules were designed by evolution to ultimately promote reproductive fitness. However, this does not imply that all human behavior is about reproduction and sex per se. Adaptive behavior to a large number of problems is required for reproductive fitness to increase. Indeed, evolutionary psychologists speak of domain-specific mental modules, evolved to deal with different types of adaptive problems. For instance, in addition to acquiring a sexual mating partner
and – if desired – retaining that mating partner, we need to fulfill our immediate physiological needs (e.g. hunger and thirst), we need to protect ourselves from enemies and avoid disease, we need to acquire status, build coalitions and friendships and we need to take care of kin and children. Each of these challenges can be divided into a series of sub challenges (Griskevicius & Kenrick, 2013; Kenrick, Griskevicius, Neuberg, & Schaller, 2010; Kenrick, 2011; Neuberg, Kenrick, & Schaller, 2010; Vyncke, 2013). Moreover, due to these domain-specific systems for dealing with different types of adaptive problems, individuals will process situations very differently depending on which mental module is currently active. As these mental modules function as motivational systems, individuals will behave in a different manner when searching for a romantic partner, when concerned about their physical safety or when attempting to advance their status (e.g. Griskevicius et al., 2007; Griskevicius, Cialdini, & Kenrick, 2006; Griskevicius, Goldstein, Mortensen, Cialdini, & Kenrick, 2006; Janssens et al., 2011; Kenrick et al., 2009; Maner et al., 2005; Maner, DeWall, Baumeister, & Schaller, 2007).

Furthermore, it is important to keep in mind that reproductive fitness is not a conscious goal. Deeply rational (i.e. fitness increasing) behavior is from the individual perspective typically driven by more proximate goals. This explains why we, for example, feel the need to spend time with family and friends, why we enjoy eating good food, why we place high value on getting praise for our work, why our home is so important to us, why we are afraid to get infected when someone nearby is coughing and why finding the perfect partner and having a family is part of the dreams of many (Buss, 2012; Kenrick et al., 2009; Neuberg et al., 2010; Saad & Gill, 2000).

2.4. THE MIND AS A FITNESS AFFORDANCE MANAGEMENT SYSTEM

When looking at our surrounding environment, we do not perceive objects and their physical and sensory traits. Rather, we perceive a world containing opportunities and threats that can be acted upon. These threats and opportunities are referred to as ‘affordances’: things in the environment that ‘afford’ you to behave in a beneficial manner (Chemero, 2003; Gibson, 1979; Miller, 2007). For instance, for a primate, a tree affords climbing and shelter, whereas fruits and nuts afford eating. Snakes, on the other hand, afford danger (Miller, 2007). However, as the
The ultimate function of all human behavior is increasing one’s fitness, our brain perceives the world in terms of ‘fitness affordances’ (Miller, 2007).

The quality of these affordances is perceived through fitness cues, that is environmental features revealing fitness information about local affordances (Miller, 2009). For example, for young (heterosexual) males, the presence of a young, fertile woman offers a sexual affordance. The specific youth and fertility cues (e.g. lustrous hair, smooth skin, an hourglass figure) indicate the quality of this fitness affordance. For survival, on the other hand, the scent of a prey is a fitness cue of food indicating increased survival chances, whereas darkness is a fitness cue of possible danger connoting reduced survival chances (Buss, 1989; Neuberg et al., 2010).

From an evolutionary perspective, fitness cues connoting fitness affordances are the only things worth noticing in an environment. Since the ultimate goal is fitness maximization, natural selection (dealing with survival) and sexual selection (dealing with reproduction) can only favor acting upon cues that indicate a fitness affordance (Miller, 2009). Accordingly, the human psyche evolved to manage these fitness affordances, both threats and opportunities, paying most attention to fitness cues. As a consequence, our set of adapted mental modules can be considered a fitness affordance management system (Neuberg et al., 2010). More specifically, the perceptual features of fitness cues (e.g. sounds, smells, morphological traits) are translated into affordance categories (e.g. physical safety threat, mating opportunity). Subsequently, the cognitive, affective and behavioral system make precise affordance distinctions to produce specific functional behaviors (Kenrick & Shiota, 2008; Neuberg et al., 2010). However, there are no fixed, hardwired connections that link a specific set of cues to particular opportunity or threat inferences, or that link a certain affordance categorization to specific emotional, cognitive or behavioral responses. These links are probabilistic and depend on additional information from the immediate environment. That is the reason, for example, that snakes are detected faster by people who feel anxious (Neuberg et al., 2010; Öhman, Flykt & Esteves, 2001).

Moreover, this fitness affordance management system has two perspectives. On the one hand, there is the receiver perspective, with fitness cue perception leading to behavioral actions.
However, as Miller (2000, 2009) pointed out, there is also the sender perspective. Not only do we receive affordance information through fitness cues, we also create strategic signals that are perceivable by others. These are fitness indicators that advertise a person’s—physical and mental—qualities, characteristics and traits (e.g. health, fertility, social status, resources, social intelligence, creativity), and through which a person can or may be perceived by others as an affordance (Miller, 2000, 2009; Sefcek & Adam, 2010). Of course, the two are inherently connected with each other: an individual’s (the sender’s) fitness indicators become another one’s (the receiver’s) fitness cues. Consequently, we all have two major evolutionary drives: pursuing fitness cues as well as signaling fitness indicators. However, these innate drives do not imply that we are consciously aware that these specific features evolved to advertise fitness. We only experience the urge and/or the pleasure to display them, similar to the unconscious pursuit of fitness cues leading to reproductive opportunities (Miller, 2009).

3. DEEP RATIONALITY OF RISKY BEHAVIOR

3.1. SEX-SPECIFICITY IN RISK-TAKING.

Generally, and cross-culturally, men behave in a riskier manner than women in a wide array of contexts, including health, financial and recreational behaviors (Betz & Weber, 2002; Böheim & Lackner, 2015; Byrnes, Miller, & Schafer, 1999; Gerdes & Gränsmark, 2010; Harris, Jenkins, & Glaser, 2006; Johnson, Wilke, & Weber, 2004; Kruger & Nesse, 2006; Wilson & Daly, 1985). Only when it concerns appearance enhancement, women are willing to take more risks than men. Accordingly, women engage more in sunbathing, have more plastic surgery, develop more eating disorders etc. (Bish et al., 2005; Gatward, 2007; Hill & Durante, 2011; Saad, 2006, 2007). Since cross-cultural sex-specific behavioral patterns generally point to differential selection pressures, we turn to the theory of sexual selection to gain more insight in the deep rationality of risk-taking behavior.
3.2. Sexual selection

Natural selection is the selection process resulting in the enhanced survival chances of those individuals that are best adapted to the prevailing environmental conditions. Sexual selection was proposed by Darwin to address an incongruity with his natural selection theory. Since natural selection favors traits that enhance the struggle for survival, how could any animal evolve characteristics with no survival advantage or even a survival disadvantage? How could the peacock’s ostentatious tail have evolved, as it signals ‘eat me’ to predators and impedes fleeing in times of danger? Moreover, natural selection could also not account for all sex differences in size, shape and behavior in many species, given that both males and females are confronted with similar ecological pressures in terms of survival problems (Buss, 2012; Durrant & Ellis, 2003; Sundie et al., 2011; Workman & Reader, 2004).

According to sexual selection theory, these traits are selected for because they either enhance attractiveness to the opposite sex (intersexual selection), or because they are an asset in same-sex competition for access to mates (intrasexual selection). In intersexual selection, evolutionary change occurs through preferential mate choice, as individuals who possess the selected qualities are preferred as mates. In intrasexual selection, individuals compete with same-sex others to get sexual access to the other sex directly, or indirectly through controlling resources desired by the other sex. The qualities that lead to success in the same-sex competitions, such as greater size and strength in men, are passed on to the next generations because of the mating success of the winners (Buss, 2012; Buss & Barnes, 1986; Geary, 2006).

This sexual selection process is strongly driven by asymmetries in obliged minimal parental investment and differences in reproductive potential between the two sexes. Parental investment refers to the activities a parent engages in to nurture and protect offspring, with the aim of enhancing the offspring’s reproductive success (Trivers, 1972). In humans, males can limit their investment to the time and energy it takes to have sexual intercourse. Women, on the other hand, are forced to more offspring care due to a nine month pregnancy and the obligatory nursing of infants. Additionally, women have a limited reproductive potential and a slower reproductive rate compared to men. Whereas men are fertile every day from puberty to old age, women’s fertility
is restricted to a couple of days per month, from menarche to menopause (Bjorklund & Shackelford, 1999; Trivers, 1972).

As a consequence, sexual selection led to psychological mechanisms motivating women to be selective in choosing sexual partners, forcing men to compete for reproductive access to women and to signal their mate quality through conspicuous traits and behavior. Men, on the other hand, devote more time to mating effort as men’s reproductive success is constrained by the reproductive access to women. Accordingly, this asymmetry in parental investment and reproductive rate led to the evolution of different mating strategies with women generally prioritizing the quality of their mate(s) and preferring to engage in a so-called long-term mating strategy. Men more often prioritize the quantity of mates, and engage more easily in a so-called short-term mating strategy (Bateman, 1948; Buss, 1995, 2012; Gangestad & Simpson, 2000; Geary, 2006; Owens, 2017; Schmitt, 2003; Trivers, 1972).

3.3. **SEXUAL STRATEGIES**

However, extensive research confirms that men as well as women can follow both long-term and short-term mating strategies. Even mixed strategies, with a combination of short and long-term relationships, can be engaged in (e.g. when having extra-marital relationships), leading to a great variation in sexual tactics (Buss, 2012). Consequently, human sexuality is sometimes referred to as a sociosexual continuum, ranging from an unrestricted to a more restricted sexual approach (Simpson & Gangestad, 1991, 1992).

According to the sexual strategies theory (Buss & Schmitt, 1993), the actual mating behavior engaged in can be considered a strategic choice. In our ancestral past, both men and women searched for mates to solve recurrent adaptive problems. Due to differential parental investment, men generally benefited from a short-term oriented, sexually unrestricted, approach whereas women took more advantage from following a long-term oriented, sexually restricted, strategy (Trivers, 1972). However, depending on the context, the reproductive benefits of the alternative mating tactic could surpass the costs, leading to sexually restricted males and sexually...
unrestricted females. For instance, by following a long-term mating strategy, men could obtain women of a higher mate value, while securing parental certainty. Unrestricted women, on the other hand, could benefit from gaining resources and higher quality genes to pass on to their children. Women could also employ a short-term oriented mating strategy to evaluate potential long-term mates, to switch partners or even to manipulate current partners (Buss & Schmitt, 1993; Buss, 2012; Greiling & Buss, 2000; Simpson, Wilson, & Winterheld, 2004).

Building on the sexual strategies theory, the strategic pluralism model (Gangestad & Simpson, 2000) stresses the importance of both personal attributes and the environmental circumstances in the adoption of a specific mating strategy. More specifically, this model states that women evaluate potential partners on two dimensions: being a good parent on the one hand, and possessing high genetic quality on the other. Trade-offs in mate choice are made taking into account one’s own features (e.g. attractiveness, status) and current environmental demands (e.g. harshness, uncertainty). Accordingly, when biparental care is necessary, parental qualities and a long-term mating partner are valued more (Schmitt, 2005). However, in times of high disease prevalence, physical health gains importance (DeBruine, Jones, Crawford, Welling, & Little, 2010; DeBruine, Jones, Tybur, Lieberman, & Griskevicius, 2010; Gangestad & Buss, 1993). This model also points out that men pursue reproductive strategies in function of their value on the mating market: attractive men high in genetic quality will often pursue a short-term mating strategy because of the reproductive benefits when seeking multiple mating partners. As less attractive, viable or healthy men do not have the same mating opportunities, they often invest more in long-term relations. Nevertheless, also male mating decisions are influenced by contextual conditions (Frederick & Haselton, 2007; Gangestad & Simpson, 2000; Kenrick et al., 2010; Simpson et al., 2004).

This impact of internal and external cues on mating strategies is also found in the life history theory, stating that sexual strategies are part of more general behavioral strategies, and depend on life history variables. Life history theory is an evolutionary framework that explores how

1 High genetic quality refers to the possession of ‘good genes’ or heritable fitness (Miller & Todd, 1998).
organisms allocate their limited time, energy and other resources to the development of traits and behavioral strategies to maximize their fitness. According to this theory, all behavioral decisions carry different costs and benefits, depending on a series of variables, such as the own sex, early life experiences, environmental circumstances and the life stage a person is currently in. Some individuals allocate their resources in a slower manner, investing in embodied capital, delayed reproduction and parenting efforts. Others, on the other hand, evolve clusters of traits associated with a fast life history, characterized by more riskier, present-oriented behavioral strategies and psychological functioning. These individuals also have a more short-term oriented sexual strategy, with early reproduction and higher mating efforts.

Consequently, investment in mating effort often comes at the expense of investment in survival, maintenance and health. However, depending on environmental circumstances and variables, discounting future costs for immediate reproductive benefits can be adaptive. For instance, individuals growing up in environments characterized by instability and uncertainty will develop riskier, present-oriented behavioral strategies because of the low probability of reproductive success when applying long-term strategies (Kruger, 2011; Neuberg et al., 2010). Additionally, when intrasexual competition is high, risky and costly mating tactics are engaged in to enhance courtship and intrasexual competitive abilities (Tybur, Bryan, & Hooper, 2012). This is especially the case for young men, experiencing the highest levels of competition and the greatest variation in reproductive success. Therefore, to increase reproductive success, sexual selection favors young male competitive behavior and courtship displays taking into account female desires (Daly & Wilson, 2001; Ellis et al., 2012; Wilson & Daly, 1985). Both the theory of differential parental investment (Trivers, 1972) as the strategic pluralism model (Gangestad & Simpson, 2000) can be considered sub theories of the life history framework.

3.4. MALE SEXUAL SIGNALING

As the above theories show, both men and women can follow either a short-term oriented or a long-term oriented mating strategy. However, because of the high reproductive costs when making a poor mating decision, women remain demanding when selecting a short-term mating
partner as well as a long-term mating partner (Li, Bailey, Kenrick, & Linsenmeier, 2002; Li & Kenrick, 2006; Schmitt, 2014). As a consequence, men are forced to compete for access to mates in both mating situations, engaging in behavior that raises their odds in the mating game. This includes sexual signaling behavior attuned to women’s preferences, as a function of the sexual strategy that is followed (Buss, 2012; Geary, 2006; Miller, 2000, 2009; Saad, 2013; Schmitt, 2014).

In line with the strategic pluralism model (Gangestad & Simpson, 2000), there appear to be two prevailing dimensions in women’s mating preferences: being a good parent on the one hand, or possessing genetic quality on the other. In a long-term mating context, women benefit from a mating partner who has the capacity and willingness to invest in (future) offspring, and who is able to protect her and the children. Accordingly, women are attracted to kind men, strong men and men with resource potential and status (Buss & Schmitt, 1993; Buss, 1989; Buss, 2012; Li et al., 2002). However, when the quality of a man’s genes has the greatest impact on a woman’s fitness, indicators of good genes are prioritized and are perceived as more attractive (Buss & Schmitt, 1993; Buss, 2012). According to the genetic benefit hypothesis and sexy son hypothesis, this could be explained as women’s offspring inherit these good genes, enhancing the children’s attractiveness and fitness (Buss, 2012; Greiling & Buss, 2000). Consequently, women possess evolved desires for cues that signal good genes, such as masculine features (muscularity, deep voice, physical strength, stature etc.), facial and bodily symmetry, social dominance and physical attractiveness (Baran Mandal, 2012; Gangestad & Simpson, 2000; Geher, Kaufmann, & Fisher, 2013; Goetz, Easton, Lewis, & Buss, 2012; Kokko, Brooks, Jennions, & Morley, 2003; Miller & Todd, 1998; Neff & Pitcher, 2005; Roberts & Little, 2008).

According to the immunocompetence signaling hypothesis (Folstad & Karter, 1992), masculine characteristics can be considered reliable indicators of good genes because testosterone is both responsible for the development of masculine characteristics, but is also immunosuppressive. This decrease in immunity results in a greater vulnerability for parasites and pathogens. As a consequence, only individuals in good condition can afford the impact of testosterone on the immune system, necessary for the production of masculine traits (Frederick & Haselton, 2007; Grammer & Thornhill, 1994; Roberts, Buchanan, & Evans, 2004). Other
researchers add that masculine features also function as cues of good condition because there are higher metabolic expenses necessary to develop characteristics such as greater size and muscularity, in addition to the immunosuppression (Frederick & Haselton, 2007). Similarly, researchers posit that symmetry indicates genetic quality and health, as it shows that individuals can afford spending sufficient energy on development and growth, despite genetic and environmental stressors producing symmetrical deviations and fluctuating asymmetries (Grammer & Thornhill, 1994; Møller & Thornhill, 1998; Rhodes et al., 2001; Thornhill & Møller, 2007; Thornhill & Gangestad, 2006; Van Dongen & Gangestad, 2011). Also mental qualities, such as social dominance, appear to be an indicator of high levels of testosterone, and are linked to both health and (future) status (Buss, 2012; Neave, Laing, Fink, & Manning, 2003; Roberts & Little, 2008).

This preference for good genes indicators peaks when women are ovulating and in their most fertile phase (e.g. Debruine et al., 2010; Gangestad, Simpson, Cousins, Garver-Apгар, & Christensen, 2004; Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Gildersleeve, Haselton, & Fales, 2014; Little, Jones, & Burriss, 2007; Penton-Voak & Perrett, 2000; Peters, Simmons, & Rhodes, 2009). Remarkably, this is especially the case when women ‘need’ the good genes (Schmitt, 2014), for instance when women are low in mate value (Millar, 2013) or when the husband is physically unattractive (Gangestad, Thornhill, & Garver-Apgar, 2010; Larson, Pillsworth, & Haselton, 2012). Similarly, men with symmetrical faces and masculine features (such as deep voice, muscular body) are found most desirable in short-term mating partners (e.g. Little, Jones, Penton-Voak, Burt, & Perrett, 2002; Provost, Troje, & Quinsey, 2008; Puts, 2005; Thornhill & Gangestad, 1999), as well as men who are confident, daring, exciting, assertive, dominant and adventurous (Geher et al., 2013; Kruger, Fisher, & Jobling, 2003). Also physical attractiveness is prioritized in men for casual sexual encounters (Kenrick, Groth, Trost, & Sadalla, 1993; Li & Kenrick, 2006).

Men’s characteristics and actual behavior appear to be in line with these female desires. For instance, men in a short-term mating mindset behave in a more assertive, non-conforming manner (Griskevicius, Goldstein, et al., 2006). Additionally, men display more heroic altruism when viewing pictures of desirable potential romantic partners, and are willing to donate more money
to charity in the presence of attractive women (Iredale, Vugt, & Dunbar, 2008; Van Vugt & Iredale, 2013). When exposed to potential mates, men also place more importance on ambition and social status (Roney, 2003), while the presence of an attractive woman increases men’s attention to status products (Janssens et al., 2011). Moreover, sexually unrestricted (short-term oriented) men tend to be more physically attractive (Simpson & Gangestad, 1992; Thornhill & Gangestad, 1994) and socially dominant and exploitative (Jonason, Li, Webster, & Schmitt, 2009), while sexually restricted (long-term oriented) men are generally more warm and agreeable (Durante, Griskevicius, Simpson, Cantú, & Li, 2012; Gangestad, Garver-Apgar, Simpson, & Cousins, 2007).

3.5. Male risk-taking as sexual signaling

Because of the high intrasexual competition among young men, there is great variance in men’s reproductive success (Daly & Wilson, 2001; Kruger & Nesse, 2006). Due to the high potential payoffs, young men use risk-taking behavior to compete with rivals (Daly & Wilson, 2001; Ermer, Cosmides, & Tooby, 2008; Griskevicius et al., 2009; Wilson & Daly, 1985). Men compete for access to mates directly, but also indirectly by trying to elevate their status and position in the social hierarchy (Daly & Wilson, 2001; Ellis et al., 2012). However, research indicates that young men also engage in risk-taking behavior to signal to women that they possess desirable qualities as a mate.

For instance, several studies showed that physical risk-taking increased in the presence of women, while no increased risk-taking occurred in the proximity of male observers (Frankenhuis, Dotsch, Karremans, & Wigboldus, 2010; Pawlowski, Atwal, & Dunbar, 2008; Ronay & Hippel, 2010). Similarly, when playing against attractive female opponents, high-level chess players used riskier strategies (Dreber, Gerdes, & Gränsmark, 2013). Even when activating mating motivations through mere mating cues (photographs, priming scenario’s, etc.), men displayed riskier behavioral

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Risk refers to an unpredictable variation in outcomes (Frankenhuis & Del Giudice, 2012; Winterhalder, 2007). Corresponding with the study of Sylwester and Pawlowski (2011), we define physical risk-taking as voluntary behavior that could lead to harmful physical or health consequences. Social risk-taking, on the other hand, is non-conform behavior that could harm a person’s reputation, whereas financial risk-taking is behavior that might reduce an individual’s resources or resource potential.
decision making and willingness across a wide range of risk-taking domains (Greitemeyer, Kastenmüller, & Fischer, 2013), including financial risk-taking (McAlvanah, 2009). This was also confirmed by studies focusing on decision biases, showing that men in a mating mindset were less loss averse and more gain seeking (Kenrick, Sundie, & Li, 2009; Li, Kenrick, Griskevicius, & Neuberg, 2012).

Moreover, research showed that risky signaling behavior targeted at women is strategic, as it is used only when the odds of obtaining reproductive benefits are high. This signaling through risk-taking appears sensitive to both the situational context, as well as the personal situation. For instance, in their research, Baker and Maner (2009) demonstrated that young men were more inclined to take risks when exposed to an attractive women, but only when she indicated being single. Similarly, no elevated risk-taking was found when viewing pictures of unattractive women, as opposed to images of highly attractive females (Baker & Maner, 2008; Wilson & Daly, 2004). Furthermore, only uncommitted men increased their risk-taking behavior in the presence of women, while taking into account the behavior women indicated finding attractive (Frankenhuis & Karremans, 2012). Men were also more risk seeking in the presence of ovulating women than women who are not in their fertile period (Miller & Maner, 2011).

Furthermore, the attractiveness of male risk-takers corresponds with the evolved mating preferences of women, for both short-term mating and long-term mating. For instance, Kelly and Dunbar (2001) showed that women found brave risk-taking more attractive than similar but non-brave risk-taking in a short-term mating partner. This was especially the case for men taking physically non-heroic risks. This preference for brave men was also found in long-term romantic partners, but had the greatest impact on men’s short-term desirability. Additionally, Basset and Moss (2004) showed that high risk-takers were preferred by women for short-term mating, more so than moderate or low risk-takers. Corresponding with Kelly and Dunbar (2001), a risk preference was also present for long-term mating, yet to a lesser extent. In a more recent study, Sylwester and Palowski (2011) found that risk-takers were preferred as short-term mating partners, while risk avoiders were found more attractive for long-term relationships. Moreover, their study showed that a physical risk-taker was preferred over financial and social risk-takers in short-term
relationships. Other research focusing solely on the long-term attractiveness of physical risk-taking confirmed that risk avoiders were preferred over risk-takers, except when physical risk-taking was heroic, indicating altruism and kindness (Farthing, 2005). In a later study Farthing (2007) complemented these findings by showing that a non-heroic physical risk-taker was preferred as a long-term mating partner over a risk-avoider, but only when the risk was moderate. According to the authors, this could be explained as moderate risk-taking allows to signal desirable traits, without the possibility of serious harm. Consequently, moderate risk-taking also carries less danger for the partner and (future) children, as the risk of losing a partner or father is limited.

3.6. **Female sexual signaling**

Although mating competition is high for young men, women also need to compete for mating opportunities. As sexually restricted men invest in long-term relationships – and potentially children – they too have a lot to lose from poor mating decisions. Accordingly, long-term oriented men are also discriminative in their preferred mating partners. Unrestricted men, on the other hand, are often high in mate value (Gangestad & Simpson, 2000; Schmitt, 2014), forcing women to compete for high-quality short-term mates (Miller, 2009). Similar to men, research indicates that women’s sexual signaling corresponds with the evolved male mating preferences.

Generally, men have a preference for young, beautiful women as short-term and long-term mating partners, as beauty and youth function as cues for fertility, reproductive value and health. Consequently, signs of youth (e.g. neotenous face, clear skin, lustrous hair, energetic behavior), signs of high estrogen levels (e.g. feminine face, 0.7 waist-to-hip ratio) and signs of health (e.g. facial and bodily symmetry) are found highly attractive. Additionally, sexually restricted men also search for indicators of faithfulness and good parenting skills (e.g. nurturing, kind, caring) in a long-term mating partner. Sexually unrestricted men, on the other hand, appear to relax their standards in order to mate with a variety of sex partners (Buss, 2012; Buss & Schmitt, 1993; Li et al., 2002; Schmitt, 2014). However, as long courtship before sexual consent is disadvantageous for sexually unrestricted men, they also search for cues of sexual willingness (Buss, 2012; Geher et al., 2013; Schmitt, 2014). Accordingly, men are also attracted to women who indicate being sexually
accessible as short-term mates (Buss, 2012; Goetz et al., 2012; Regan, Levin, Sprecher, Christopher, & Cate, 2000; Schmitt, Couden, & Baker, 2001).

Similar to men, women engage in sexual signaling behavior that corresponds with the evolved mating preferences of men. For instance, women motivated to acquire a long-term mate display more helpful behavior, but only when the behavior is publicly visible (Griskevicius et al., 2007). They also become more cooperative (Griskevicius, Goldstein, et al., 2006). Additionally, women accentuate their beauty and youth using cosmetics, high heels and carefully selected clothes (Smith, 1999; Etcoff, Stock, Haley, Vickery, & House, 2011; Griskevicius & Kenrick, 2013; Hill, Rodeheffer, Griskevicius, Durante, & White, 2012; Jones, Russell, & Ward, 2015; Russell, 2009; Saad, 2007, 2013). Women near ovulation also dress more sexier (Durante, Li, & Haselton, 2008; Durante, Griskevicius, Hill, Perilloux, & Li, 2011; Haselton, Mortezaie, Pillsworth, Bleske-Rechek, & Frederick, 2007; Saad & Stenstrom, 2012). This corresponds with the finding that women’s behavior and partner preferences become more short-term oriented during ovulation, with an increase in sexual desire and higher flirting behavior (Cantú et al., 2014; Durante et al., 2012; Gangestad, Thornhill, & Garver, 2002; Gildersleeve et al., 2014; Peters et al., 2009).

3.7. FEMALE RISK-TAKING AS SEXUAL SIGNALING

Given the sex-specificity in risk-taking, not only male but also female risk-taking is shaped by sexual selection pressures. Consequently, female risky behaviors too should be strategic, context dependent and attuned to male desires. However, at first sight, risk-taking seems less relevant as a sexual signal in women. First of all, due of the differences in parental investment, women are more vulnerable to the potential harmful consequences of risk-taking behavior than men. Moreover, given that men prioritize beauty and youthfulness in potential partners, as indicators of fertility and fecundity, it appears that women would benefit more from displaying their physical attractiveness to potential mates. Accordingly, women perceive most risk-taking behavior as more dangerous and less pleasant than men (Gardner & Steinberg, 2005; Harris et al., 2006; Harris & Miller, 2000). They also behave in a less riskier manner in various domains (Betz & Weber, 2002; Böheim & Lackner, 2015; Byrnes, Miller, & Schafer, 1999; Gerdes & Gränsmark,
A clear exception to this behavioral pattern is beauty boosting behavior. Corresponding with men’s preferences, risky appearance enhancement behavior – including sunbathing and cosmetic surgery – is engaged in more by women than men (Saad, 2006, 2013). Moreover, research confirms that these behaviors are strategically used. Indeed, only in single women, mating motives increased sunbathing behavior and taking dangerous diet pills, but not risk-taking behavior unrelated to the physical appearance (Hill & Durante, 2011).

In addition, most research indicates that a mating mindset does not increase female risk-taking behavior. For instance, corresponding with men’s evolved mating preferences, the study of Greitemeyer, Kastenmüller and Fischer (2013) found that a long-term mating motive does not induce higher risk-taking inclinations in a wide range of behaviors, including gambling and sexual risk-taking. Several studies showed that pictures of attractive men also do not increase risky financial decision making in women (Baker & Maner, 2008, 2009; Fischer & Hills, 2012; Li, Kenrick, Griskevicius, & Neuberg, 2012; Wilson & Daly, 2004). However, other research suggests that physical and social risk-taking might be perceived as suitable signaling behavior by some women. For instance, studies found that young women engage in more dangerous driving in the presence of a male peer passenger (Simons-Morton, Lerner, & Singer, 2005; Williams, Ferguson, & McCartt, 2007). Additionally, in the domain of social risk-taking no sex differences were found, both in the assessment of potential negative consequences as in behavioral intentions. (Betz & Weber, 2002; Harris et al., 2006; Johnson et al., 2004).

Moreover, several studies indicate that engaging in certain forms of risk-taking is beneficial for women in the mating domain, especially as a short-term mating partner. For instance, in the study of Basset and Moss (2004), high risk-taking enhanced female attractiveness compared to not engaging in risky behavior or only moderately, but only in a short-term mating and dating context. This finding was confirmed by Sylwester and Pawlowski (2011) showing that female risk-takers were considered more attractive than risk avoiders in short-term mating contexts. Moreover, physical and social risk-takers were rated most desirable as short-term partners, while no such preference was found for financial risk takers. In long-term mating contexts, on the other hand,
men generally preferred risk avoiders as partners (Farthing, 2005; Sylwester & Pawlowski, 2011). Only altruistic physical risk-taking and moderate non-heroic physical risk-taking was also preferred in a romantic, long-term mating partner (Farthing, 2005, 2007). As sexually unrestricted men search for cues of sexual willingness in potential short-term mating partners (Buss, 2012; Regan et al., 2000; Schmitt et al., 2001), these attractiveness findings could indicate that men use female risk-taking as a cue that women are also willing to engage in other forms of risk-taking, including sexual risk-taking. Corresponding with this reasoning, the study of Goetz et al. (2012) showed that reckless behavior in women is perceived as a cue of sexual exploitability and is found sexually attractive.

4. (Costly) Signaling theory

According to signaling theory, signals are perceivable traits or behaviors that are intended to (or evolved to) communicate a difficult to observe quality about the signaler, with the intention of affecting the receiver’s beliefs or behavior to the advantage of the sender. The receiver, in turn, uses the signal as a cue to infer information and as a guide for future action (Donath, 2011; Dunham, 2011; Maynard Smith & Harper, 2003). Consequently, signals can be considered fitness indicators, advertising individuals’ qualities and traits, whereas cues are actually fitness cues.

Consequently, the above findings indicate that young male physical risk-taking could function as a short-term mating signal. Not only do young men increase their physical risk-taking in the case of short-term mating opportunities, physical risk-taking also enhances a young man’s desirability as a short-term mating partner. To explain the functioning of young male risk-taking as a short-term mating signal, researchers suggest that young men use risky behavior, and particularly physical risk-taking to signal genetic quality. This corresponds with the good genes hypothesis, stating that women search for indictors of genetic quality in short-term mating partners (Gangestad & Simpson, 2000; Greiling & Buss, 2000). Due to behaving in a physically risky manner, young men could advertise physical qualities, such as strength, health, vigor, physical prowess and viability. However, because of the risky nature of the signaling behavior, risk-taking
could also demonstrate mental traits related to risk-proneness, including bravery, courage and confidence (Bassett & Moss, 2004; Farthing, 2005; Kelly & Dunbar, 2001; Sylwester & Pawłowski, 2011). As an alternative explanation, researchers suggested that women are attracted to risk-takers, as braveness, risk-proneness and physical prowess etc. are qualities that were beneficial for resource acquisition in the ancestral environment, due to the risky nature of hunting (Bassett & Moss, 2004; Farthing, 2005; Hawkes & Bliege Bird, 2002; Zuckerman & Kuhlman, 2000). To explain why physically risky behavior could signal these qualities, researchers (Farthing, 2007; Sylwester & Pawłowski, 2011) point into the direction of the handicap principle (Zahavi and Zahavi, 1997; Zahavi, 1975) and the costly signaling theory (Bliege Bird, Smith, & Bird, 2001).

According to these theories, costly behaviors are used to reliably signal difficult to observe qualities or finite resources that vary between individuals (e.g. bravery, dominance, strength, financial resources, etc.). Through engaging in costly behaviors – in terms of time, energy, resources or risks – individuals can show that they possess a certain quality or resource in such abundance that they can afford wasteful displays. As these signals are costly to produce in terms of the quality they signal (i.e. the cost is quality-dependent), they are more expensive and less beneficial for individuals who possess less of the quality. Accordingly, only high-quality individuals can afford the strategic cost of the conspicuous behavior, which functions both as a self-advertisement and a quality guarantee (Bird and Smith, 2005; Bliege Bird et al., 2001; Donath, 2011; Miller, 2009; Zahavi, 1977; Zahavi and Zahavi, 1997).

Furthermore, for costly signaling to take place, signalers and observers should have conflicting interests, yet both should benefit from honest signaling. For the signaler, wasteful displays must raise the odds of gaining a fitness advantage (e.g. an increased desirability as a mating partner). However, the signal must also be of value to the intended audience, providing reliable information about a fitness relevant trait. For instance, based on costly signals, observers

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3 Donath (2011) remarks that competition can be very subtle, and is even present in cooperative relationships due to small conflicts of interests. Additionally, Zahavi (1997) stresses that also in the mating game, males and females have conflicting interests.
should be able to assess a signaler’s level of suitability as an ally, competitor or potential mate. Finally, a costly signal must be easily observable, in which there is a logical relationship between the signal and the quality that one wishes to demonstrate (Bird and Smith, 2005; Bliege Bird et al., 2001; Farthing, 2005; Griskevicius et al., 2007; McKeown, 2013; Zahavi and Zahavi, 1997).

Costly signals and handicaps are largely present in the animal world, even though costly signals of strength and status lower the animal’s chances of survival (Donath, 2011). For instance, when gazelles detect a predator such as a wolf, they start stotting (jumping up and down) instead of running for their lives. Although this behavior seems odd at first sight, gazelles use stotting to signal their fleeing capacity and strength. As chasing gazelles is also a high investment for the wolf, the costly signal is beneficial for both predator (preventing the loss of wasted energy) and prey (preventing being chased after in the first place) (Zahavi & Zahavi, 1997). Additionally, costly signaling theory has been applied to male consumption behavior, including conspicuous consumption, altruism and green consumption (Griskevicius et al., 2007, 2010; Sundie et al., 2011). Nell (2002) also used the handicap principle to explain reckless driving, suggesting that these kinds of dangerous conspicuous behavior serve as fitness indicators because of its riskiness. Even blood donations were studied as a costly signal of donor quality (Lyle, Smith, & Sullivan, 2009), as well as male charity donations in the presence of women (Iredale et al., 2008; Van Vugt & Iredale, 2013).

Other researchers remark that the mental qualities signaled by risk-taking (e.g. bravery) are used by young men to enhance their reputation, status and position in the social hierarchy, as these mental traits can be considered assets in male intrasexual competition (Daly & Wilson, 2001; Ellis et al., 2012). This reasoning is also found in the crazy bastard hypothesis (Fessler, Tiokhin, Holbrook, Gervais, & Snyder, 2014), stating that young men willingly engage in nonviolent risk-taking to increase their reputation as valuable allies and dangerous rivals. By demonstrating risk-proneness, and consequently an indifference to the possibility of harm, individuals are perceived as more formidable and tough (measured by strength and stature). However, this theory focuses on risk-taking as an honest signal of risk-proneness, without focusing on questions of genetic or phenotypic quality (Fessler, Holbrook, Tiokhin, & Snyder, 2014). Additionally, due to the intrinsic connection between the action (physical risk-taking) and the perceived trait (willingness to engage
in risk-taking), the authors refer to risky behavior as an index to the general propensity to take risks (Fessler, Tiokhin, et al., 2014). Indices are considered unfakeable signals, that can only be produced and displayed when individuals actually have the quality (Donath, 2011; Maynard Smith & Harper, 2003). Similar to costly signals, the form of the signal is inherently related to the displayed quality. Yet, contrary to costly signals, indices have no strategic, handicapping costs. Moreover, displaying an index does not use up the signaled quality (Donath, 2011). For instance, tigers scratch trees to mark their territory, as a higher scratch is an index signal of the tiger’s size (Maynard Smith & Harper, 2003). In humans, playing a game of tennis at a high level is an index of good coordination (Donath, 2011).

In addition, the studies discussed above suggest that physical risk-taking – as well as social risk-taking – might also function as a short-term mating signal in women. Accordingly, like men, women could use physically risky behavior to advertise both bodily (e.g. health) and mental qualities (e.g. bravery). However, risk-taking seems less suitable as a signaling mechanism, given that men can infer health and fertility from women’s physical appearance and body, while daredevilry is less desirable for a woman as it can harm reproduction and childcare (Campbell, 2004). Nonetheless, research on the crazy bastard hypothesis showed that women who voluntarily engaged in risky physical behavior were perceived as larger in size and height, because of their higher risk-proneness (Fessler, Holbrook, Tiokhin, & Snyder, 2014).

However, as sexually unrestricted men are also sensitive to cues indicating sexual willingness (Buss & Schmitt, 1993; Regan, Levin, Sprecher, Christopher, & Cate, 2000), Sylwester and Pawlowski (2011) suggested that women might use signaling strategies analogous to men to indicate that they are also more masculine and unrestricted in their sexuality. In line with this reasoning, research confirmed that risk-taking behavior is actually perceived as masculine (Courtenay, 2000; Mahalik, Burns, & Syzdek, 2007). Furthermore, sexually unrestricted women are found to be more masculine, both mentally, physically and behaviorally (Campbell et al., 2009; Clark, 2004; Mikach & Bailey, 1999; Scarbrough & Johnston, 2005), and having higher testosterone levels (Edelstein, Chopik, & Kean, 2011; van Anders, Hamilton, & Watson, 2007; van Anders &
Consequently, female risk-taking might function as a signal of intent, rather than of a signal of quality.

5. THE DEEP RATIONALITY OF DARK CONSUMPTION

The deleterious health consequences of cigarette and alcohol use are well known. In the short run, smoking leads to poorer long functioning, characterized by shortness of breath, coughing and reduced physical performances (American Cancer Society, 2014). Additionally, smoking rapidly causes stains on a person’s teeth and skin, as well as the typical – unpleasant – smoker’s breath (Doe & DeSanto, 2009). In the long run, smoking damages almost every part of the body, leading to an increased risk for cardiovascular and respiratory diseases, strokes and lung cancer (USDHHS, 2010, 2014). These harmful effects even appear when smoking ‘only’ five cigarettes a day (USDHHS, 2014).

Drinking large amounts of alcohol in a short period of time (i.e. heavy episodic drinking or binge drinking), on the other hand, causes intoxication and impairs the functioning of the brain. Accordingly, alcohol affects individuals’ coordination, speech, memory and attention, as well as people’s judgment and decision making. These effects highly increase the risk of injuries and harm. Moreover, the higher the blood alcohol level, the higher the risk of sickness, amnesia, loss of consciousness and even death due to alcohol poisoning (Health Promotion Agency, 2015; NIAAA, 2015). Additionally, due to the toxic effects of alcohol on body tissues and organs, chronic heavy drinking is considered a causal component of more than 200 diseases, including gastrointestinal diseases (e.g. liver cirrhosis), cancers (e.g. pancreatic cancer) and cardiovascular diseases (WHO, 2014). Remarkably, recent research even showed that the alleged beneficial effects of moderate alcohol use are nonexistent (Chikritzhs et al., 2015; Stockwell et al., 2016). Finally, smoking cigarettes and drinking alcohol are considered ‘pediatric diseases’ (Prokhorov et al., 2006), as early smoking and drinking are a gateway to nicotine and alcohol dependency in adulthood due to the addictive effects (Brown, Carpenter, & Sutfin, 2011; Hingson, Heeren, Winter, & Edition, 2006; Rehm, Taylor, & Room, 2006; USDHHS, 2012).
Despite all these negative consequences, the number of young adult smokers and excessive drinkers remains high. For instance, in Belgium, more than 90% of the college and university students indicated drinking alcohol in the last year, of which 60% had also engaged in heavy episodic drinking (Lorant & Nicaise, 2014; Rosiers et al., 2014). According to the recent Global Drug Survey, 38% of the young men and 22% of the young women even had a risky drinking pattern in Belgium, compared to 25% male and 20% female risky drinkers worldwide (Winstock, Barratt, Ferris, & Maier, 2017). In the US, approximately 60% of the young adults aged between 18 and 25 had consumed alcohol in the last month, which corresponds to circa 20.8 million young adults. Moreover, almost 38% of the American young adults had also engaged in binge drinking behavior in the past month (CBHSQ, 2015), while 35% of the college students and 29% of non-college young adults even reported binge drinking behavior in the past week (Johnston, O’Malley, Bachman, Schulenberg, & Miech, 2015). Additionally, 30% of the Flemish college and university students indicated smoking cigarettes in the last year (Rosiers et al., 2014). A more general survey found 26% smokers in the age categorie of 20 to 24 year olds, with 22% of these young adults smoking daily (Gisle & Demarest, 2014). Similarly, 28% of the 18 to 25 year olds in the US had smoked cigarettes in the last month (CBHSQ, 2015), as well as 23% of the 18-34 year olds in the UK (Office for National Statistics, 2014).

Given the harmfulness and prevalence of psychoactive substance (ab)use, evolutionary theorists attempted to reveal the evolutionary basis of substance use and addiction (Saah, 2005). According to the neurotoxin regulation hypothesis, all major recreational drugs are derived from plant toxins, such as nicotine, cocaine and cannabis. These toxins evolved as chemical plant defenses, to discourage herbivores from eating the plant. Accordingly, humans evolved defensive mechanisms to detoxify these plant chemicals, as well as adaptations to exploit them. Consequently, humans – in addition to other animals – learned to consume these plants for their nutritional value (Hagen et al., 2009; Saah, 2005), but also for self-medication such as parasite treatment (Sullivan & Hagen, 2002). Other researchers even state that the derived short-term beneficial effects of neurotoxins led to the evolution of adaptations motivating drug-seeking behavior (Russil Durrant, Adamson, Todd, & Sellman, 2009; Hagen et al., 2009).
However, according to the evolutionary reward model (also known as the ‘hijack hypothesis’), substance use might have been adaptive in the ancestral environment, but can be considered maladaptive today due to a mismatch between evolved human behavior and the new environmental demands (Kacir, 2010; Müller & Schuman, 2011). As the doses of psychoactive substances that humans consumed in the ancestral environment were generally low, they were below the toxic range (Hagen et al., 2009; Müller & Schuman, 2011). Yet, recently, psychoactive substances are very pure and highly concentrated, ‘hijacking’ the natural reward pathways in the brain. This reward system can be considered a signaling system, indicating fitness affordances and disaffordances through emotions. Behaviors that raise the odds of survival and reproductive success are rewarded and reinforced by positive emotions, whereas negative emotions discourage fitness-impairing behaviors (Nesse & Berridge, 1997; Sullivan, Hagen, & Hammerstein, 2008). Psychoactive substances override these evolved neural mechanisms, arousing strong positive emotional experiences. As a consequence, using substances falsely signals fitness advantages, while interfering with the adaptive functioning of negative emotions (Russil Durrant et al., 2009; Kacir, 2010; Nesse & Berridge, 1997; Sullivan et al., 2008). Repeated substance use eventually even alters the motivational-emotional system, leading to addiction (Saah, 2005).

A similar reasoning is found in the ‘drunken monkey hypothesis’, explaining that humans are attracted to alcohol because in the EEA ethanol served as a cue indicating ripe, fermenting, sugar-rich fruit. As caloric food was scarce in our ancestral environment, consuming alcohol was an adaptive ancestral nutritional strategy. As the levels of alcohol were rather low in ripe fruit, ancestral alcohol consumption did not lead to intoxication. However, today, because of agriculture, controlled fermentation and distillation processes, alcohol is highly present in a concentrated form, leading to an evolutionary mismatch between evolved human behavior and the new environmental demands (Dudley, 2000, 2002, 2014).

Although both the evolutionary reward model and drunken monkey hypothesis perceive substance abuse as maladaptive because they are evolutionary novel, other researchers propose that individuals can also use psychoactive substances (in its current form) in an instrumental manner, to improve fitness-relevant behavior. For instance, individuals could use substances to
improve social interactions or cognitive performances, to facilitate sexual behavior, to cope with stress or fear, etc. Based on evolved learning mechanisms, individuals consume a psychoactive drug to change their mental state, to allow for better performance and goal achievement (Müller & Schuman, 2011). This instrumental view corresponds with more proximate oriented research, such as alcohol studies based on the motivational model (Cooper, 1994; Cox & Klinger, 1988) stating that adolescents and young adults are motivated to consume alcohol based on the direct (coping, enhancement) and indirect (conformity, social) effects they expect to achieve (e.g. Anthenien, Lembo, & Neighbors, 2017; Kuntsche et al., 2014; Kuntsche, Knibbe, Gmel, & Engels, 2006; Lyvers, Hasking, Hani, Rhodes, & Trew, 2010).

The theories discussed in this paragraph focus on the functional and hedonic dimension of the psychoactive substance consumption. However, research indicates that young adults’ cigarette and alcohol use also has a signaling dimension. For instance, most youngsters start drinking alcohol and smoking cigarettes in the presence of peers, without liking the distinctive taste of alcohol and tobacco (Amos & Bostock, 2007; de Visser, Wheeler, Abraham, & Smith, 2013; Leary, Tchividjian, & Kraxberger, 1994; Wiltshire, Amos, Haw, & McNeill, 2005). Additionally, also after initial trial, adolescents and young adults prefer to smoke and drink in the company of others (Ali & Dwyer, 2009; de Visser et al., 2013; Moran, Wechsler, & Rigotti, 2004; Teunissen et al., 2014). Research also shows that young adults consider both smoking and drinking as useful tactics to obtain self-presentational goals (de Visser et al., 2013; Gough, Fry, Grogan, & Conner, 2009; Leary et al., 1994; Martin & Leary, 2001; O’Grady, Harman, Gleason, & Wilson, 2012).

Many studies implicitly focus on the signaling function of young adult substance use by investigating how cigarettes and alcohol are used in the process of group acceptance, friendship and social bonding (e.g. Bancroft, Zimpfer, Murray, & Karels, 2014; Brown et al., 2011; Cullen, 2010; de Visser et al., 2013; Hong, Guo, & Chen, 2015; Seaman & Ikegwuonu, 2010). Additionally, much research attempts to clarify the process of direct and indirect peer pressure, through behavioral modeling and sociocultural group norms (e.g. Borsari & Carey, 2001, 2003; Echeverria, Gundersen, Manderski, & Delnevo, 2015; Kinard & Webster, 2010; Lorant & Nicaise, 2014; McLeod et al., 2008; Osgood, Feinberg, Wallace, & Moody, 2014; Teunissen et al., 2012; Teunissen et al.,
However, given the physically harmful consequences of smoking and heavy (episodic) drinking behavior, both behaviors can be considered physically risky behaviors, and therefore a typical form of dark consumption. As research indicates that physical risk-taking operates as a short-term mating signaling strategy, this dissertation aims to investigate if smoking cigarettes and drinking alcohol could equally function as a short-term mating signaling system among young adults.

6. RESEARCH AIDS AND RESEARCH QUESTIONS

The general research objective is to explore the deep rationality of young adults’ smoking and (heavy episodic) drinking behavior as typical forms of dark consumption. Consequently, although ‘dark consumption’ refers to a wide range of destructive consumption behaviors (Saad, 2007), we will from now on use this term to refer to smoking cigarettes and drinking alcohol.

Previous evolutionary models mainly focused on the hedonic (Dudley, 2002, 2014; Kacir, 2010; Saah, 2005) and functional (Durrant et al., 2009; Hagen et al., 2009; Müller & Schuman, 2011; Sullivan & Hagen, 2002) motivations to explain dark consumption, despite the harmful and risky consequences. This dissertation, on the other hand, uses a signaling and cue-reading perspective stating that young adults use dark consumption as a short-term sexual signaling strategy because of its risky nature. The general goal of this thesis is to increase awareness of less obvious behavioral motivations to engage in dark consumption, and to contribute to research on interpersonal communication through consumption behavior. In addition, the dissertation also wishes to offer new insights to social marketing professionals and institutions aimed at targeting dark consumption behavior.

According to the evolutionary perspective, the human mind functions as a fitness affordance management system. Consequently, fitness cues are the only things worth noticing (Miller, 2009). Also signaling theory emphasizes that signals need to be easily perceivable and must be noticed (Donath, 2011; Guilford & Dawkins, 1991; Maynard Smith & Harper, 2003). As this
dissertation investigates the signaling dimension of dark consumption, we wish to start with verifying that dark consumption functions as a fitness cue and catches the eye of young adults

**RQ 1: Does dark consumption attract young adults’ attention?**

Furthermore, as literature on sexual signaling and risk-taking behavior indicates that physically risky behavior may function as a short-term mating signaling strategy, this dissertation wishes to investigate if dark consumption – containing physical risks – could also operate as a short-term mating signal in young men and young women. This leads to the second and main research question in this dissertation:

**RQ2: Does dark consumption function as a short-term sexual signal?**

To resolve this question, this dissertation attempts to answer a series of sub questions. Firstly, to operate as a signal, receivers must use the signal as a cue to infer a hidden trait (Donath, 2011). Accordingly, dark consumption should operate as a cue of an unrestricted sexuality. Furthermore, as signals evolved to influence the beliefs and behaviors of others in ways that benefit the signaler (Donath, 2011; Maynard Smith & Harper, 2003), dark consumption should increase the sender’s short-term mating success. As research on risk-taking behavior already showed that physically risky behavior enhances the short-term attractiveness of potential partners, but lowered their long-term desirability (Farthing, 2005, 2007; Kelly & Dunbar, 2001; Sylwester & Pawłowski, 2011), this dissertation aims to investigate if dark consumption indeed enhances young adults’ short-term attractiveness, while harming their long-term attractiveness.

Signaling theory also stresses that for a signaling system to be stable, a signal needs to be reliable (Donath, 2011). Consequently, the perception must correspond with young adults’ actual behavior. Therefore, as a first step in establishing whether this is actually the case, we aim to verify that there is a clear link between engaging in dark consumption and having an unrestricted sexuality in young adults. However, as signals are displayed with the intention of influencing the receiver’s beliefs or behavior towards the signaler (Donath, 2011; Dunham, 2011; John Maynard Smith & Harper, 2003), establishing a link between dark consumption and having a short-term
mating strategy does not suffice to state that dark consumption functions as a short-term mating signal. Therefore, corresponding with other research on conspicuous signaling behavior in the mating domain (e.g. Griskevicius et al., 2007; Sundie et al., 2011; Wang & Griskevicius, 2014), this thesis wishes to investigate if short-term mating motivations actually increase young adults’ dark consumption.

According to risk-taking literature, physically risky behavior functions as a short-term mating signal because it can be used to signal physical qualities, such as strength, health and physical prowess. However, it could also indicate mental qualities, including bravery and confidence (Bassett & Moss, 2004; Farthing, 2005; Kelly & Dunbar, 2001; Sylwester & Pawłowski, 2011). Similarly, researchers suggest that toxic psychoactive substances could be used to advertise that one is genetically equipped to withstand the detrimental physical effects (Borkowska & Pawłowski, 2014; Dewitte, 2011; Sylwester & Pawłowski, 2011), whereas others believe that substance use is used to display mental characteristics linked to risk-taking (Daly & Wilson, 2001; Ellis et al., 2012). Consequently, this dissertation wishes to investigate which of these qualities are being signaled by engaging in dark consumption.

In summary, Research Question 2 studies the signaling function of dark consumption as a function of its physical riskiness. However, in addition to physical riskiness, dark consumption also has other aspects, including a financial aspect due to the cost of alcoholic beverages. Therefore, this dissertation also wishes to explore if the expensiveness of dark consumption behavior might affect the functioning of substance use as a mating signal. This leads to the third research question in this thesis:

*RQ 3: Does the financial cost affect the functioning of dark consumption as a short-term mating signal*

Again, multiple sub research questions are necessary to answer the above research question. According to research on conspicuous consumption, showy spending behavior functions as a short-term mating cue and cue of status and resources in both young men and women (Hudders, De Backer, Fisher, & Vyncke, 2014; Sundie et al., 2011). Additionally, young men also
seem to use conspicuous consumption as a short-term sexual signal (Sundie et al., 2011), whereas conspicuous consumption seems a more suitable signal for female intrasexual competition (Hudders et al., 2014). Therefore, this thesis wishes to explore if expensive dark consumption also functions as a cue indicating a short-term oriented mating strategy, status and resources in both young men and young women. It also wants to investigate if dark consumption increases young adults’ short-term attractiveness. Finally, we aim to investigate if short-term mating motivations increase young adults’ spending on dark consumption.

7. DISSERTATION OUTLINE

The general aim of this dissertation is to help reveal the deep rationality of young adults’ dark consumption, using a signaling and cue-reading perspective. To investigate the functioning of dark consumption as an adaptive short-term mating signaling system, experimental research is used as the main research method. The dissertation consists of eight chapters, of which six are empirical chapters:

Chapter 2, *Does Alcohol Catch The Eye? Investigating Young Adults’ Attention To Alcohol Consumption*, verifies that dark consumption attracts young adults’ attention by means of two studies. Attracting attention is a necessary prerequisite for dark behavior to function as a signal. Consequently, using an eye-tracking study, this paper investigates if drinking behavior draws young adults’ external attention (i.e. visual attention). Additionally, a recall experiment studies if drinking behavior and alcohol cues also capture young adults’ internal attention (i.e. memory).

Chapter 3, *The Young Male Cigarette And Alcohol Syndrome: Smoking And Drinking As A Short-Term Mating Strategy*, explores if young male dark consumption could function as a short-term mating strategy by means of two studies. The first study uses a factorial survey experimental design, using behavioral profiles to study how young male dark consumption is perceived by young women. More specifically, this study investigates if a higher cigarette and alcohol consumption functions as a short-term mating cue, and whether this brings short-term attractiveness advantages to the users. In addition, this chapter examines the mediating impact of perceived
behavioral riskiness and unhealthiness on women’s perceptions. A second survey study verifies that dark consumption is linked to a short-term oriented sexuality.

Chapter 4, *Cigarette And Alcohol Use To Seduce? Female Cigarette And Alcohol Consumption As A Short-Term Mating Strategy*, has the same structure as chapter 3 to explore if female dark consumption could also function as a short-term mating strategy. Accordingly, a factorial survey experiment studies the functioning of dark consumption as a short-term mating cue in women, as well as the effect of dark consumption on women’s short-term attractiveness. In correspondence with chapter 3, mediation analyses examine the indirect effect of perceived behavioral riskiness and unhealthiness on young men’s perceptions. In addition, a survey study verifies the link between short-term mating and engaging in dark consumption.

Chapter 5, *Drinking High Amounts Of Alcohol As A Short-Term Mating Strategy. The Impact Of Short-Term Mating Motivations On Young Adults’ Drinking Behavior*, empirically investigates if short-term mating motivations increase young adults’ drinking behavior more than long-term mating motivations. Additionally, this paper also investigates if short-term mating motivations affect young adults’ perception of heavy drinking, to find out if the number of alcoholic drinks that is perceived as heavy is higher in short-term mating situations than in long-term mating situations. Priming methodology is used to active both short-term and long-term mating motivations.

In chapter 6, *What Alcohol Says About You. An Experimental Study On Qualities Signaled By Heavy Episodic Drinking*, a factorial survey experiment is conducted, using behavioral profiles to study how heavy episodic drinking is perceived by young adults. Contrary to chapter 3 and chapter 4, the behavioral profiles vary in the amount of alcoholic drinks that are consumed on one occasion (instead of frequency), investigating if binge drinking functions as a short-term mating cue, if it affects young adults’ attractiveness, if it signals physical qualities related to health and formidability and if it signals mental qualities related to risk-proneness.

Finally, chapter 7, *Conspicuous Alcohol Consumption. Expensive Drinking As Signaling Behavior*, explores if the expensiveness of drinking behavior affects the functioning of alcohol consumption as a short-term mating signal in young men and young women. Using a forced choice
design, a first experiment investigates if an expensive drink functions as a status and money cue, and whether it indicates being single and sexually unrestricted. This first study also investigates if a young adult drinking an expensive alcoholic beverage is preferred as a short-term mating partner. A second, follow-up study verifies that these perceptions are mediated by the perceived expensiveness of the alcoholic drink. In addition, a third experiment explores if short-term mating motivations affect the expensiveness of young adults’ choice of alcoholic beverage, as well as young adults’ spending behavior, using priming methodology.
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CHAPTER 2

DOES ALCOHOL CATCH THE EYE?

INVESTIGATING YOUNG ADULTS’ ATTENTION TO ALCOHOL CONSUMPTION
CHAPTER 2: DOES ALCOHOL CATCH THE EYE?
INVESTIGATING YOUNG ADULTS’ ATTENTION TO ALCOHOL CONSUMPTION.4

Many studies on young adults’ motivations for drinking overlook the symbolic aspects of alcohol use. However, research indicates that young adults’ alcohol consumption is also driven by signaling motivations. Although the interest of a receiver is a necessary prerequisite of a signal, no previous studies have verified whether drinking behavior indeed attracts young adults’ attention. Therefore, we conducted two studies. A two-part eye-tracking study (N1 = 135, N2 = 140) showed that both young men and young women pay special visual attention to male and female drinking behavior. Additionally, a recall experiment (N = 321) confirmed that observed male and female drinking is also better remembered than observed non-signaling, functional behavior. Moreover, also alcoholic beverages receive special attention, as they were recalled better than other functional products, and also non-alcoholic drinks similar in color and shape. In summary, the experiments clearly showed that male and female drinking behavior can be used as a signal, as both behaviors clearly function as an attention-attracting cue. Additionally, as alcoholic beverages draw more attention than non-alcoholic drinks, this attention is clearly linked to the alcohol element of the drinking behavior.

4 Chapter 2 is accepted for publication as “Vincze, E., & Vyncke, P. (in press). Does Alcohol Catch The Eye? Investigating Young Adults’ Attention To Alcohol Consumption. Evolutionary Psychology.”
1. **INTRODUCTION**

Excessive alcohol consumption is associated with a range of health-related risks. Drinking large amounts of alcohol in a short period of time causes intoxication, thereby impairing the functioning of the brain. Consequently, physical coordination, consciousness, cognition, perception, and behavior are affected (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2010; World Health Organization [WHO], 2014). Accordingly, the effects of drinking large volumes of alcohol turn from pleasant (e.g., being relaxed and more confident) to harmful, with risk of sickness, coma, and sometimes fatal injuries (NIAAA, 2010). Moreover, because of the toxic effects on organs and body tissues (Rehm, 2011; WHO, 2014), repeated heavy alcohol consumption is linked to more than 200 diseases and health conditions (e.g., cancer, cardiovascular disease, liver disease). Despite these harmful effects, alcohol consumption is highly prevalent among young adults (Center for Behavioral Health Statistics and Quality [CBHSQ], 2015; Rosiers et al., 2014). Binge drinking behavior, defined as consuming a large amount of alcohol in a limited time, even peaks during young adulthood (CBHSQ, 2015; Johnston, O’Malley, Bachman, Schulenberg, & Miech, 2015; Substance Abuse and Mental Health Services Administration, 2014).

Given the negative consequences and high prevalence of heavy drinking during young adulthood, many studies have attempted to shed light on the underlying motives and inducing factors behind the drinking behaviors of young adults. According to the well-known motivational model, young adults often decide to consume alcohol based on the affective change they expect to achieve by drinking (Cooper, 1994; Cox & Klinger, 1988). These affective changes can be the direct chemical effects of alcohol, such as tension reduction and stress relief (coping motivation), or drinking to enhance a positive emotional state (enhancement motivation). On the other hand, the effects can also be indirect, such as fitting in and being liked by peers (conformity motivation) or socializing with peers (social motivation) (Cooper, 1994; Emmanuel Kuntsche, Fischer, & Gmel, 2008; Emmanuel Kuntsche, Knibbe, Gmel, & Engels, 2005). Although many studies have linked the four motivations to young adults’ drinking behavior (e.g., Anthenien, Lembo, & Neighbors, 2017; Aurora & Klanecky, 2016; Collins et al., 2016; Hasking, Lyvers, & Carlopio, 2011; Kuntsche, Knibbe, Gmel, & Engels, 2006; Lyvers, Hasking, Hani, Rhodes, & Trew, 2010; Wahesh, Lewis, Wyrick, &
However, research suggests that drinking alcohol also has a specific symbolic dimension, in which drinking behavior is used as a signal. Young adults indicate consuming alcohol for self-presentational reasons (e.g., de Visser, Wheeler, Abraham, & Smith, 2013; Martin & Leary, 2001; O’Grady, Harman, Gleason, & Wilson, 2012). Moreover, drinking alcohol brings young adults self-presentational benefits such as enhanced status or attractiveness (Dumas, Graham, Bernards, & Wells, 2014; Van Den Abbeele, Penton-Voak, Attwood, Stephen, & Munafo, 2015). Yet, to function as a signal, drinking behaviour must not only be easily perceivable by others (Guilford & Dawkins, 1991), but also be successful in capturing the interest of other young adults (Maynard Smith & Harper, 2003). However, to date, no previous studies have verified whether drinking behavior actually draws the attention of other young adults. Therefore, we set up two studies to explore young adults’ visual attention to and recall of drinking behavior.

1.1. SELF-PRESENTATIONAL DRINKING BEHAVIOR

Despite cross-cultural variations in drinking policies and legislation, the drinking cultures in the United States and Northern and Western Europe (Belgium, UK, Germany, etc.) correspond to a certain degree. For instance, all mentioned countries have high alcohol consumption. Moreover, young people in particular are rather tolerant of excessive drinking and intoxication (CBHSQ, 2015; Gordon, Heim, & MacAskill, 2012; Karlsson & Österberg, 2004; Kuntsche, Rehm, & Gmel, 2004; Leifman, 2001; Room, 2001; Room & Mäkelä, 2000; TNS Opinion & Social, 2010; WHO, 2014).

Several studies conducted in these countries indicate that drinking behavior is often engaged in by young adults for self-presentational reasons, in which they attempt to control the image they display to others. First of all, young adults’ alcohol consumption is generally highly visible, as they prefer to drink in the company of others (de Visser et al., 2013). Moreover, there also appears to be a strong link between young adults’ level of drinking behavior and displaying this drinking behavior on social networking websites (Moreno, Christakis, Egan, Brockman, & Becker, 2012; Ackerman, 2015; Watkins, Franz, DiLillo, Gratz, & Messman-Moore, 2015), these studies are mainly limited to functional (conformity and social) and hedonic (coping and enhancement) motivations.
Additionally, young adults indicate that they perceive alcohol as a means to create impressions. Of 10 risky behaviors, drinking alcohol was reported most frequently by college-aged students as a typical behavior used to achieve self-presentational goals and social payoffs (Martin & Leary, 2001). Additionally, when motivated to make an attractive impression, both young men and young women drink more alcohol in social situations (O’Grady et al., 2012). In other studies, young adults mention that drinking behavior is used to display and strengthen friendships (de Visser et al., 2013; Niland, Lyons, Goodwin, & Hutton, 2013). Research also showed that both mating effort and social competitiveness increase university students’ participation in drinking games, which were considered venues for displays of fortitude and sexual competition (Hone & McCullough, 2015; Hone, Carter, & Mccullough, 2013). College students also indicate engaging in drinking behavior in order to increase their chances of casual sex (Tan, 2012).

Consuming alcohol also seems to bring self-presentational benefits, as drinking alcohol is linked to higher status. Indeed, higher-status group members drink more alcohol compared to peers with a lower status (Dumas, Wells, Flynn, Lange, & Graham, 2014). Additionally, young adults perceive men who engage in frequent binge drinking, as well as young women who drink alcohol frequently, as having higher status (Dumas, Graham, et al., 2014). Exceeding peers’ alcohol consumption during occasions of heavy drinking also conveys higher status among both young men and women (Dumas, Graham, et al., 2014). Furthermore, having consumed a moderate amount of alcohol increases young adults’ general attractiveness compared to being completely sober (Van Den Abbeele et al., 2015). Finally, although risky drinking is not considered attractive in a steady, long-term partner (Farthing, 2007; Wilke, Hutchinson, Todd, & Kruger, 2006), it does bring attractiveness advantages to short-term sexual partners (Vincke, 2016a, 2016b).
1.2. **(Costly) Signaling Theory**

Given the self-presentational motivations and benefits of alcohol consumption, young adults’ drinking behavior can be studied as a signal. Signals are perceivable behaviors or traits that are intended or evolved to indicate a difficult-to-observe quality about the signaler. Signals are displayed with the conscious or unconscious intention of influencing the receiver’s beliefs or behavior towards the signaler (Donath, 2011; Dunham, 2011; Maynard Smith & Harper, 2003). Signals are designed to take advantage of receiver psychology (Cronk, 2005). Accordingly, the signal must not only carry information about the sender, but this must be information that is of interest to the receiver. Moreover, signals not only need to be easily detectable, they must actually be attention-grabbing (Guilford & Dawkins, 1991; Maynard Smith & Harper, 2003). The receiver then uses the signal as a cue to infer the hidden qualities and traits, as a guide to future action (Donath, 2011; Maynard Smith & Harper, 2003).

To explain why young adults would use alcohol as a signal, the theory of costly signaling (Bird & Smith, 2005; Bliege Bird, Smith, & Bird, 2001) and the corresponding handicap principle (Zahavi and Zahavi, 1997; Zahavi, 1975) may be highly relevant. These theories state that individuals signal relevant information about their qualities and resources, by displaying traits or behaviors that are costly in terms of time, resources, energy, or risk. Costly signals evolved because organisms possessing less of the signalled quality or resource could not afford the costs associated with their conspicuous advertisement. Consequently, the costliness of the signal ensures the reliability and effectiveness of the signal (Donath, 2011; Zahavi & Zahavi, 1997). However, for costly signaling to take place, there has to be a strong relationship between the signal and its cost, ensuring that only high-quality individuals engage in this type of signaling behavior. Furthermore, both the signaler and observer should benefit from honest signaling. For the observer, the costly signal should bring reliable information about a relevant trait (e.g., access to resources, courage, health), whereas the costly display must bring advantages to the signaler (e.g., enhanced attractiveness, status). Furthermore, the costly signal needs to be at least easily observable, allowing receivers to correctly interpret the signal. Furthermore, these signals should even be attention grabbing, and therefore stimulate receivers to engage in interpreting these signals (Bird
& Smith, 2005; Bliege Bird et al., 2001; Griskevicius et al., 2007; McKeown, 2013; Smith & Bird, 2000; Zahavi, 1975; Zahavi & Zahavi, 1997). As drinking behavior carries negative physical consequences, and given that these negative effects vary between individuals, it is suggested that drinking behavior could be used by young adults as a costly signal that they are genetically equipped to overcome the harmful effects of toxic substances (Sylwester & Pawłowski, 2011).

1.3. CURRENT RESEARCH

Given its self-presentational motives and benefits, alcohol consumption could function as a signal among young adults, but therefore requires young adults to take an interest in their peers’ drinking behaviors. That is, for young adults, alcohol consumption must not only be observable, but even attention grabbing. However, to date, no previous studies have verified whether this is actually the case.

Given humans’ limited informational capacity, the environment presents more perceptual information than we can process. Therefore, our attentional mechanisms evolved to ensure that we select and process only the most important and relevant information, both externally and internally (Chun, Golomb, & Turk-Browne, 2010; Pashler, Johnston, & Ruthruff, 2001). External attention concerns information about the surrounding environment, perceived through the senses (Chun et al., 2010). Accordingly, our eyes automatically follow what interests us (e.g., Glaholt, Wu, & Reingold, 2010). Internal attention, on the other hand, refers to internally generated information, including representations in our memory. As the number of alternatives that can be considered or remembered at the same time is limited, internal attention also needs to select relevant information represented in the mind (Brigard, 2012; Chun et al., 2010; Kiyonaga & Egner, 2013).

Because of this distinction between external and internal attention, two studies were conducted, focusing on visual attention (i.e., external attention) and recall (i.e., internal attention). In these studies, the attention to drinking behavior is compared to functional behavior that is
generally considered to be neutral, that is, without signaling intention (cf. pretest study 1). Similarly, alcoholic drinks are compared to functional products and non-alcoholic drinks.

As both young men and women engage in self-presentational drinking behavior, and given that both sexes gain signaling benefits, we expect that young adults will pay more visual attention to male and female drinking behavior, compared to other more functional behaviors to which they are exposed (hypothesis 1). Similarly, observed male and female drinking behavior will be recalled better than observed functional behavior (hypothesis 2). As alcoholic drinks are inherently part of alcoholic drinking behavior, we also expect alcoholic products to be recalled better than functional products (hypothesis 3). Finally, for signaling through alcohol consumption, the beverages need to contain alcohol. Therefore, we also believe that young adults will have better recall of alcoholic beverages compared to non-alcoholic drinks (hypothesis 4).

The two studies were conducted among young adults in Flanders, the Flemish-speaking part of Belgium. Belgium has a liberal drinking culture (Österberg & Karlsson, 2004), as illustrated by a survey showing that 82% of the Belgian population had recently consumed alcohol (Gisle & Demarest, 2014). Additionally, binge drinking behavior is most prevalent among young adults, especially young males (Gisle & Demarest, 2014). Alcohol consumption also peaks among college and university students. For instance, two large-scale Belgian studies showed that more than 90% of young adult students had recently consumed alcohol (Lorant, Nicaise, Soto, & d’Hoore, 2013; Rosiers et al., 2014). Moreover, 60% of those students had engaged in heavy episodic drinking within the last year (Rosiers et al., 2014), 23% of them monthly or even weekly. The second study also confirmed the high frequency of excessive drinking among college students, finding a monthly average of 2.8 excessive drinking sessions (Lorant et al., 2013). Furthermore, the recent Global Drug Survey confirms that alcohol is highly present among young adults, with 96% of the voluntary participants engaging in drinking behavior. In addition, more than one-third of young male participants and one-fifth of young female participants even indicated engaging in risky drinking patterns (Winstock, Barratt, Ferris, & Maier, 2017). As the legal drinking age is 18 for spirits and 16 for all other alcoholic drinks, young adults are legal consumers of alcohol in Belgium. In Flanders, they prefer to drink beer, wine, as well as distilled spirits (Rosiers et al., 2014).
2. **STUDY 1: VISUAL ATTENTION**

2.1. **DESIGN AND PARTICIPANTS**

To examine whether young adults pay attention to peers who engage in drinking behavior, a two-part eye-tracking study was conducted. These eye-tracking studies verified whether young adults pay more attention to drinking behavior than to functional, non-signaling behavior. The first part of the eye-tracking study included 135 participants, and the second part included 140. All participants were young adults aged between 18 and 29 (Part 1: $M = 20.89, SD = 1.72$; Part 2: $M = 20.98, SD = 1.73$), with an equal distribution between men and women (Part 1: 51.9% men, 48.1% women; Part 2: 50% men, 50% women). The vast majority of the participants were college or university students (Part 1: 94.8%; Part 2: 92.1%). Additionally, approximately half of the participants indicated that they were in a relationship (Part 1: 51.9%; Part 2: 51.1%), whereas the other half were single. One individual indicated homosexual orientation; all others indicated heterosexual orientation. The participants received no monetary compensation.

2.2. **MATERIALS AND METHOD**

**Eye-tracker.** Young adults’ eye movements were measured using a Tobii 1750 eye tracker and Tobii Studio software (version 1.7.3). Calibration gave an accuracy of 0.5 degrees. Stimuli were presented on a 17-inch monitor, with a resolution of $1280 \times 1024$ pixels. Participants were seated approximately 60 cm from the monitor.

**Visual displays.** Both parts of the eye-tracking study had a within-subjects design, in which participants viewed a set of 20 visual displays. Each of the 20 displays consisted of three to four images, showing either different objects or one person engaging in different behaviors. Four experimental displays focused on drinking behavior, whereas the other slides functioned as fillers. Each display showed one drinking behavior and two to three functional behaviors (see Table 1) of the same person. In part 1, the four experimental displays on drinking behavior showed a young
male adult (male study), whereas part 2 showed a young female adult (female study). The four experimental displays showed identical drinking and functional behaviors in parts 1 and 2.

All images presented in the visual displays were constructed by means of a professional photo shoot, using a white background. The models in both the male and female study were young adult volunteers aged between 23 and 26 years old and of heterosexual orientation. In all pictures, the model had a neutral expression, showing no emotions. In slide 1, the model was sitting at a table for all four behaviors, whereas the remaining three slides showed a model standing up. To avoid looking biases (Glaholt et al., 2010; Plassmann, Ramsøy, & Milosavljevic, 2012; Reutskaja, Nagel, Camerer, & Rangel, 2011), the position of the drinking behavior image in the display varied randomly across all four slides. In addition, the presentation order of the 20 slides was randomized, using the randomization option in the eye-tracker software.

**Pretest functional behavior.** To determine functional behaviors without signaling dimension, 40 people were asked to rate a list of functional behaviors according to their perceived communicative or symbolic neutrality. They indicated on a 7-point scale how neutral, common, and every day they perceived a specific functional behavior to be. The chosen functional behaviors had a neutrality score of 5.75 or higher.

**Table 1: Experimental slides used in eye-tracking**

<table>
<thead>
<tr>
<th>Images</th>
<th>Display 1</th>
<th>Display 2</th>
<th>Display 3</th>
<th>Display 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking behavior</td>
<td>Holding a glass of red wine</td>
<td>Drinking a beer</td>
<td>Holding a beer (with a table of empty glasses)</td>
<td>Drinking from a bottle of gin</td>
</tr>
<tr>
<td>Functional behavior 1</td>
<td>Writing on paper</td>
<td>Carrying a bucket</td>
<td>Cooking</td>
<td>Putting on a sweater</td>
</tr>
<tr>
<td>Functional behavior 2</td>
<td>Licking an envelop</td>
<td>Standing</td>
<td>Filling a bowl with peanuts</td>
<td>Holding a plastic bag</td>
</tr>
<tr>
<td>Functional behavior 3</td>
<td>Checking a watch</td>
<td>Opening an umbrella</td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>
2.3. Procedure

The eye-tracking studies took place in a laboratory setting. Upon arrival, participants received a brief explanation of how the eye-tracker functioned, and the calibration process. After providing some basic sociodemographic information, the calibration of the participants’ eyes was conducted. If the calibration quality was sufficient, the actual eye-tracking study was started. Participants were instructed to sit comfortably, and to look at the visuals in a spontaneous manner. Each slide was visible for five seconds, after which the screen automatically displayed the following slide.

2.4. Results

To process the eye-tracking metrics of the experimental displays, areas of interest (AOI) were created for all images on each experimental display. Defining a separate AOI for each image enables quantification of gaze data, and comparison of gaze data between different images. For each AOI, five variables were selected (Tobii Technology, 2008, pg 81-85). Time to first fixation gives the time (in milliseconds, ms) from when the stimulus was shown until the start of the first eye fixation within an AOI. Fixation length is the duration of the fixations within an AOI (ms). Fixation count gives the number of fixations within an AOI. Observation length is the total time (ms) that a participant has looked at an AOI, starting with each fixation in the AOI and ending with each fixation outside the AOI. Finally, the observation count gives the number of eye visits to an AOI.

To verify whether both young men and young women paid more visual attention to drinking behaviors compared to the functional, neutral behaviors, 10 new variables were created for both the male and female study. For all five eye-tracking variables (e.g., time to first fixation), a mean score was calculated for the four AOIs covering the drinking behavior, as well as a mean score for the 10 AOIs covering the functional behaviors. Subsequently, for each eye-tracking variable, mixed analysis of variance (mixed ANOVA) was conducted. The within-subjects factor comprised the mean scores for drinking behavior and functional behavior. The sex of the participants functioned as the between-subjects factor.
For the male behaviors (see Table 2), there was a significant main effect for all five eye-tracking metrics, with no significant interaction effects between the level of attention and the sex of the participants. As can be seen in Table 3, both men and women fixated sooner (time to first fixation), longer (fixation length), and more frequently (fixation count) on male drinking behavior compared to the other, merely functional behaviors. Male drinking behavior was also observed longer (observation length) and more often (observation count) than the functional behaviors.

For the female behaviors (see Table 2), there was a significant main effect for time to first fixation and observation count. Also a significant interaction effect with the participants’ sex was present for fixation length, fixation count, and observation length. As shown in Table 3, both male and female participants fixated sooner on female drinking behavior compared to the other, merely functional behaviors (time to first fixation), and both looked at female drinking behavior more frequently (observation count). However, only the male participants fixated longer ($p = .025$) and more frequently ($p = .028$) on female drinking behavior compared to the other, functional behaviors. For women, the fixation length and count did not differ ($ps \geq .221$). Similarly, only men observed female drinking behavior longer ($p = .032$), whereas the observation length among female participants did not differ between drinking and functional behavior ($p = .431$). In addition, for both the female drinking behavior ($ps \geq .066$) and the merely functional behaviors ($ps \geq .122$), there were no significant differences between men’s and women’s level of attention.
<table>
<thead>
<tr>
<th>Effect</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to first fixation</td>
<td>24.83</td>
<td>1</td>
<td>131</td>
<td>.&lt;.001</td>
<td>.159</td>
<td></td>
</tr>
<tr>
<td>Time to first fixation * Sex</td>
<td>0.50</td>
<td>1</td>
<td>131</td>
<td>.824</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Fixation length</td>
<td>52.43</td>
<td>1</td>
<td>131</td>
<td>.&lt;.001</td>
<td>.286</td>
<td></td>
</tr>
<tr>
<td>Fixation length * Sex</td>
<td>1.08</td>
<td>1</td>
<td>131</td>
<td>.301</td>
<td>.008</td>
<td></td>
</tr>
<tr>
<td>Fixation count</td>
<td>105.33</td>
<td>1</td>
<td>131</td>
<td>.&lt;.001</td>
<td>.446</td>
<td></td>
</tr>
<tr>
<td>Fixation count * Sex</td>
<td>0.27</td>
<td>1</td>
<td>131</td>
<td>.601</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>Observation length</td>
<td>50.40</td>
<td>1</td>
<td>131</td>
<td>.&lt;.001</td>
<td>.278</td>
<td></td>
</tr>
<tr>
<td>Observation length * Sex</td>
<td>0.54</td>
<td>1</td>
<td>131</td>
<td>.463</td>
<td>.004</td>
<td></td>
</tr>
<tr>
<td>Observation count</td>
<td>88.46</td>
<td>1</td>
<td>131</td>
<td>.&lt;.001</td>
<td>.403</td>
<td></td>
</tr>
<tr>
<td>Observation count * Sex</td>
<td>0.166</td>
<td>1</td>
<td>131</td>
<td>.648</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Time to first fixation</td>
<td>14.77</td>
<td>1</td>
<td>137</td>
<td>.&lt;.001</td>
<td>.097</td>
<td></td>
</tr>
<tr>
<td>Time to first fixation * Sex</td>
<td>1.21</td>
<td>1</td>
<td>137</td>
<td>.273</td>
<td>.009</td>
<td></td>
</tr>
<tr>
<td>Fixation length</td>
<td>0.55</td>
<td>1</td>
<td>137</td>
<td>.460</td>
<td>.004</td>
<td></td>
</tr>
<tr>
<td>Fixation length * Sex</td>
<td>6.12</td>
<td>1</td>
<td>137</td>
<td>.015</td>
<td>.043</td>
<td></td>
</tr>
<tr>
<td>Fixation count</td>
<td>0.72</td>
<td>1</td>
<td>137</td>
<td>.398</td>
<td>.005</td>
<td></td>
</tr>
<tr>
<td>Fixation count * Sex</td>
<td>5.32</td>
<td>1</td>
<td>137</td>
<td>.023</td>
<td>.037</td>
<td></td>
</tr>
<tr>
<td>Observation length</td>
<td>0.97</td>
<td>1</td>
<td>137</td>
<td>.327</td>
<td>.007</td>
<td></td>
</tr>
<tr>
<td>Observation length * Sex</td>
<td>4.39</td>
<td>1</td>
<td>137</td>
<td>.038</td>
<td>.031</td>
<td></td>
</tr>
<tr>
<td>Observation count</td>
<td>48.48</td>
<td>1</td>
<td>137</td>
<td>.&lt;.001</td>
<td>.261</td>
<td></td>
</tr>
<tr>
<td>Observation count * Sex</td>
<td>0.67</td>
<td>1</td>
<td>137</td>
<td>.414</td>
<td>.005</td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Attention to male and female drinking behavior

<table>
<thead>
<tr>
<th></th>
<th>Male Behavior</th>
<th>Female Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>Drunk behavior</td>
</tr>
<tr>
<td>Time to first fixation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.71 (0.53)</td>
<td>0.97 (0.43)</td>
</tr>
<tr>
<td>Female</td>
<td>0.84 (0.51)</td>
<td>1.08 (0.41)</td>
</tr>
<tr>
<td>Fixation length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.02 (0.80)</td>
<td>1.49 (0.48)</td>
</tr>
<tr>
<td>Female</td>
<td>2.00 (0.76)</td>
<td>1.60 (0.49)</td>
</tr>
<tr>
<td>Fixation count</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5.94 (2.26)</td>
<td>4.11 (1.31)</td>
</tr>
<tr>
<td>Female</td>
<td>6.44 (2.33)</td>
<td>4.79 (1.35)</td>
</tr>
<tr>
<td>Observation length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.15 (0.86)</td>
<td>1.58 (0.52)</td>
</tr>
<tr>
<td>Female</td>
<td>2.20 (0.76)</td>
<td>1.73 (0.48)</td>
</tr>
<tr>
<td>Observation count</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2.65 (0.88)</td>
<td>2.19 (0.70)</td>
</tr>
<tr>
<td>Female</td>
<td>3.01 (0.95)</td>
<td>2.51 (0.68)</td>
</tr>
</tbody>
</table>

2.5. Discussion

The eye-tracking study clearly showed that drinking behavior draws young adults’ attention. Indeed, they paid attention to drinking behavior sooner than to non-signaling functional behavior. Drinking behavior was also observed more frequently, and was fixated on more, both in length and in count. Remarkably, women were less interested in female drinking behavior than were men, possibly indicating that female drinking behavior is more relevant to men. Male drinking, on the other hand, was of interest to both sexes. However, although this study indicates that drinking behavior attracts young adults’ external visual attention, it remains unclear whether drinking behavior and alcoholic beverages also capture young adults’ internal attention. Therefore, a second study was conducted, focusing on recall.
3. **Study 2: Recall**

3.1. **Design and Participants**

To verify whether drinking alcoholic beverages is also better recalled, an online experimental study involving a visual recollection task was conducted with 170 student volunteers from Ghent University. Additionally, these students were also requested to forward the link to the online experimental study to two other peers willing to participate in the study. In total, 377 participants started the online experiment. However, only the data of those participants that completed the entire study were retained for statistical analyses. Two participants younger than 18 years, and five participants older than 30 were omitted from the sample. Consequently, the final sample consisted of 321 young adults (141 male, 180 female) aged between 18 and 27 (\(M = 20.94; SD = 1.85\)). Similar to study 1, the sample consisted mainly of college and university students (89.1%). Slightly more than half of the participants (53.6%) indicated being in a relationship. In terms of sexual orientation, 97.5% of participants were heterosexual, with seven individuals identifying as bisexual and one as homosexual. Participants received no monetary compensation for their participation.

The study employed a mixed-subjects experimental design, in which both men and women viewed a series of displays. This visual recollection task is based on previous research on conspicuous consumption and status products (Janssens et al., 2011; Lens, Driesmans, Pandelaere, & Janssens, 2012). In total, participants saw a series of 16 visual displays. The first eight (product) visual displays contained images of six products. The following eight (behavioral) visual displays each showed one person engaging in five different behaviors.
3.2. Materials and Method

Product visual displays. Of the eight visual product displays, four focused on beverages; the other four served as fillers. In each display, six products were randomly arranged in a circle. Five products were functional products (knife, key, backpack, lamp, toothbrush, table, etc.), whereas one product was either an alcoholic or a non-alcoholic beverage (a glass of beer / bottle of vodka; a glass of fruit juice / bottle of water). To avoid potential effects of product color on product recall, all products within a specific visual display were of similar colors. Accordingly, the beer and fruit juice displays showed six yellow products, whereas the vodka and water bottle displays contained blue/white products (cf. appendix). Additionally, to avoid looking biases due to the position of the product in the display (Glaholt et al., 2010; Plassmann et al., 2012; Reutskaja et al., 2011), two versions of each display were created using a different arrangement of the products. Participants randomly viewed one of the two versions.

Behavioral visual displays. Four of the behavioral visual displays showed alcoholic drinking behavior, whereas the remaining four served as fillers. All displays showed the same person engaged in five different behaviors, randomly arranged in a circle. Consequently, all visual displays consisted of six pictures, taken by a professional photographer. In all the pictures, the model adopted a behavioral position against a white background, with a neutral facial expression. All models were young adult volunteers aged between 21 and 26, and were of heterosexual orientation. In the experimental displays, four behaviors were functional behaviors (writing, reading, putting on shoes, making a phone call, etc.), while one behavior showed drinking an alcoholic beverage (cf. appendix). More specifically, in the female displays, one display showed a young woman drinking a glass of white wine, whereas the second display showed a young woman drinking from a bottle of gin. In the male displays, one display showed a young man drinking a beer, whereas the second display showed a young man drinking from a bottle of gin. Similarly to the product displays, two versions of each display were created, using a different arrangement of the five behaviors.

Measures. Participants saw each display only for a brief moment. The participants were exposed for only one second to the eight product displays, and slightly longer (two seconds) to the
eight behavioral displays as these were more difficult to interpret. After each display, participants had 25 seconds to write down which products or behaviors they had seen. A timer in the upper-right corner of the screen showed participants how much time they had remaining to write down their answers.

Similarly to previous research (Lens et al., 2012), recall probability and recall position were used for testing the hypotheses. For recall probability of the product visual displays, we calculated the proportion of recalled alcoholic beverages (total number of recalled alcoholic beverages divided by two, since we used two displays with alcoholic beverages), the proportion of recalled non-alcoholic beverages (total number of recalled non-alcoholic beverages divided by two), as well as the proportion of recalled functional products of the two alcohol displays (total number of recalled functional products divided by 10, since the two product displays showing alcoholic beverages contained a total of 10 neutral, functional products). For the behavioral visual displays, separate scores were calculated for male and female behavior: The recall probability of alcoholic drinking behavior (total number of recalled alcoholic drinking behaviors divided by two, since there were two displays for both male and female behavior) and the recall probability of functional behaviors (total number of recalled functional behaviors divided by eight, since there were four examples of this type on each slide).

To measure the average recall position of the alcoholic and non-alcoholic beverages, a position score was given to each of the recalled beverages. More specifically, the position score consisted of the reverse ordinal position in which the beverage was recalled, taking into account the number of recalled products. For instance, when five products were recalled, the beverage received a score of five when it was recalled first, and a score of one when it was recalled last. If the beverage was not recalled, it was given a score of zero. Subsequently, for both the alcoholic and non-alcoholic beverages, each of the position scores of the two displays were added, and divided by the total number of products recalled in the two displays. The higher the number, the earlier (and therefore stronger) the recall. Objects and behaviors that were wrongly recognized by the participants were omitted from the calculations.
3.3. Procedure

Participants willing to take part in the experiment received an email containing a hyperlink to the online experiment. The email explained that the experiment could not be conducted on a smartphone because of the necessity of a large screen, and potential participants were instructed to complete the experiment using a laptop or desktop computer in a non-distracting environment. Upon opening the hyperlink, participants were informed that the study involved recall of products and behaviors. This was followed by some sociodemographic questions. Subsequently, a more detailed explanation of the experiment was given, clarifying that participants would be shown, very briefly, 16 displays of either six products or five forms of behavior, and that after each display they had 25 seconds to write down all the objects or behaviors they remembered. Next, a test display with six objects was shown, to familiarize the participants with the procedure. This was followed by the 16 displays. Each new display was preceded by a slide, showing the number 1 to 16, to ensure that the participants were attentive to the upcoming display.

3.4. Results

Alcoholic drinking behavior will be recalled better than functional behavior (hypothesis 2). For both male and female behavior, a two-way mixed ANOVA was conducted. The proportions of recalled drinking behavior and recalled functional behavior served as variables in the within-subjects factor, with sex as between-subjects factor. The results showed significant main effects for both the male behavior ($F(1, 311) = 6.79, p = .010, \eta^2 = .021$) and female behavior ($F(1, 314) = 159.93, p < .001, \eta^2 = .337$). As expected, young adults recalled young male drinking behavior ($M = .64; SD = .36$) better than non-signaling functional behavior ($M = .58; SD = .17$). Also, young women’s drinking behavior ($M = .81; SD = .27$) was recalled better compared to other functional behavior ($M = .57; SD = .15$). No significant interaction with sex was observed for either male ($F(1, 311) = 0.03, p = .875, \eta^2 < .001$) or female ($F(1, 314) = 0.15, p = .70, \eta^2 < .001$) behavior.

Alcoholic beverages will be recalled better than functional products (hypothesis 3). A two-way mixed ANOVA was conducted to verify whether alcoholic beverages were remembered better than functional products. The proportions of recalled alcoholic beverages and functional products
products shown on the two visual displays were used as variables in the within-subjects factor, with the sex of the participants as the between-subjects variable. The results showed a significant main effect of the recalled proportion ($F(1, 319) = 14.52, p < .001, \eta^2_p = .044$), and a non-significant interaction effect between the proportion recalled products and the sex of the participants ($F(1, 319) = 0.06, p = .803, \eta^2_p < .001$). Confirming hypothesis 3, young adults recalled alcoholic beverages ($M = .65; SD = .36$) better than functional products ($M = .57; SD = .12$).

**Alcoholic beverages will be recalled better than non-alcoholic beverages (hypothesis 4).** By means of a two-way mixed ANOVA, we verified whether young adult men and women recalled alcoholic beverages better than non-alcoholic beverages. The proportions of recalled alcoholic and non-alcoholic beverages served as variables in the within-subjects factor, and the sex of the participant was the between-subjects variable. Here also, there was a significant main effect of the proportion of recalled beverages ($F(1, 316) = 13.60, p < .001, \eta^2_p = .041$), yet no significant interaction effect with sex was observed ($F(1, 316) = 0.42, p = .516, \eta^2_p = .001$). Conforming hypothesis 4, young adults recalled alcoholic beverages ($M = .65; SD = .35$) better than non-alcoholic beverages ($M = .55; SD = .34$).

Finally, to investigate whether alcoholic beverages are stored more ‘top-of-mind’ in young adults’ memories, and therefore recalled earlier compared to non-alcoholic beverages, a two-way mixed ANOVA was conducted, with average recall position of the alcoholic and non-alcoholic beverages as within-subjects factor, and participant sex as between-subjects factor. The significant main effect ($F(1, 316) = 36.09, p < .001, \eta^2_p = .102$) indicated that young adults indeed recalled alcoholic beverages ($M = .57; SD = .40$) earlier compared to non-alcoholic beverages ($M = .40; SD = .31$), indicating more top-of-mind memory processing, and therefore again greater internal attention to alcoholic beverages than to non-alcoholic beverages. No significant interaction with sex was observed ($F(1, 316) = 0.02, p = .887, \eta^2_p < .001$).
3.5. **Discussion**

The visual recollection study confirmed that internally, drinking behavior and alcoholic products received a great deal of attention, particularly compared with average functional products. Indeed, both young men and women recalled drinking behavior better than they did functional behaviors that lacked a clear signaling dimension. Moreover, as alcoholic drinks were also remembered better than functional products, and even better than non-alcoholic drinks, the findings demonstrate that even mere cues indicating that a product contains alcohol may lead to increased attention within young adults’ brains.

4. **General Discussion**

Research indicates that young adults might use alcohol consumption as a form of signaling behavior to obtain self-presentational benefits. However, no previous studies have verified whether alcoholic beverages and alcohol consumption by other young adults do indeed attract young adults’ attention. As there are two relevant forms of attention, two studies were conducted, with the first focusing on visual attention (external attention) and the second on recall processes (internal attention).

The results indicated that both male and female drinking behavior strongly attracts young adults’ attention. First of all, the eye-tracking study showed that young men and young women fixated sooner, more frequently, and longer on young men drinking alcoholic beverages, compared to these same men being engaged in other, more functional behaviors with no clear signaling dimension; young adults also observed these drinking behaviors longer and more frequently. Young men and young women also fixated sooner on female drinking behavior than on functional behaviors, and observed female drinking behavior more frequently. However, only young men fixated on and observed female drinking behavior longer than functional behaviors. Men also fixated more frequently on female drinking behavior than on functional behavior. As drinking behavior was better recalled than functional behavior, the visual recollection experiment confirmed that also internally young adults pay more attention to drinking behavior than to
functional behavior. Indeed, both young men and young women had stronger recollection of male and female drinking behavior than of functional behaviors.

Moreover, the recollection study also showed that young adults’ heightened attention is not limited to actual drinking behavior. Equally, images of alcoholic beverages had higher recollection scores than purely functional consumer products. More specifically, alcoholic drinks were recalled better than other functional products, including non-alcoholic drinks of similar liquid color to the alcoholic drinks. Moreover, alcoholic beverages seemed to be stored more in a ‘top-of-mind’ memory position, as they were recalled faster than their non-alcoholic counterparts. These results suggest that alcoholic beverages serve as cues for young adults without them necessarily even viewing actual drinking behaviors. Moreover, the findings confirm that it is not the drink product ‘as beverage’ that draws the attention, but the fact that it is specifically an alcoholic beverage.

The results of the two experiments suggest that drinking behavior can be studied as a form of signaling behavior, in which perceivable behavior is used to display information about the signaler, with the intention of affecting receivers’ beliefs or behaviors (Donath, 2011; Maynard Smith & Harper, 2003). Studies showing that drinking behavior brings self-presentational benefits to young adults (Dumas, Graham, et al., 2014; Dumas, Wells, et al., 2014; Van Den Abbeele et al., 2015; Vincke, 2016a, 2016b) illustrate that drinking alcohol can indeed affect receivers’ beliefs about drinkers. Furthermore, prototype studies focusing on the social image of heavy drinkers, occasional drinkers, and abstainers indicate that drinking behavior affects young adults’ perception of peers (Gerrard et al., 2002; Spijkerman, Larsen, Gibbons, & Engels, 2010; Spijkerman, van den Eijnden, Vitale, & Engels, 2004; Teunissen et al., 2014; van Lettow, Vermunt, de Vries, Burdorff, & van Empelen, 2013). Additionally, studies focusing on young adults’ signaling motivation when drinking alcohol (de Visser et al., 2013; Hone et al., 2013; Martin & Leary, 2001; O’Grady et al., 2012) show that young adults also have—whether consciously or unconsciously—the intention of displaying information about themselves via alcohol.
Both of the present studies show that young adults’ drinking behavior is easily perceivable and certainly not ignored by other young adults, seemingly corresponding to the theory of costly signaling (Bird & Smith, 2005; Bliege Bird et al., 2001) and its handicap principle (Zahavi & Zahavi, 1997). However, although consuming alcohol can be physically harmful, more research is necessary to confirm whether drinking alcohol is indeed a reliable indicator of specific physical qualities. For smoking – also a known harmful and risky activity – partial confirmation for this assumption was found, as people with low dispositional health suffered more from the harmful effects of smoking compared to persons with high dispositional health (Dewitte, 2011). For alcohol, only one previous study has attempted to verify whether drinking behavior reflects certain physical qualities, by linking this behavior to fluctuating asymmetry as an indicator of overall genetic quality. However, the study did not find confirmation that the use of alcohol functions as an indicator of those specific biological qualities. Nevertheless, the authors indicated that, given the influence of prenatal and other environmental stressors on fluctuating asymmetry, its use as a measure of overall genetic quality is questionable (Borkowska & Pawlowski, 2014). Equally, drinking behavior could also indicate certain mental qualities, such as the propensity to take physical and/or social risks. As drinking behavior also has financial aspects due to the price of alcoholic beverages, drinking behavior could potentially even be used as a costly signal to indicate the drinker’s financial resources to others. However, to date, it remains unclear whether alcohol consumption is used for these signaling purposes.

Future research could also focus on identifying how alcohol is used in different contexts. One the one hand, male alcohol consumption could function as an intersexual courtship signal, as women participants displayed interest in men’s drinking behavior. However, as men also paid attention to same-sex drinking behavior, alcohol use might also function as a signal for other males, in either intrasexual competitive contexts or in more reciprocal social contexts. As people search for different qualities in romantic partners, sexual partners, coalitional partners, and friends, it would be interesting to know which characteristics and qualities young men attempt to signal in different social situations, through different forms of alcohol consumption.
Similarly, as men also took an interest in women’s drinking behavior, alcohol might also be used by young women as a signal in mating situations. However, the lower attention given by women to other women’s drinking behavior might indicate that consuming alcohol is a less relevant behavior in female intrasexual signaling. Indeed, whereas men engage in risky intrasexual competitive behavior (Chen & Chang, 2015; Daly & Wilson, 2001; Griskevicius et al., 2009; Wilson & Daly, 1985), women prefer engaging in self-promotion in which they attempt to improve their appearance and physical attractiveness (Fisher & Cox, 2011; Fisher, Cox, & Gordon, 2009). This has been attributed to women’s predominant role as the primary caregivers for children, making risky behaviors less appropriate competitive behaviors due to their higher reproductive costs (Campbell, 2004). As drinking behavior, especially in an excessive manner, can also be considered risky and harmful behavior, this could explain why women pay less attention to female peers’ drinking behavior. Nonetheless, as young women mention using alcohol for social bonding and maintaining friendships (De Visser, 2013), female peers’ alcohol consumption remains important information.

Together, these results suggest that alcohol consumption might operate as a signaling system in different domains, including intersexual courtship, intrasexual competition, group bonding, and strengthening friendships. However, further research is necessary to unravel the functioning of alcohol as a signal in these different contexts, and to increase the understanding of the meaning of alcohol. Moreover, as sociocultural norms affect young adults’ drinking behavior, future research should take into account both the national and local drinking cultures when studying the meaning of alcohol as a signal. One the one hand, national cultural norms affect both the acceptance and expectation to drink alcohol on specific social occasions, as well as the general attitudes towards binge drinking and intoxication (Fjær, Pedersen, von Soest, & Gray, 2016; Grønkjær, Curtis, De Crespigny, & Delmar, 2011; Mäkelä & Maunu, 2016). Accordingly, alcohol will be perceived very differently in abstinent societies or countries with constrained ritual drinking practices, compared to the more liberal European drinking cultures in which non-drinkers are often perceived as unusual (Felson, Savolainen, Bjarnason, Anderson, & Zohra, 2011; Gordon et al., 2012; Room, 2001; Room & Mäkelä, 2000). Additionally, the symbolic meaning of alcohol consumption and excessive drinking also depends on the local community or peer group of which one is a
member (Mitchell, Poyrazli, & Broyles, 2016; Savic, Room, Mugavin, Pennay, & Livingston, 2016; Sudhinaraset, Wigglesworth, & Takeuchi, 2016). Furthermore, local alcohol regulations and policies also affect the meaning of alcohol. For example, an 18-year old drinking alcohol would be perceived differently in Belgium than in the US, where the legal drinking age is 21.

Finally, there are also some limitations to our studies. Firstly, neither study took into account the actual drinking behavior of the participants. Nonetheless, it is possible that drinking behavior and alcoholic beverages receive more attention from drinkers, compared to non-drinkers. However, as the proportion of alcohol consumers is very high among young adult students in Belgium (Rosiers et al., 2014), we believe that there would have been very few non-drinkers in this study group. Additionally, attention to alcoholic beverages was only measured by means of recall. Future eye-tracking studies should also study the visual attention to alcoholic products. Also, the number of visual displays of alcohol was rather low in both the eye-tracking and recall experiments. As drinking alcohol has both physical, mental, and financial aspects, future studies might research young adults’ attention to a larger number of drinking behaviors, presenting a wider variety of alcoholic beverages and levels of drinking, and investigating which specific qualities are signaled by particular drinking patterns. Moreover, the fact that the recall experiment was conducted online rather than in a controlled laboratory environment could be considered a limitation. Consequently, we could not control for potential distractions or Internet connectivity issues that might have affected the recall of the respondents. Finally, attention to drinking behavior was compared to functional behavior, as this behavior carries little signaling intention. Although the neutrality of the functional behaviors was pretested in advance, and although none of the products displayed brand names, we cannot be entirely sure that all of those functional behaviors were free of a signaling dimension for all participants.

The findings of the two studies may be of interest to social marketing professionals and health promotion institutions targeting youth alcohol (ab)use. As both studies indicate that young adults pay attention to peers’ alcohol use, drinking alcohol can and will be used for signaling and impression management purposes. Accordingly, social marketing campaigns might benefit from focusing on this signaling dimension of youth alcohol use, in addition to the more traditional,
informative approaches focusing on health-related matters. Also, motivational research, focusing on identifying the motivations and inducing factors for drinking alcohol, might benefit from including signaling motivations within the research and framework.
5. References


6. APPENDIX

6.1. EXAMPLE OF PRODUCT VISUAL DISPLAYS

**VISUAL DISPLAY OF BEER**

**VISUAL DISPLAY OF FRUIT JUICE**

6.2. EXAMPLE OF BEHAVIORAL VISUAL DISPLAYS

**VISUAL DISPLAY OF GLASS OF WINE**

**VISUAL DISPLAY OF BOTTLE OF GIN**
CHAPTER 3

THE YOUNG MALE CIGARETTE AND ALCOHOL SYNDROME. SMOKING AND DRINKING AS A SHORT-TERM MATING STRATEGY.
Despite the many health risks of cigarette and alcohol use, high levels of smoking and drinking are being persisted. Moreover, young men engage more in these behaviors as compared to women. As male physical risk-taking behavior gains attractiveness in short-term mating contexts and given that smoking and drinking has considerable physical costs, this study explores the possibility that cigarette and alcohol use is part of a male short-term mating strategy. By means of a between-subjects experiment (N = 239), women’s perceptions of young male smoking and drinking were investigated. The experiment showed that women perceive men who smoke and drink as being more short-term oriented in their sexuality than non-users. Moreover, both cigarettes and (especially) alcohol use brought some attractiveness benefits in short-term mating contexts. A follow-up study (N = 171) confirmed that men’s behavior corresponds with women’s perceptions. Overall, these findings show that cigarette and alcohol use can operate as a short-term mating strategy.


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1. INTRODUCTION

Smoking cigarettes and drinking alcohol at a young age is known to bring adverse consequences to its users. For instance, in the short run, smoking leads to poor lung functioning and rapid fatigue during physical activity (American Cancer Society, 2014). Alcohol, on the other hand, causes drunkenness and alcohol poisoning, leading to headaches, coma or even death (Fuller et al., 2013; National Institute on Alcohol Abuse and Alcoholism, 2015). Moreover, because of the addictive effects, early cigarette and alcohol use leads to dependency later in life, causing a high disease and premature death risk (Brown et al., 2008; Doll, Peto, Boreham, and Sutherland, 2004; Ellickson, Tucker, and Klein, 2001, 2003; Jha et al., 2013; WHO, 2014).

However, despite all dangers, smoking and drinking peaks during young adulthood (Johnston, O’Malley, Bachman, Schulenberg, and Miech, 2014; Substance Abuse and Mental Health Services Administration [SAMHSA], 2014a). Corresponding with most research findings on risk-taking behavior (Betz and Weber, 2002; Byrnes, Miller, and Schafer, 1999) and the young male syndrome [stating that risky behavior is found most frequently among the sex with the highest reproductive competition (Fischer and Hills, 2012; Wilson and Daly, 1985)], these high numbers of youth smoking and drinking are mostly attributable to young men (Ahlström and Österberg, 2005; Johnston et al., 2012; Poelen et al., 2005; SAMSHA, 2014). Accordingly, there might be underlying motivations for young men that surpass the harmful consequences of both unhealthy consumption behaviors.

Studies already showed that men attune their risky courtship displaying behavior to female desires, depending on the sexual strategy that is being followed (Ellis et al., 2012; Frankenhuys and Karremans, 2012). Furthermore, in accordance with the female preference for physical qualities in short-term mating situations, studies demonstrated that physical risk-taking is especially attractive in short-term mating contexts (Bassett and Moss, 2004;
Kelly and Dunbar, 2001; Sylwester and Pawłowski, 2011). Consequently, in this paper, we aim to explore the hypothesis that male smoking and drinking behavior – being risky physical consumption behaviors – are used as a male short-term mating strategy. By means of two studies, the functioning of cigarette and alcohol use as a short-term sexual strategy is explored.

1.1. MALE RISK-TAKING AS A SEXUAL STRATEGY

Because of the high reproductive costs when making a poor mating decision (Trivers, 1972), women are selective when choosing a short-term sexual partner as well as a long-term romantic partner (Buss and Schmitt, 1993; Li and Kenrick, 2006). Accordingly, men are forced to strive for mating opportunities through competitive behavior and courtship displays in both mating contexts (Buss, 2007; Geary, 2006; Kenrick, Sadalla, Groth and Melanie, 1990). This is especially the case for young men, experiencing the highest level of competition and the greatest variation in reproductive success (Daly and Wilson, 2001; Ellis et al., 2012; Wilson and Daly, 1985). Which qualities are being displayed by men depends on women’s preferences and on the sexual strategy that is followed (Buss, 2006; Saad, 2013).

When searching for a long-term partner, women prefer a man who has the willingness and capacity to protect and care for children. Consequently, women are attracted to kind men, physically strong men, and especially men with resources and status (Buss & Schmitt, 1993; Li, Bailey, Kenrick, & Linsenmeier, 2002). In short-term mating, on the other hand, a man’s genetic quality is most important. Accordingly, women place greater value on a man’s physical attractiveness (Buss & Schmitt, 1993; Li & Kenrick, 2006), making men with symmetrical faces and masculine features more desirable (Little, Jones, Penton-Voak, Burt, and Perrett, 2002; Provost, Troje, and Quinsey, 2008; Puts, 2005).

Men’s risk-taking behavior corresponds with these female preferences. Both physical risk-taking (Frankenhuis, Dotsch, Karremans, and Wigboldus, 2010; Pawlowski,
Atwal, and Dunbar, 2008; Ronay and Hippel, 2010) and financially risky decision making
(Baker and Maner, 2008; McAlvanah, 2009; Wilson and Daly, 2004) are stimulated in a
mating mindset. Moreover, findings indicate that these male risky behaviors are strategic
courtship displays, as men limit their risky signaling to situations where the odds of gaining
reproductive benefits are high. For instance, young men are inclined to take more risks
when exposed to a women, but only when she is attractive (Baker and Maner, 2008) and
single (Baker and Maner, 2009). Moreover, only uncommitted men increase their risk-
taking in the presence of women, while taking into account women’s preferences
(Frankenhuis and Karremans, 2012).

In addition, the attractiveness of risk takers depends on the type of risk, as well as
the mating context. Corresponding with female desires, physical risk-taking enhances male
attractiveness, especially in short-term mating contexts (Bassett and Moss, 2004; Kelly and
Dunbar, 2001; Sylwester and Pawłowski, 2011). Moreover, in short-term sexual encounters,
physical risk takers are preferred over social or financial risk takers (Sylwester and
Pawłowski, 2011). In long-term mating contexts, on the other hand, women generally
prefer risk avoiders (Sylwester and Pawłowski, 2011), except when it concerns heroic risk-
taking (Farthing, 2005) or moderate physical risk-taking, carrying less danger for the partner
and children (Bassett and Moss, 2004; Farthing, 2007; Kelly and Dunbar, 2001).

1.2. Cigarette and Alcohol Use as a Short-Term Mating Strategy

Because of the many – short-term and long-term – negative health consequences,
smoking cigarettes and drinking alcohol can be considered forms of physical risk-taking.
Given this physical risk inherent to smoking and drinking, women’s preference for male
physical risk-taking in short-term mating contexts, and the fact that men adapt their risky
behavior to the preferences of women, we propose that smoking and drinking behavior
could be used by men as a short-term sexual courtship strategy. Accordingly, smoking and
drinking should be engaged in more by men having an unrestricted, short-term oriented sexuality, while bringing short-term attractiveness benefits.

In line with these assumptions, studies show that there is a strong link between drinking alcohol and engaging in casual sexual relationships (Grello, Welsh, and Harper, 2006; Lindgren, Pantalone, Lewis, and George, 2009; Turchik, Garske, Probst, and Irvin, 2010). Similarly, recent studies indicate that the high participation of men in drinking games can be (partially) explained by men’s higher mating efforts and higher sexual motivation (Hone and McCullough, 2015; Hone, Carter, and Mccullough, 2013). Furthermore, also smoking seems to be related to following a more risky and short-term oriented sexual approach (Farid, Rus, Dahlui, Al-Sadat, and Aziz, 2014; Långström and Hanson, 2006), in which young adults putting a lot of effort in attracting sexual partners, are more willing to smoke in social situations (Jones and Figueredo, 2007). In addition, Hill and Chow (2002) link risky drinking to reproductive success in young men. Some studies contradict the assumed attractiveness benefits of heavy alcohol and cigarette use in men. However, women were asked to rate these men on their general desirability. Hence, in accordance with evolved long-term female desires, no preferences for physical risk-taking behavior were found (Farthing, 2005; Van Den Abbeele, Penton-Voak, Attwood, Stephen, and Munafo, 2015; Wilke, Hutchinson, Todd, and Kruger, 2006). Corresponding with risk-taking literature, moderate alcohol use did enhance men’s general attractiveness (Van Den Abbeele et al., 2015).

1.3. CURRENT RESEARCH

As scientific literature points into the direction of smoking and drinking as a male short-term mating strategy, we expect men’s smoking and drinking frequency to affect women’s perception. More specifically, we believe that a higher smoking and drinking frequency will lead to a more harmful impression of a young man’s overall behavior (Hypothesis 1). Additionally, we expect that women will infer a man’s short-term mating
strategy from his smoking and drinking behavior (Hypothesis 2). Also, cigarette and alcohol use will bring attractiveness benefits to young adult men (Hypothesis 3). Corresponding with risk-taking literature, we expect occasional smoking and drinking, being moderate risky behaviors, to bring attractiveness benefits in both short-term and long-term mating situations (Hypothesis 3a). However, heavy smoking and drinking will only bring attractiveness benefits in short-term mating contexts (Hypothesis 3b). Furthermore, if smoking and drinking functions as a short-term mating strategy because of its physical harmfulness, women’s perceptions will be mediated by how unhealthy and risky they perceive a man’s behavior to be (Hypothesis 4). By means of an experimental study, women’s perceptions as a function of men’s smoking and drinking behavior were explored.

In addition, for cigarette and alcohol use to function as a short-term sexual strategy, women’s perceptions must correspond with men’s actual behavior. Therefore, we expect users of cigarettes and alcohol to have a more short-term oriented mating strategy compared to non-users (Hypothesis 5). Moreover, we expect to find a correlation between young male users’ smoking and drinking behavior and their level of sexual unrestrictedness that matches with the findings of hypothesis 2 (Hypothesis 6). A follow-up study verified the sexual strategy of young male users and non-users.

2. **STUDY 1: THE PERCEPTION OF MALE SMOKING AND DRINKING BEHAVIOR**

2.1. **MATERIALS AND METHODS**

2.1.1. **PARTICIPANTS**

Following the young adult life stage proposed by Levinson (1987), women between the age of 17 and 30 were approached to participate in an online experiment. Due to attractiveness related questions, data of participants with a homosexual orientation were excluded. Participants who indicated being male or outside the young adult age range and
participants with largely incomplete questionnaires were also removed from the data set. The final sample consisted of 239 Flemish women ($M_{age} = 21.09; SD = 2.22$), living in the Dutch speaking part of Belgium. In Belgium, alcohol can be legally sold in shops or bars to youngsters from 16 years old. Only when it concerns liquors, the age limit rises to 18 years. Similarly, it is illegal to sell cigarettes to youngsters under 16 years old (www.belgium.be).

2.1.2. Design

To investigate if women perceive men’s sexual strategy and attractiveness differently depending on their smoking and drinking behavior, an online between-subjects experimental design was used. More specifically, a factorial survey experiment was conducted, in which vignettes (profiles), varying (an) experimental factor(s), were used to assess the impact of behavioral traits on evaluations (Auspurg and Hinz, 2015). This research approach was chosen for because it has proven useful in the studying of risky behaviors (Bassett and Moss, 2004; Kelly and Dunbar, 2001; Sylwester and Pawłowski, 2011) and signaling behavior (Sundie et al., 2011).

2.1.3. Stimuli and Procedure

For this study, behavioral profiles (vignettes) were used in which the hobbies of a typical young male were described in circa 70 words. Two sets of profiles were created addressing a young man’s smoking and drinking behavior. Each profile set consisted of three versions, varying the main character’s behavioral frequency. All three profile versions were identical, except for the final sentence stating that a person did not engage, occasionally engaged or frequently engaged in either smoking or drinking (see Appendix). To present the vignettes to the participants, three online links were created via the program ‘Thesistools’. The three links displayed the smoking profile first, followed by the drinking profile, but varied the behavioral frequencies. For instance, when opening the first link, women were asked to rate an occasional smoker and a frequent alcohol drinker.
The attractiveness of the main characters was assessed by asking the following question: ‘Based on the profile you just read, how attractive would you find this person as a potential partner in the following situations? a) a short-term relationship (a date, one-night stand, casual relationship, etc.) b) a long-term relationship (loyal, committed relationship, marriage).’ Both questions were measured on a 7-point Likert scale ranging from 1 (not at all attractive) to 7 (very attractive).

To investigate whether a man’s short-term mating strategy is inferred from his cigarette and alcohol use, participants were also instructed to fill in the three attitudinal items of the Sociosexual Inventory (SOI, Simpson and Gangestad, 1991) from the target’s perspective (Sundie et al., 2011). More specifically, participants were asked to indicate: ‘To what extent do you think the person in the profile would agree with the following statements? Answer this question as you think the main character from the profile would reply.’ For instance, the participating women indicated to what degree the person of the personality profile would agree with the statement ‘Sex without love is OK’. All answers were given on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (highly agree), a higher score meaning a more short-term oriented, unrestricted, sexual strategy. For both the smoking and alcohol related vignettes, a new variable computed the mean score of the three questions ($\alpha_{\text{Smoking}} = .68; \alpha_{\text{Drinking}} = .77$).

Lastly, participants were also asked to indicate how harmful they considered the overall behavior of the target individual to be in terms of unhealthiness and riskiness: ‘Based on the profile you just read, to what extent do you agree with the following statements a) This person behaves in an unhealthy manner b) This person behaves in a risky manner’. Here also, answers were giving on a 7-point Likert scale, ranging from 1 (absolutely not) to 7 (very much).

Participants agreeing to take part in the study randomly received one of the three online links. All participants were informed that they would be taking part in an experiment concerning the perception of behavior. Participants were also assured of their anonymity.
and of the confidentiality of their answers. Subsequently, all participants read the short vignettes. Each behavioral profile was followed by the three measures (attractiveness, SOI, perceived behavioral harmfulness).

2.1.4. Statistical analysis

The statistical analysis consisted of analysis of variance (ANOVA) for hypotheses one to three, and mediation analysis for hypothesis four, by means of SPSS version 21. When a mixed ANOVA was conducted (H1,H3), significant main effects were reported via pairwise comparisons, whereas significant interaction effects were interpreted by means of simple effects analyses, assessed via the SPSS syntax (Field, 2013). For the univariate ANOVA (H2), significant main effects were followed by means of Tukey post-hoc testing.

To study whether women’s perceptions are mediated by the perceived overall behavioral unhealthiness and riskiness (H4), mediation analyses were conducted, using model 4 of the PROCESS procedure of Hayes (Hayes, 2013; http://www.afhayes.com). Separate mediation analyses were preferred over the use of multiple mediators because of the high correlation between the two potential mediators riskiness and unhealthiness, for both the smoking profiles and drinking profiles (r_{Smoking} = .46, p < .001; r_{Drinking} = .55, p < .001). Only in the case of distinct mediators, a model with two mediators is considered more appropriate (Kenny et al. 1998). Given the three conditions of the independent variable ‘profile version’ (no usage, occasional usage, frequent usage), three dummy variables were created to compare all conditions (occasional usage vs. no usage, frequent usage vs. no usage, frequent usage vs. occasional usage). To test the underlying process, bias-corrected bootstrapping was used – with 5000 bootstrap samples – to generate 95% confidence intervals around the indirect effect (a*b) of the overall behavioral impressions. Mediation occurs if the confidence intervals around the indirect effects exclude zero.
2.2. Results

2.2.1. The Impact of Smoking and Drinking on Perceived Behavioral Harmfulness

To study hypothesis 1, two mixed ANOVAs (one for smoking behavior and one for drinking behavior) were conducted with perceived unhealthiness and riskiness as dependent variables in the within-subjects factor ‘harmfulness’. Profile version served as between-subjects factor, representing the three behavioral levels: never, occasionally and frequently.

As can be seen in Table 1, there was a significant main effect of the within-subjects factor harmfulness as well as the between-subjects factor profile version, for both the smoking and drinking profiles. In addition, results showed significant interaction effects between perceived riskiness and unhealthiness as a function of usage frequency.

Table 1: Significant effects of the perceived behavioral harmfulness as a function of cigarette and alcohol use

<table>
<thead>
<tr>
<th></th>
<th>Effect</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>p</th>
<th>(\eta_p^2)</th>
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</thead>
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<td>.029</td>
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<td></td>
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<td>.198</td>
</tr>
<tr>
<td></td>
<td>Profile Version</td>
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<td>233</td>
<td>&lt; .001</td>
<td>.363</td>
</tr>
<tr>
<td>Drinking profiles</td>
<td>Harmfulness</td>
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<td>1</td>
<td>236</td>
<td>&lt; .001</td>
<td>.279</td>
</tr>
<tr>
<td></td>
<td>Harmfulness * Profile version</td>
<td>24.50</td>
<td>2</td>
<td>236</td>
<td>&lt; .001</td>
<td>.172</td>
</tr>
<tr>
<td></td>
<td>Profile Version</td>
<td>39.17</td>
<td>2</td>
<td>236</td>
<td>&lt; .001</td>
<td>.249</td>
</tr>
</tbody>
</table>

For the smoking profiles, the significant main effect of profile version confirmed hypothesis 1, showing that smoking was perceived to be more harmful as the frequency rose \(M_{\text{Frequently}} = 4.63; SD_{\text{Frequently}} = 1.05; M_{\text{Occasionally}} = 3.26; SD_{\text{Occasionally}} = 1.32. M_{\text{Never}} = 2.57; SD_{\text{Never}} = 1.03; all ps < .001\). However, simple effects analyses of the interaction effect (see Figure 1) indicated that while the perceived overall behavioral unhealthiness rose with the smoking frequency (all ps < .001), there was no significant difference in perceived riskiness
between not smoking and smoking occasionally ($p = .727$). The frequent smoking profile, on the other hand, had a significantly higher perceived riskiness compared to smoking occasionally ($p < .001$) and not smoking ($p < .001$).

In addition, although the significant main effect of the within-subjects factor harmfulness showed that the perceived unhealthiness ratings ($M = 3.61; SD = 1.77$) exceeded the perceived riskiness ($M = 3.36; SD = 1.47$) for the smoking profiles, the interaction effect pointed out that this was only the case for occasional smoking ($p = .001$) and frequent smoking ($p < .001$). The non-smoking profile was perceived to be more risky than unhealthy ($p < .001$).

For the drinking profiles, the significant main effect of profile version showed that drinking alcohol frequently ($M = 5.10; SD = 1.18$) was perceived to be more harmful than drinking occasionally ($M = 3.85; SD = 1.07, p < .001$) and not drinking at all ($M = 3.56; SD = 1.22, p < .001$). However, a person drinking occasionally was not perceived to behave more harmful than a non-drinker ($p = .116$). This was also found in the follow-up analyses of the interaction effect, as the perceived unhealthiness ($p = .107$) and riskiness ($p = .256$) did not differ significantly between a non-user and an occasional user. Yet, it did rise significantly when drinking alcohol frequently ($p_{\text{Unhealthiness}} \leq .001, p_{\text{Riskiness}} \leq .030$).

Furthermore, although the significant main effect of harmfulness showed that the alcohol profiles were considered more risky ($M = 4.62; SD = 1.58$) than unhealthy ($M = 3.70; SD = 1.53$), follow-up analyses of the interaction effect showed that this was present only in the non-drinking profile and the occasional drinking profile ($p < .001$). No difference was found between perceived riskiness and unhealthiness for the frequent drinking profile ($p = .818$).
2.2.2. The perceived sexual strategy as a function of cigarette and alcohol use

To study women’s perception of a man’s sexual strategy as a function of his cigarette and alcohol use (H2), two one-way analyses of variance (ANOVA) were conducted (one for smoking behavior, one for drinking behavior), with the mean SOI score as dependent variable and profile version (i.e. the three behavioral frequencies never, occasionally and frequently) as independent variable.

Results showed that the perceived sexual strategy was affected by a man’s smoking behavior ($F(2,236) = 10.91, p < .001, \eta^2_p = .085$) and drinking behavior ($F(2,236) = 29, p < .001, \eta^2_p = .197$). Post hoc testing (see Figure 2) indicated that both an occasional ($p = .002$) and a frequent smoker ($p < .001$) were seen as significantly more sexually unrestricted than a non-smoker. No significant differences were found between occasional smokers and frequent smokers ($p = .572$). For alcohol use, on the other hand, post hoc tests revealed that there was no significant difference in how an occasional drinker and a non-drinker was

![Figure 1: Perceived behavioral harmfulness as a function of cigarette and alcohol use](image.png)
seen \((p = 1.0)\). Only a frequent drinker was perceived by women as more sexually unrestricted than a non-drinker \((p < .001)\) and an occasional drinker \((p < .001)\).

![Figure 2: Perceived sexual strategy as a function of cigarette and alcohol use](image)

### 2.2.3. Attractiveness as a Function of Cigarette and Alcohol Use

Similar to hypothesis 1, two mixed ANOVAs (one for smoking behavior, one for drinking behavior) were conducted to examine whether male short-term and long-term attractiveness are affected differently by an individual’s smoking and drinking behavior (H3). Short-term attractiveness and long-term attractiveness served as independent variables in the within-subjects factor ‘attractiveness’, whereas profile version was used as between-subjects factor, varying between not using, occasional usage and frequent usage.

For both the smoking and drinking profiles, a significant main effect of the within-subjects factor attractiveness and the between-subjects factor profile version was found. In addition, results also showed a significant interaction effect between short-term and long-term attractiveness as a function of the smoking and drinking frequency.
For smoking behavior, the significant main effect of profile version indicated that a non-smoker \((M = 4.57; \text{SD} = 1.38, p < 0.001)\) and an occasional smoker \((M = 4.49; \text{SD} = 1.28, p < 0.001)\) were considered more attractive than a frequent smoker \((M = 3.64; \text{SD} = 1.48)\). No differences were found between a non-smoker and occasional smoker \((p = .735)\). Follow-up simple effects analyses of the interaction effect confirmed that for short-term attractiveness, there was no significant difference between a non-smoker and an occasional smoker \((p = .513)\). A frequent smoker was considered slightly less attractive for short-term mating compared to a non-smoker \((p = .046)\) and significantly less attractive than an occasional smoker \((p = .009)\). In a long-term mating context, there were also no significant differences between not smoking and smoking occasionally \((p = .238)\). However, contrary to short-term attractiveness, frequent smoking significantly lowered a man’s desirability as a potential partner compared to not smoking \((p < .001)\) or smoking cigarettes occasionally \((p < .001)\).

In addition, although the significant main effect of the within-subjects factor attractiveness showed that short-term attractiveness \((M = 4.56; \text{SD} = 1.50)\) scored higher than long-term attractiveness \((M = 3.90; \text{SD} = 1.71)\) in the smoking profiles, pairwise comparisons of the interaction effect indicated that only an occasional \((p \leq .001)\) and frequent user \((p < .001)\) was considered significantly more attractive for short-term mating compared to long-term mating. Non-smokers were rated equally attractive \((p = .20)\) in both mating contexts (see Figure 3).
A slightly different picture emerged when looking at the main effect of profile version for the alcohol profiles. Drinking occasionally ($M = 4.71; SD = 1.21$) was considered more attractive than not drinking ($M = 3.78; SD = 1.29, p < .001$) and drinking frequently ($M = 3.64; SD = 1.48, p < .001$), with no significant differences between not drinking and frequent drinking ($p = .517$). However, the interaction effect showed that for short-term relationships, both occasional drinking ($p < .001$) and frequent drinking ($p = .033$) were considered as more attractive than being a non-drinker. Additionally, an occasional drinker was perceived as more desirable than a frequent drinker ($p = .012$). For long-term mating contexts, occasional drinking was also considered more attractive than not drinking ($p = .002$) or frequent drinking ($p < .001$). Yet, heavy drinking significantly lowered a man’s long-term desirability, as it was considered less attractive than both not drinking ($p = .001$) and occasional drinking ($p < .001$).

Moreover, here also, short-term attractiveness ($M = 4.38; SD = 1.59$) received a higher score than long-term attractiveness ($M = 3.71; SD = 1.56$), creating a significant within-subjects factor main effect. However, similar to the smoking profiles, simple effects analyses of the interaction effect clarified that this was only the case for an occasional ($p < .001$) and frequent drinker ($p < .001$). Non-drinkers were considered equally attractive in a short-term or long-term mating contexts ($p = .499$).
2.2.4. The influence of the perceived riskiness and unhealthiness on women’s impressions

To answer hypothesis 4, mediation analyses were conducted, with the SOI-scores, short-term attractiveness and long-term attractiveness as separate outcome variables (Y). The three dummy variables of the profile versions were used as independent variables (X) and covariates. Perceived overall unhealthiness and riskiness were the two separate mediators (M).
Table 3: Indirect effects of the overall behavioral perception on women’s impressions

<table>
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<th></th>
<th>Smoking profiles</th>
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<td>ULCI</td>
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</tbody>
</table>

*= significant indirect effect  
a*b = indirect effect of X on Y through M  
NS = no smoking, OS = occasional smoking , FS = frequent smoking
Results (see Table 3) showed significant indirect effects of the behavioral frequency of smoking on sexual unrestrictedness scores, through unhealthiness perceptions. These findings indicate that as the smoking frequency increases, the perceived behavioral unhealthiness rises, leading to a more sexually unrestricted impression. For drinking alcohol, there was no mediation through perceived unhealthiness, yet perceived riskiness did positively mediate the observed level of sexual unrestrictedness for frequent drinking compared to not drinking and occasional drinking.

For short-term attractiveness, no mediating effects were found for both smoking and drinking behavior. Long-term attractiveness, on the other hand, was mediated by women’s overall behavioral perception but in a negative manner. Consequently, a higher frequency led to a more harmful behavioral perception, lowering a man’s long-term attractiveness. For smoking, mediation occurred through unhealthiness perceptions. For alcohol, both the perceived unhealthiness and riskiness mediated the attractiveness scores, yet only for frequent drinking behavior, compared to not drinking and occasional drinking.

2.3. DISCUSSION STUDY 1

The results of this study indicate that both smoking and drinking could be considered a physically harmful behavior, that functioned as an indicator of young men’s short-term mating strategy. Also, smoking and (especially) drinking brought short-term attractiveness benefits to men. In addition, women’s assessment of men as a function of their smoking and drinking behavior was partially mediated by the perceived overall behavioral harmfulness. These results correspond with smoking and drinking as a male short-term mating strategy. However, for a mating strategy to work, young men’s behavior should correspond with women’s perceptions. Therefore, the second study focused on the sexual strategy of young male smokers and drinkers.
3. STUDY 2: THE SEXUAL STRATEGY OF YOUNG MALE SMOKERS AND DRINKERS

3.1. MATERIALS AND METHODS

3.1.1. RESPONDENTS

As this study was part of a more extended questionnaire assessing a wide range of behaviors, 884 men and women of all ages were contacted to fill in the survey. Of this group, 609 respondents completed the survey. Given our focus on young adult men, only data provided by men between the age of 17 and 30 years old were used in this study. Our final sample consisted of 171 Flemish respondents (\(M=21.99; SD=2.51\)), of which 24.6% smoked cigarettes (\(N=42\)), while the majority of the respondents indicated drinking alcohol (94.2%). Only a few respondents never drank any alcohol (\(N=10\)).

3.1.2. DESIGN AND MEASURES

To investigate whether young men who engage in smoking and drinking behavior are more unrestricted in their sexuality (H5) and whether the behavioral frequency of users correlates with their sexual unrestrictedness (H6), an online survey was conducted in which people indicated their smoking and drinking frequencies and their mating strategy. Based on large scale substance use questionnaires (Johnston et al., 2014; Steketee, Jonkman, Berten, and Vettenburg, 2013), both the frequency and average consumption of young adults’ smoking and drinking behavior was questioned. To differentiate between users and non-users, respondents were asked if they ever smoked cigarettes or drank alcohol. The smoking and drinking frequency of young adults was measured by asking respondents to indicate the number of days in the past month that they have smoked cigarettes or consumed alcohol. Answers were given on a 7-point scale, with fixed categories ranging from ‘not one day’ to ‘all days’. The average consumption was assessed by asking how much they smoked cigarettes / drank alcohol on average per week. A scale with eight categories
was provided, ranging from ‘less than one cigarette/drink a week’ to ‘more than 20 cigarettes/alcoholic drinks a day’.

To assess young men’s sexual mating strategies, their level of sexual unrestrictedness was measured through the Revised Sociosexual Inventory (SOI-R, Penke and Asendorpf, 2008). This questionnaire consists of nine questions and statements, focusing on a person’s attitude toward uncommitted sex (e.g. *Sex without love is OK*.), their sociosexual desire (e.g. *How often do you have fantasies about having sex with someone with whom you do not have a committed romantic relationship?*) and past behavioral experiences (e.g. *With how many different partners have you had sex within the past 12 months?*). Also the Short-term Mating Orientation (STMO) scale and Long-term Mating Orientation (LTMO) scale were added, measuring short-term and long-term mating tendencies through statements (Jackson and Kirkpatrick, 2007). The STMO contains 10 statements (e.g. *Sometimes I would rather have sex with someone I did not care about*.), while the LTMO consists of eight questions (e.g. *I hope to have a romantic relationship that lasts the rest of my life.*). All scales had sufficient internal consistency ($\alpha_{SOI-R} = .81; \alpha_{STMO} = .87; \alpha_{LTMO} = .76$).

### 3.1.3. Statistical Analysis

Independent t-testing was used to verify if smokers are more sexually unrestricted than non-smokers (H5) via the revised SOI (SOI-R). Given the violated assumption of normality, combined with large differences in sample sizes, non-parametric Mann-Whitney tests were used to compare users and non-users on the STMO and LTMO. These tests could not be conducted for drinkers and non-drinkers, due to the small sample of 10 non-drinkers. Therefore, as an additional verification, three new variables were created through a median split (via rank cases) of SOI-R, STMO and LTMO, dividing all respondents into a more sexually unrestricted and restricted group. Mann-Whitney tests were conducted to verify if both groups differed in their drinking frequency and average consumption. Finally, to study the
correlation between users’ level of sexual unrestrictedness and their cigarette and alcohol consumption, a one-tailed Spearman correlation was opted for (H6).

3.2. RESULTS

An independent t-test was conducted with SOI-R as dependent variable and being a smoker/non-smoker as independent variable. Similarly, two Mann-Whitney tests were performed, with STMO and LTMO as dependent variables. Confirming hypothesis 5, results via SOI-R showed that smokers ($M = 4.56; SD = 1.26$) were significantly more unrestricted in their sexuality than non-smokers ($M = 3.87; SD = 1.22; t(169) = 3.13, p = .002, r = .23$). Also on the STMO scale, smokers ($Md = 4.80$) scored significantly higher than non-smokers ($Md = 4.15; U = 2122, z = -2.05, p = .041, r = -.16$). No significant differences were found between users ($Md = 4.14$) and non-users ($Md = 4.29$) on the LTMO scale, yet a trend was visible in which smokers were less long-term oriented ($U = 2151, z = -1.95, p = .052, r = -.09$).

For alcohol, Mann-Whitney tests were performed with the median split variables as independent variables and drinking frequency / average consumption as the dependent testing variables. Findings showed that the sexually short-term oriented group had a higher ranking on drinking frequency and average drinking than the more sexually restricted group. This was found when the median split was based on SOI-R ($U_{Frequency} = 2666.5, z = -2.82, p = .005, r = -.22; U_{Average} = 2980, z = -2.16, p = .031, r = -.17$), STMO ($U_{Frequency} = 2905.5, z = -1.91, p = .056, r = -.15; U_{Average} = 2921, z = -2.23, p = .026, r = -.17$), and LTMO ($U_{Frequency} = 2688, z = -2.53, p = .011, r = -.20; U_{Average} = 2655, z = -2.98, p = .003, r = -.23$). All sexually unrestricted groups had a median score of five on both measures, while the more restricted groups had a median of four. Accordingly, the unrestricted group consumed up to 20 alcoholic drinks a week, while the restricted group only drank between four and 10 drinks a week. Furthermore, the more short-term oriented group drank between 10 and 19 days last month, compared to 6 to 9 days of the more long-term oriented group.
Furthermore, Spearman’s one-tailed correlations between the usage of smokers and drinkers (frequency and average consumption) and their level of sexual unrestrictedness were conducted. Findings showed that there was no significant correlation between the level of smoking behavior and their sexual orientation (all $p$s $\geq .116$). However, the extent to which young men drink alcohol did correlate positively with their short-term mating orientation. Men who drank more frequently ($r_s = .21$, $p = .003$) and had a higher average consumption ($r_s = .19$, $p = .008$) scored slightly higher on the SOI-R and vice versa. The same positive correlation was found for the STMO scale ($r_s$ _Frequency$ = .16$, $p = .02$; $r_s$ _Average$ = .19$, $p = .007$). For the LTMO scale, a small negative correlation was present, indicating that a lower alcohol usage was correlated with a higher long-term mating orientation ($r_s$ _Frequency$ = -.20$, $p = .007$; $r_s$ _Average$ = -.22$, $p = .003$). Since the same pattern is found as in study 1, these findings confirm hypothesis 6.

3.3. DISCUSSION STUDY 2

Results of study 2 showed that young men who smoke were more short-term oriented in their sexuality compared to non-smokers. Additionally, sexually unrestricted young adults appeared to drink more compared to the long-term oriented group. Furthermore, among cigarette users, no link was found between a man’s smoking frequency and his level of sexual unrestrictedness. However, a higher alcohol consumption was positively correlated to a more unrestricted sexuality. These findings correspond with women’s perceptions, making no distinction between occasional and frequent smokers, yet assessing heavy drinkers differently from occasional drinkers.
4. **GENERAL DISCUSSION**

4.1. **DISCUSSION**

Despite the harmful physical effects of smoking and drinking, many young men continue to use both substances. Therefore, in this paper, we explored the possibility that young men use these physical risky behaviors as a short-term mating strategy. A first experiment studied whether smoking and drinking affects the perceived overall behavioral harmfulness (H1), whether women perceive smokers and drinkers to be more sexually unrestricted compared to non-users (H2) and whether both unhealthy consumption behaviors bring short-term attractiveness benefits (H3). In addition, it was also verified if women’s perceptions are mediated by the perceived behavioral unhealthiness and riskiness (H4). Furthermore, a follow-up study investigated whether these female perceptions correspond with men’s actual behavior and mating strategy (H5, H6).

Confirming hypothesis 2, the first study showed that both smokers and drinkers were perceived to be more short-term oriented in their sexuality compared to people who do not use cigarettes or alcohol. However, a smoker was considered more sexually unrestricted independent of his smoking frequency, whereas only a heavy drinker was perceived to be more short-term oriented compared to a non-user.

In addition, corresponding with hypothesis 3, smoking and drinking brought short-term attractiveness benefits to its users. While the attractiveness ratings of non-users did not differ depending on the mating context, both occasional and frequent users were considered more appealing as a short-term dating partner than a long-term partner. Moreover, as stated in hypothesis 3b, frequent drinking enhanced a young man’s short-term desirability compared to not drinking, while harming his long-term attractiveness. For smoking, a similar trend was visible, in which frequent smoking was considered only slightly less attractive than not smoking in a short-term relationship, but heavily lowered a man’s long-term desirability. Also, as expected in hypothesis 3a, occasional drinking increased the
attractiveness of men in both short-term and long-term mating contexts. Occasional smoking, on the other hand, was found equally attractive as not smoking in both situations. These attractiveness findings correspond with the studies of Farthing (2007), Kelly and Dunbar (2001), and Basset and Moss (2004) showing that heavy physical risk-taking is mainly attractive in short-term mating contexts, while moderate physical risk-taking is also appealing for long-term mating. It also corresponds with the recent study showing that moderate alcohol use enhances a man’s general (long-term) attractiveness, whereas heavy alcohol use has a rather negative impact (Van Den Abbeele et al., 2015).

The second study confirmed these female perceptions and hypothesis 5, showing that male smokers were indeed more short-term oriented in their sexuality compared to non-users. Furthermore, the more sexually unrestricted young adults appeared to have a higher drinking consumption. These findings complement the findings of Jones and Figuerdo (2007) as well as Hones et.al. (2013, 2015), showing that higher mating efforts are linked to smoking and drinking behavior. Moreover, when looking at the mating strategy of actual smokers and drinkers, there appeared to be no link between users’ amount of smoking and their level of sexual unrestrictedness, whereas a positive correlation was present for drinking alcohol. These findings also correspond with women’s assessment of study 1, in which frequent drinkers were perceived differently from occasional drinkers, yet no differences were found between occasional and frequent smokers. Accordingly, also hypothesis 6 was confirmed.

In summary, the above findings show that both unhealthy consumption behaviors could operate as a short-term mating strategy, in which men use heavy smoking and drinking to signal a short-term mating orientation and to obtain attractiveness benefits in short-term mating contexts. However, this is especially the case for drinking alcohol, more so than smoking cigarettes. In addition, results are inconclusive as to how smoking cigarettes and drinking alcohol actually functions as a short-term mating strategy. On the one hand, findings confirmed that both behaviors are actually considered physically
harmful behaviors, as heavy smoking and heavy drinking affected the perceived overall behavioral unhealthiness and riskiness of young adults. However, hypothesis 4, verifying that women’s perceptions are actually mediated by the perceived behavioral harmfulness, was only partially confirmed. In line with expectations, the positive mediation in the assessment of a young man’s sexual strategy indicated that a higher perceived behavioral harmfulness leads to a more sexually unrestricted impression as the behavioral frequency rises. Furthermore, also the negative mediating effect on a man’s long-term attractiveness corresponds with risk-taking literature, showing that a man’s desirability lowers as the perceived harmfulness of the behavior rises above a certain level (Bassett and Moss, 2004; Farthing, 2007). Yet, mediation analyses were unable to confirm that the perceived harmfulness also had an impact on the short-term attractiveness ratings. In addition, unhealthiness mediated the impact of smoking behavior on women’s perception, while especially riskiness had indirect effects on how drinking alcohol affected the perception of women.

These differences in results between the smoking and drinking profiles could be related to the general idea that prevails among young people in Belgium about smoking and drinking. Studies already showed that having a favorable image of smokers facilitates smoking behavior (Gerrard, Gibbons, Stock, Lune, and Cleveland, 2005; Gibbons and Gerrard, 1995; Spijkerman, van den Eijnden, and Engels, 2005), while a positive image of drinkers is related to a higher alcohol consumption (Gerrard et al., 2002; Spijkerman, van den Eijnden, Vitale, and Engels, 2004). In Belgium, drinking alcohol is widely accepted among young adults, with 93% of the Flemish college and university students drinking alcohol (Rosiers et al., 2014). Furthermore, occasional drinking is not always perceived as harmful, due to studies stating that moderate drinking can have positive effects on a person’s health (Ellison, 2007; Gutjahr, Gmel, and Rehm, 2001; Rimm, Klatsky, Grobbee, and Stampfer, 1996). The discourse on smoking, on the other hand, is much more negative. Young adults are confronted more with warnings of the dangers of smoking (e.g. each packet of cigarettes contains a clear warning message in Belgium, yet no such messages are
found on alcoholic beverages). As a consequence, smoking is less socially accepted, leading to ‘only’ 30% of the young adult students being a smoker (Rosiers et al., 2014). These cultural attitudes could explain why there is a difference in the functioning of smoking and drinking as a short-term mating strategy. The fact that smoking is less socially accepted compared to drinking corresponds with the fact that drinking alcohol leads to clear attractiveness benefits, whereas smoking behavior is limited to not harming men’s attractiveness. Moreover, it matches with the fact that smokers are considered more sexually short-term oriented, irrespective of their smoking frequency, whereas only heavy drinking functions as an indicator of a person’s sexual strategy. Finally, it also corresponds with the mediating effect of perceived unhealthiness on smoking behavior, while perceived riskiness had a higher impact on alcohol based impressions.

4.2. LIMITATIONS AND FUTURE RESEARCH

A potential confound in the first experimental study is the fact that the presentation order of the cigarette and alcohol vignettes was not randomized (all participants first rated a smoking profile, followed by a drinking profile). Although each of the three online links varied the behavioral frequency of the behavioral profiles, some order effects might have influenced participants’ ratings. Also, the experimental study did not take into account the participants’ smoking and drinking behavior. Yet, for a future study, it would be interesting to investigate if users assess young men differently compared to non-users. Furthermore, asking about the perceived behavioral unhealthiness and riskiness appeared insufficient to gain complete insight in the functioning of smoking and drinking as a the short-term mating strategy, as no mediating effects were found to explain the short-term attractiveness ratings. Perhaps asking how unhealthy and risky participants considered the actual smoking and drinking behavior to be - instead of the overall behavior - would show significant positive mediating effects. In addition, to increase our understanding of why smoking and drinking operates as a short-term mating strategy, follow-up studies could also focus on identifying which characteristics cigarette and alcohol use signal to potential partners, in
addition to the attractiveness benefits. When studying women’s perceptions of men, we would also suggest new studies to take into account the amount of cigarettes and alcohol that is consumed on one occasion. As short-term mating intentions are often based on interactions in one occasion, women are not always aware of men’s general smoking and drinking behavior. However, the amount of cigarettes and alcoholic beverages that are consumed on one occasion, can often be witnessed. Moreover, drinking or smoking occasionally can mean also that a person occasionally engages in heavy episodic drinking/smoking instead of moderate usage. Furthermore, in our second study, we only had a limited number of respondents who did not drink alcohol. As a consequence, additional tests were performed using a median split between the more short-term and long-term oriented respondents. However, future studies are necessary to verify that the differences in sexual unrestrictedness are present for both smokers and drinkers.

4.3. CONCLUSION AND IMPLICATIONS

In this paper, we explored the possibility that young male smoking and drinking is used as a short-term mating strategy. Findings showed that cigarette and alcohol use are considered physically harmful behaviors that operate as a cue of young men’s short-term mating orientation. Furthermore, despite all efforts to sensitize young adults for the dangers of smoking and drinking, male cigarette and (especially) alcohol use still bring attractiveness benefits in short-term mating situations. Given the harmfulness and high frequency of both consumption behaviors in young adulthood, these findings are of interest to both social marketing professionals and institutions aimed at limiting youth smoking and drinking behavior. Not only do these findings show that emphasizing the physical harmful effects of cigarettes and alcohol in order to prevent the unhealthy behaviors might not be effective. It may even turn out to be contra productive.
5. REFERENCES


6. APPENDIX

6.1. SMOKING PROFILES

Peter likes soccer. For years, he has been a loyal fan of his favorite team. Regularly, Peter plays indoor soccer with his friends, at the local club. They rarely win, but they always have fun. Afterwards, they usually stick around for a drink in the cafeteria. *Peter does not smoke. You will never catch him taking a puff of a cigarette.*

Peter likes soccer. For years, he has been a loyal fan of his favorite team. Regularly, Peter plays indoor soccer with his friends, at the local club. They rarely win, but they always have fun. Afterwards, they usually stick around for a drink in the cafeteria. *Occasionally, Peter loves to smoke a cigarette or two.*

Peter likes soccer. For years, he has been a loyal fan of his favorite team. Regularly, Peter plays indoor soccer with his friends, at the local club. They rarely win, but they always have fun. Afterwards, they usually stick around for a drink in the cafeteria. *Peter smokes a lot. Both when he is alone or in company, he will light cigarettes frequently.*
6.2. **Drinking Profiles**

Kasper is an absolute film lover. However, he does not like to go to the big cinema complexes. He prefers going to the smaller cinemas because of the unique atmosphere. Furthermore, he also likes playing a game of cards with his friends. He prefers playing poker, because he loves bluffing and putting on a ‘poker face’. *Kasper never drinks alcohol. You’ll never catch him taking a sip.*

Kasper is an absolute film lover. However, he does not like to go to the big cinema complexes. He prefers going to the smaller cinemas because of the unique atmosphere. Furthermore, he also likes playing a game of cards with his friends. He prefers playing poker, because he loves bluffing and putting on a ‘poker face’. *Occasionally, Kasper loves to drink a glass of alcohol or two.*

Kasper is an absolute film lover. However, he does not like to go to the big cinema complexes. He prefers going to the smaller cinemas because of the unique atmosphere. Furthermore, he also likes playing a game of cards with his friends. He prefers playing poker, because he loves bluffing and putting on a ‘poker face’. *Kasper drinks alcohol often. Both when he is alone or in company, he will frequently drink some alcohol.*
CHAPTER 4

CIGARETTE AND ALCOHOL USE TO SEDUCE? FEMALE CIGARETTE AND ALCOHOL CONSUMPTION AS A SHORT-TERM MATING STRATEGY.
In developed countries, the traditional gender gap in youth smoking and drinking is closing. Since tobacco and alcohol are more harmful to women than to men, this is an alarming trend. As men are generally more short-term oriented in their sexuality than women, and given that cigarette and alcohol use are still considered masculine behaviors, we explored if female smoking and drinking can function as a short-term mating strategy. By means of a between-subjects experiment (N = 218), men’s perceptions of female smoking and drinking were studied. The experiment showed that young men perceive women who use cigarettes and alcohol as being more sexually unrestricted. Furthermore, cigarettes and (especially) alcohol use brought some short-term attractiveness benefits to women. In short-term mating contexts, drinking enhanced women’s attractiveness, whereas occasional smoking was found equally desirable as not smoking. However, in long-term mating contexts, frequent drinking and all smoking behavior harmed women’s desirability. A follow-up study (N = 202) confirmed men’s perceptions, showing that female users of tobacco and alcohol are indeed more short-term oriented in their sexuality. Overall, results indicate that female smoking and drinking can operate as a short-term mating strategy.

1. INTRODUCTION

In young adulthood, smoking cigarettes and drinking alcohol is widespread (Hammond, 2005; Substance Abuse and Mental Health Services Administration [SAMHSA], 2014; U.S. Department of Health and Human Services [DHHS], 2012). Generally, males engage most in these behaviors. Yet, a high number of women also smokes and drinks (Ahlström & Österberg, 2005; DHHS, 2012; SAMHSA, 2014). Even more, research shows that the traditional gender gap in youth smoking and drinking is closing, particularly in the well-developed European and American regions (Amos, Greaves, Nichter, & Bloch, 2012; Flandorfer, Wegner, & Buber, 2010; Hitchman & Fong, 2011; Holmila & Raitasalo, 2005; World Health Organization, 2005, 2008).

Given the detrimental physical, social and behavioral effects of early smoking and drinking (Doll, Peto, Boreham, & Sutherland, 2004; Ellickson, Tucker, & Klein, 2003; Jha et al., 2013; World Health Organization, 2014), this is a worrisome trend. Especially since female users are more susceptible to the negative health effects due to physiological differences (Huxley & Woodward, 2011; Mancinelli, Vitali, & Ceccanti, 2009; Neugut & Jacobson, 2006; Nolen-Hoeksema, 2004; Steliga & Dresler, 2011). As women have higher levels of body fat and estrogen, combined with lower levels of metabolizing enzymes, women absorb and retain alcohol more than men. This leads to higher alcohol concentrations in women’s blood, and a greater toxicity (Holmila & Raitasalo, 2005; Mumenthaler, Taylor, O’Hara, & Yesavage, 1999; World Health Organization, 2005). In addition, women are more vulnerable to cardiovascular and lung diseases due to a higher genetic susceptibility to tobacco carcinogens (Bennett et al., 1999; Shriver et al., 2000).

In order to halt this alarming trend, more insight is necessary in why young women increasingly engage in cigarette and alcohol consumption.

1.1. HUMAN SEXUALITY AND COURTSHIP BEHAVIOR

Due to asymmetries in fertility and minimum level of parental investment (Buss & Schmitt, 1993; Trivers, 1972), men and women benefit from engaging in different sexual strategies. Men often follow a more short-term oriented, unrestricted mating strategy, approaching a higher number of women. Women, on the other hand, are generally more long-
term oriented and restricted. However, both the sexual strategies theory (Buss & Schmitt, 1993) and the strategic pluralism model (Gangestad & Simpson, 2000) point out that men and women follow both mating strategies depending on environmental circumstances (e.g. harshness, uncertainty) and personal characteristics (e.g. attractiveness).

As women are generally more sexually restricted than men (Schmitt, 2005), they are often demanding of a costly courtship before consenting to sexual encounters. Therefore, to avoid high mating efforts, cues of sexual availability in women are beneficial for men following a short-term mating strategy. Accordingly, women engage in behaviors to signal their short-term mating orientation to men (Buss & Schmitt, 1993; Regan, Levin, Sprecher, Christopher, & Cate, 2000). Research suggests that women often use signaling strategies analogous to men, to indicate that they are also more manlike and unrestricted in their sexual strategy (Sylwester & Pawłowski, 2011).

1.2. Male short-term mating

Several studies indicate that physical risk-taking is used by men in short-term mating situations. Not only does the proximity of attractive women stimulate physically risky behavior (Frankenhuis, Dotsch, Karremans, & Wigboldus, 2010; Pawlowski, Atwal, & Dunbar, 2008; Ronay & Hippel, 2010), physical risk-taking is also found most attractive in short-term mating situations (Bassett & Moss, 2004; Kelly & Dunbar, 2001; Sylwester & Pawłowski, 2011). Also, smoking cigarettes and drinking alcohol – being physically risky behaviors – appear to function as a short-term mating strategy. Young men with high mating motivations engage more in drinking games and smoking behavior (Hone and McCullough, 2015; Hone, Carter, and Mccullough, 2013; Jones and Figueredo, 2007), whereas women perceive male cigarette and alcohol users to be more sexually unrestricted and more desirable as a short-term partner than non-users (Vincke, 2016).

1.3. Female short-term mating

Also in women, risk-taking functions as a cue in short-term mating situations. Both physical and social risk-taking [i.e. engaging in non-conformist behavior that can damage one’s reputation] enhance female attractiveness in short-term mating contexts (Bassett & Moss, 2004; Kelly & Dunbar, 2001; Sylwester & Pawłowski, 2011).
In long-term mating situations, on the other hand, men prefer risk avoiders (Bassett & Moss, 2004; Sylwester & Pawłowski, 2011), unless the risky activities are moderate (Farthing, 2007).

In line with risk-taking literature and male signaling, research also indicates that female cigarette and alcohol consumption are related to short-term mating. Indeed, and similar to men, women with high mating efforts participate more in drinking games (Hone & McCullough, 2015; Hone et al., 2013). In addition, both young men and women who are actively dating, drink more alcohol compared to young adults who are not dating or who are in a committed relationship (Devos-Comby, Daniel, & Lange, 2013; Pedersen, Lee, Larimer, & Neighbors, 2009). Moreover, the study of Clark (2004) shows that the amount of money spent on alcohol is a very strong predictor of women’s level of sexual unrestrictedness. Women even indicate considering drinking as a means to indicate sexual willingness to others (Lindgren, Pantalone, Lewis, & George, 2009; Lindgren, Parkhill, George, & Hendershot, 2008), whereas men perceive women who drink alcohol as being more sexually available and willing (Abbey, 2002; Garcia & Kushnier, 1987; Koukounas, Djokie, & Miller, 2014; Lindgren et al., 2008; Parks & Scheidt, 2000).

In women, smoking behavior is also linked to higher mating efforts and an unrestricted sexual approach (Jones & Figueredo, 2007; Långström & Hanson, 2006). Female adolescent girls with a liberal sexual approach are up to eight times more likely to smoke (Li, King, & Winter, 2010), while - more so for girls than boys - early dating is a strong predictor of smoking later in life (Fidler, West, Jarvis, & Wardle, 2006). Smoking also appears to be the best predictor of sexual risky behavior in both male and female adolescents (Farid, Rus, Dahlui, Al-Sadat, & Aziz, 2014).

Given the harmful health consequences of smoking and drinking, both behaviors can be considered physically risky for women. In addition, cigarette and alcohol use is still perceived as masculine behavior (de Visser & McDonnell, 2012; de Visser & Smith, 2007; Holmila & Raitasalo, 2005; Rolfe, Orford, & Dalton, 2009), leading to a ‘manly’ impression of women who engage in smoking and drinking (Jackson & Tinkler, 2007; Rolfe et al., 2009). As a consequence, smoking and drinking can also be considered social risk-taking, used by women to oppose to traditional gender roles.
1.4. Current research

As women engage in male signaling strategies to indicate a short-term mating orientation to others, we hypothesize that female cigarette and alcohol use can function as a short-term mating strategy. Accordingly, we expect that a woman’s smoking and drinking behavior will operate as a perceivable cue that affects men’s perception. As smoking cigarettes and drinking alcohol can be considered physically and socially risky for women, we believe that a higher cigarette and alcohol consumption will lead to a more unhealthy and risky impression of a young woman’s overall behavior (Hypothesis 1). Moreover, we expect that men will perceive women who engage in cigarette and alcohol use as being more unrestricted in their sexuality (Hypothesis 2). Also, smoking and drinking will bring attractiveness advantages to young women (Hypothesis 3). Corresponding with risk-taking literature, occasional smoking and drinking behavior - being moderate risky behaviors - will enhance women’s attractiveness in both short-term and long-term mating contexts (Hypothesis 3a). Heavy smoking and drinking, on the other hand, will bring attractiveness benefits only in short-term mating situations (Hypothesis 3b). Additionally, if cigarette and alcohol use function as a short-term mating strategy because of their physical or social riskiness, we also believe that the perceived overall behavioral unhealthiness and riskiness will mediate men’s assessment of women (Hypothesis 4).

Furthermore, for smoking and drinking to operate as a short-term mating strategy, men’s perceptions must correspond with young women’s actual behavior. Therefore, female smokers and drinkers must be more short-term oriented in their sexuality compared to non-users (Hypothesis 5). Moreover, we believe to find a correlation between users’ level of sexual unrestrictedness and their average cigarette and alcohol consumption that matches with the results of hypothesis 2 (Hypothesis 6). To answer these hypotheses, two studies were conducted.
2. **Study 1: The perception of female smoking and drinking behavior**

2.1. **Material and method**

2.1.1. **Design**

To investigate how young men assess women’s sexual strategy and attractiveness as a function of their smoking and drinking behavior, an online between-subjects experiment was conducted. More specifically, a factorial survey approach was used, in which participants evaluated vignettes (descriptions), varying (an) experimental factor(s) (Auspurg & Hinz, 2015). This research approach has already proven successful in the study of risky behavior (Bassett & Moss, 2004; Kelly & Dunbar, 2001; Sylwester & Pawłowski, 2011) and conspicuous signaling behavior (Sundie et al., 2011).

2.1.2. **Participants**

In total, 233 young men started the online experiment. Because of the attractiveness related questions of hypothesis 3, participants with a homosexual orientation were excluded from the dataset, as well as participants outside the young adult age range and participants with largely incomplete questionnaires. The final sample consisted of 218 men, between the age of 18 and 30 ($M = 21.77; SD = 2.37$). All participants were Flemish, living in the Dutch-speaking part of Belgium. In Belgium, it is legal to sell alcohol to youngsters from 16 years on. Only when buying liquor, the age limit rises to 18 years. The 16-year old age limit also counts for buying cigarettes (www.belgium.be), making all participants legal consumers of both substances.

2.1.3. **Materials and measures**

In this first study, behavioral profiles (vignettes) were created, describing the hobbies of a typical young women in circa 70 words. In total, two behavioral profile sets were created, focusing respectively on smoking and drinking behavior. Each profile set consisted of three versions, varying the women’s smoking or drinking frequency. All three versions were identical, except for the last sentence, stating that the person did not use, used occasionally
or used frequently (see Appendix). All participants rated one version of each behavioral profile set, i.e. one smoking behavioral profile and one drinking behavioral profile.

To distribute these profiles, three online links were created via the program ‘Thesistools’, each link containing two profiles. All three links first showed a smoking profile followed by a drinking profile, yet varied the behavioral frequencies. For instance, when opening the first link, participants were asked to read a behavioral profile in which the target individual smoked occasionally, and one in which she drank alcohol frequently.

To assess the attractiveness of the main character as a function of her smoking / drinking frequency, participants were asked the following: ‘Based on the profile you just read, how attractive would you find this person as a potential partner in the following situations? (a) a short-term relationship (a date, one-night stand, casual relationship, etc. (b) a long-term relationship (loyal, committed relationship, marriage).’ Both questions were followed by a 7-point Likert scale, ranging from 1 (not at all attractive) to 7 (very attractive).

To gain insight in the perceived sexual strategy, participants were asked to fill in the three attitudinal items of the Sociosexual Inventory (e.g. ‘Sex without love is OK.’), assessing the level of sexual unrestrictedness (Simpson & Gangestad, 1991). However, participants were asked to fill in these questions from the perspective of the main character in the profile (Sundie et al., 2011): ‘To what extent do you think the person in the profile would agree with the following statements? Answer this question as you think the main character from the profile would reply.’ Here also, a 7-point Likert scale was used, ranging from 1 (I strongly disagree) to 7 (I strongly agree). A new variable computed the mean score of the three questions, for both the smoking and drinking profiles ($\alpha_{Smoking} = .81; \alpha_{Drinking} = .79$). A higher score indicated a more short-term oriented, unrestricted, sexual orientation.

Finally, participants also indicated on a 7-point Likert scale how unhealthy and risky they considered the overall behavior of the target individual to be: ‘Based on the profile you just read, to what extent do you agree with the following statements (a) This person behaves in an unhealthy manner (b) This person behaves in a risky manner’.
Participants agreeing to take part in the experiment randomly received one of the online links to the different vignette sets. Participants were first informed that they would be taking part in an experiment focusing on behavioral perceptions, in which evaluations of others needed to be made. After confirming participants’ confidentiality and anonymity, all participants read and rated the behavioral profiles.

2.1.4. Statistical analysis

In the first study, mixed analyses of variance (mixed ANOVAs) were conducted to verify hypothesis 1 and 3. Significant main effects were reported via pairwise comparisons. Simple effects analyses via the SPSS syntax (Field, 2013) were used to discuss significant interaction effects. To study hypothesis 2, univariate ANOVAs were conducted, followed by Tukey post-hoc testing. Finally, for hypothesis 4, mediation analyses were performed, using model 4 of the PROCESS procedure of Hayes (Hayes, 2013; http://www.afhayes.com). Because of the high correlation between the two potential mediators unhealthiness and riskiness in both profile sets ($r_{\text{smoking}} = .58, p < .001$; $r_{\text{drinking}} = .56, p < .001$), separate mediation analyses were preferred over parallel mediation with two mediators (Kenny, Kashy, & Bolger, 1998). In addition, three dummy variables were created to compare the conditions of the independent variable ‘profile version’: occasional usage vs. no usage, frequent usage vs. no usage, frequent usage vs. occasional usage. Bias-corrected bootstrapping (with 5000 bootstrap samples) was used to generate 95% confidence intervals around the indirect effects of perceived unhealthiness and riskiness on the SOI and attractiveness ratings. Mediation is present when the confidence intervals exclude zero.

2.2. Results

2.2.1. Perceived behavioral harmfulness as a function of smoking and drinking

To investigate hypothesis 1, two mixed ANOVAs were conducted: one for the smoking profiles and one for the drinking profiles. Perceived unhealthiness and riskiness served as dependent variables in the within-subjects factor ‘harmfulness’. Profile version functioned as between-subjects factor, with the three behavioral frequencies: never, occasional and frequent.
For both the smoking \((F(2,212) = 15.14, p < .001, \eta^2_p = .125)\) and drinking profiles \((F(2,214) = 7.95, p < .001, \eta^2_p = .069)\), results showed a significant interaction effect between perceived riskiness and unhealthiness as a function of usage frequency. Additionally, there was also a significant main effect of profile version \((F_{\text{Smoking}}(2,212) = 57.72, p < .001, \eta^2_p = .353; F_{\text{Drinking}}(2,214) = 63.08, p < .001, \eta^2_p = .371)\).

For the smoking profiles, the profile version main effect showed that the vignettes were perceived to be more harmful as the smoking frequency rose \((M_{\text{Frequently}} = 5.01; SD_{\text{Frequently}} = 1.11; M_{\text{Occasionally}} = 3.84; SD_{\text{Occasionally}} = 1.36. M_{\text{Never}} = 2.92; SD_{\text{Never}} = 1.09; \text{all } ps < .001)\). Simple effects analyses of the interaction effect (see Figure 1) confirmed that this was the case for both perceived behavioral riskiness \((ps \leq .030)\), and unhealthiness \((ps < .001)\).

For the drinking profiles, the main effect of profile version also showed a higher perceived harmfulness as the drinking frequency rose \((M_{\text{Frequently}} = 4.19, SD_{\text{Frequently}} = 1.43; M_{\text{Occasionally}} = 2.69, SD_{\text{Occasionally}} = 0.92; M_{\text{Never}} = 2.16; SD_{\text{Never}} = 0.96; \text{ps} \leq .005)\). However, the interaction effect clarified that this was only the case for perceived behavioral riskiness \((ps \leq .002)\). The occasional drinking profile was not perceived to be more unhealthy than the non-drinking profile \((p = .110)\), whereas the frequent drinking profile did score significantly higher compared to the occasional drinker \((p < .001)\) and non-drinker \((p < .001)\).

![Figure 1: Perceived harmfulness as a function of cigarette and alcohol use](image-url)
2.2.2. Perceived sexual strategy as a function of smoking and drinking

To study if men actually use women’s smoking and drinking behavior as a cue to infer sexual strategies (H2), two ANOVAs were conducted (one for smoking behavior, one for drinking behavior). The mean SOI score served as dependent variable, whereas profile version - varying between the three behavioral frequencies never, occasional and frequent - was used as independent variable.

Results indicated that women’s perceived sexual strategy was affected by their smoking behavior ($F(2,215) = 8.43, p < .001, \eta^2_p = .073$) and drinking behavior ($F(2,215) = 21.17, p < .001, \eta^2_p = .165$). More specifically, post-hoc analyses (see Figure 2) showed that both an occasional ($p = .012$) and frequent smoker ($p < .001$) were perceived as significantly more short-term oriented in their sexuality compared to a non-smoker. However, there were no significant differences between the two smoking frequencies ($p = .599$). Similarly, frequent ($p < .001$) and occasional drinkers ($p = .010$) were perceived as significantly more sexually unrestricted compared to a non-drinker. Additionally, a frequent alcohol user was also regarded as having a more short-term oriented mating strategy compared to an occasional drinker ($p = .001$).

![Figure 2: Perceived sexual strategy as a function of cigarette and alcohol use](image)
2.2.3. Attractiveness as a Function of Smoking and Drinking

Two mixed ANOVAs were conducted (one for smoking behavior, one for drinking behavior) to investigate if women’s short-term and long-term attractiveness is affected differently depending on their smoking and drinking frequency. Short-term and long-term attractiveness functioned as the dependent variables in the within-subjects factor ‘attractiveness’. Profile version (i.e. the three behavioral frequencies) was used as between-subjects factor.

For the smoking profiles, results showed a significant main effect of the within-subjects factor ‘attractiveness’ \( (F(1,215) = 276.40, \ p < .001, \ \eta^2_p = .562) \) and between-subjects factor profile version \( (F(2,215) = 28.21, \ p < .001, \ \eta^2_p = .208) \). Also a significant interaction was present between a women’s short-term and long-term attractiveness as a function of her smoking frequency \( (F(2,215) = 5.08, \ p = .007, \ \eta^2_p = .045) \).

According to the profile version main effect, both a non-smoker \( (M = 4.55, \ SD = 1.21, \ p < .001) \) and an occasional smoker \( (M = 4.27, \ SD = 1.31, \ p < .001) \) were significantly more attractive than a frequent smoker \( (M = 3.09, \ SD = 1.21) \), with no differences between a non-smoker and occasional smoker \( (p = .176) \). The interaction effect (see Figure 3) confirmed these findings for short-term attractiveness, with no significant differences between the non-smoking and occasional smoking profile \( (p = .814) \), and frequent cigarette use being less desirable in a short-term mating partner \( (ps < .001) \). However, both occasional \( (p = .010) \) and frequent smoking \( (p < .001) \) did harm a woman’s long-term attractiveness compared to not smoking, occasional smoking being more attractive than frequent smoking \( (p < .001) \). In addition, the main effect of the within-subjects factor showed that overall, the smoking profiles received higher short-term attractiveness \( (M = 4.87, \ SD = 1.60) \) than long-term attractiveness ratings \( (M = 3.07, \ SD = 1.62) \). The simple effect analyses of the interaction effect confirmed that short-term attractiveness scores exceeded the long-term attractiveness ratings in all three profiles \( (ps < .001) \).

For the alcohol profiles, findings showed a significant main effect of profile version \( (F(2,215) = 8.96, \ p < .001, \ \eta^2_p = .077) \), as well as a significant interaction effect between short-
term and long-term attractiveness and the drinking frequency ($F(2, 215) = 17.08, p < .001, \eta^2_p = .137$).

The profile version main effect showed that occasional drinking ($M = 5.35, SD = 1.03$) was perceived as more attractive than both not drinking ($M = 4.50, SD = 1.48, p < .001$) and drinking frequently ($M = 4.90, SD = 1.08, p = .034$). Drinking frequently was considered slightly more attractive than not drinking ($p = .048$). However, when looking at the interaction effect (see Figure 3), this pattern differed for short-term and long-term attractiveness. More specifically, both an occasional ($p = .003$) and frequent drinker ($p < .001$) were perceived as more desirable for short-term mating than a non-drinker, with no significant differences between the two alcohol using profiles ($p = .276$). Yet, the attractiveness benefits of heavy drinking faded in a long-term mating context. Only occasional drinking enhanced a woman’s long-term attractiveness compared to not drinking ($p < .001$) and frequent drinking ($p < .001$). Not drinking and drinking frequently did not differ ($p = .432$). Additional follow-up analyses of the interaction effect showed that there were no differences between a woman’s short-term and long-term desirability in the non-drinking condition ($p = .144$). An occasional drinker, on the other hand, was more attractive as a long-term partner ($p = .006$), whereas a frequent drinker was more desirable as a short-term than a long-term partner ($p < .001$).

![Figure 3: Attractiveness as a function of cigarette and alcohol use](image)
2.2.4. The influence of perceived riskiness and unhealthiness on male impressions

To investigate if men’s perceptions are affected by the perceived behavioral riskiness (hypothesis 4), mediation analyses were conducted. The SOI-scores, short-term attractiveness and long-term attractiveness were used separately as outcome variables (Y). The three dummy variables of the profile versions served as independent variables (X) and covariates, with perceived unhealthiness and riskiness as the two (separate) mediators (M).

Results (see Table 1) showed significant positive indirect effects of the smoking and drinking frequency on the perceived level of sexual unrestrictedness, through unhealthiness and riskiness perceptions. These findings indicate that as the smoking and drinking frequency increased, the perceived behavioral unhealthiness and riskiness rose, leading to a more sexually unrestricted impression of the young woman. Only for occasional drinking, no mediation via perceived unhealthiness was found. In addition, in the smoking profiles, no significant indirect effects were present for short-term and long-term attractiveness. However, for drinking alcohol, perceived behavioral riskiness did mediate women’s short-term and long-term desirability in a positive manner. Accordingly, a higher drinking frequency led to a more risky impression, enhancing a woman’s attractiveness.
Table 1: Indirect effects of the overall behavioral perception on men's impressions

<table>
<thead>
<tr>
<th>Smoking profiles</th>
<th>Sexual Unrestrictedness</th>
<th>Drinking profiles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unhealthiness</td>
<td></td>
</tr>
<tr>
<td>OS vs NS*</td>
<td>.186 (.095 .023 .402)</td>
<td>OD vs ND</td>
</tr>
<tr>
<td>FS vs NS*</td>
<td>.381 (.176 .031 .732)</td>
<td>FD vs ND*</td>
</tr>
<tr>
<td>FS vs OC*</td>
<td>.195 (.090 .029 .387)</td>
<td>FD vs OD*</td>
</tr>
<tr>
<td></td>
<td><strong>a*b</strong> SE LLCI ULCI</td>
<td><strong>a*b</strong> SE LLCI ULCI</td>
</tr>
<tr>
<td>Riskiness</td>
<td><strong>a*b</strong> SE LLCI ULCI</td>
<td>Riskiness</td>
</tr>
<tr>
<td>OS vs NS*</td>
<td>.077 (.053 .005 .218)</td>
<td>OD vs ND*</td>
</tr>
<tr>
<td>FS vs NS*</td>
<td>.221 (.113 .023 .464)</td>
<td>FD vs ND*</td>
</tr>
<tr>
<td>FS vs OC*</td>
<td>.144 (.081 .020 .346)</td>
<td>FD vs OD*</td>
</tr>
<tr>
<td></td>
<td><strong>a*b</strong> SE LLCI ULCI</td>
<td><strong>a*b</strong> SE LLCI ULCI</td>
</tr>
<tr>
<td>Short-term Attractiveness</td>
<td>Unhealthiness</td>
<td></td>
</tr>
<tr>
<td>OS vs NS</td>
<td>-.176 (.125 -.456 .039)</td>
<td>OD vs ND</td>
</tr>
<tr>
<td>FS vs NS</td>
<td>-.362 (.244 -.871 .078)</td>
<td>FD vs ND</td>
</tr>
<tr>
<td>FS vs OC</td>
<td>-.185 (.130 -.474 .041)</td>
<td>FD vs OD</td>
</tr>
<tr>
<td></td>
<td><strong>a*b</strong> SE LLCI ULCI</td>
<td><strong>a*b</strong> SE LLCI ULCI</td>
</tr>
<tr>
<td>Long-term Attractiveness</td>
<td>Unhealthiness</td>
<td></td>
</tr>
<tr>
<td>OS vs NS</td>
<td>-.137 (.106 -.378 .046)</td>
<td>OD vs ND</td>
</tr>
<tr>
<td>FS vs NS</td>
<td>-.280 (.217 -.752 .121)</td>
<td>FD vs ND</td>
</tr>
<tr>
<td>FS vs OC</td>
<td>-.143 (.113 -.394 .052)</td>
<td>FD vs OD</td>
</tr>
<tr>
<td></td>
<td><strong>a*b</strong> SE LLCI ULCI</td>
<td><strong>a*b</strong> SE LLCI ULCI</td>
</tr>
</tbody>
</table>

*= significant indirect effect

*a\*b = indirect effect of X on Y through M;
LLCI = lower level confidence interval; ULCI = upper level confidence interval
NS = no smoking, OS = occasional smoking, FS = frequent smoking
ND = no drinking, OD = occasional drinking, FD = frequent drinking
2.3. DISCUSSION STUDY 1

The findings of the first experimental study showed that both smoking and drinking could be considered unhealthy and risky behaviors that influence men’s perceptions. First of all, both behaviors functioned as a cue indicating women’s short-term sexual strategy. Additionally, frequent drinking brought short-term attractiveness benefits to women, whereas a similar trend was visible for occasional smoking. These results indicate that cigarette and (especially) alcohol use could function as a female short-term mating strategy. However, for this mating strategy to work, women’s behavior must correspond with men’s perceptions. Therefore, a second survey study was conducted.

3. STUDY 2: THE SEXUAL STRATEGY OF YOUNG FEMALE SMOKERS AND DRINKERS

3.1. MATERIAL AND METHOD

3.1.1. DESIGN

The aim of the second study was to investigate if young women who use cigarettes and alcohol are more unrestricted in their sexuality compared to non-users (Hypothesis 5), and to verify whether there is a correlation between the level of sexual unrestrictedness and the behavioral frequency of users, similar to men’s perceptions (Hypothesis 6). To answer these hypotheses, an online survey was carried out assessing young women’s smoking and drinking behavior, as well as their mating strategy. Corresponding with large surveys on substance use, (Johnston, O’Malley, Bachman, Schulenberg, & Miech, 2014; Steketee, Jonkman, Berten, & Vettenburg, 2013), both the frequency and average consumption of cigarettes and alcohol was measured.

3.1.2. RESPONDENTS

The final sample consisted of 202 Flemish young women between the age of 18 and 30 years old ($M = 21.39; SD = 2.5$). Of this sample, 16.8% smoked cigarettes ($N = 34$). Almost all
women indicated drinking alcohol (91.1%), with only a small group never drinking any alcohol (N = 18).

3.1.3. Measures

The questionnaire started by asking the respondents if they sometimes smoked or drank alcohol. Additionally, the smoking and drinking frequency of users was measured by questioning on how many days in the previous month they had smoked cigarettes or drank alcohol. Answers were given on a 7-point scale with fixed categories (not a single day; 1 to 2 days; 3 to 5 days; 6 to 9 days; 10 to 19 days; 20 to 29 days; all days). Subsequently, average weekly consumption was assessed by asking how often respondents smoked cigarettes or drank alcohol on average per week. This was measured with an 8-point scale (less than 1 cigarette a week; 1 to 3 cigarettes a week; 4 to 10 cigarettes a week; 11 to 20 cigarettes a week; 1 to 3 cigarettes a day; 4 to 10 cigarettes a day; 11 to 20 cigarettes a day; more than 20 cigarettes a day). The same frequency categories were used for alcoholic drinks.

To assess young women’s level of sexual unrestrictedness, the Revised Sociosexual Inventory (SOI-R, Penke & Asendorpf, 2008) was used. This inventory consists of nine questions, addressing a person’s attitude towards casual sex (e.g. Sex without love is OK.), their sexual desires (e.g. How often do you have fantasies about having sex with someone with whom you do not have a committed romantic relationship?) and past behavioral experiences (e.g. With how many different partners have you had sex within the past 12 months?). Additionally, the Short-term Mating Orientation (STMO) scale and Long-term Mating Orientation (LTMO) scale were added, measuring both short-term and long-term mating tendencies separately via statements (Jackson & Kirkpatrick, 2007). The STMO contains 10 statements (e.g. Sometimes I would rather have sex with someone I do not care about.), while the LTMO consists of eight questions (e.g. I hope to have a romantic relationship that lasts the rest of my life.). All scales had sufficient internal consistency (α_{SOI-R} = .83; α_{STMO} = .89; α_{LTMO} = .75).
3.1.4. Statistical analyses

Mann-Whitney tests were used to investigate if the mating strategy of smokers and drinkers differs from non-users (Hypothesis 5). This non-parametric variant for testing two groups was chosen because of the large differences in sample sizes between users and non-users, combined with a violation of the normality assumption for some groups. Secondly, one-tailed correlations were conducted to verify whether users’ level of sexual unrestrictedness rises with their smoking and drinking frequency (Hypothesis 6). As respondents indicated their frequency and average alcohol and cigarette consumption on an scale with fixed answer categories, the non-parametric correlation measure ‘Spearman rho’, suited for ordinal variables, was opted for.

3.2. Results

Three Mann-Whitney tests were conducted for both smokers and drinkers, with being a user/non-user as independent variable and the SOI-R, STMO and LTMO as dependent variables. Results showed that smokers (Md = 3.56) scored significantly higher on the revised SOI compared to non-smokers (Md = 2.67), indicating a higher level of sexual unrestrictedness (U = 2097, z = -2.44, p = .015, r = -.17). No significant differences were found for the STMO (U = 2451, z = -1.21, p = .227, r = -.09) and LTMO scale (U = 2696.5, z = -0.41, p = .682, r = -.03). For drinking alcohol, the STMO scale showed that drinkers (Md = 3.10) were more short-term oriented in their sexuality than non-drinkers (Md = 2.40), U = 1045, z = -2.53, p = .011, r = -.18. A similar non-significant trend was found via the SOI-R (U = 1246.5, z = -1.73, p = .083, r = -.12), with a higher level of sexual unrestrictedness for drinkers (Md = 2.78) than non-drinkers (Md = 2.39). Finally, also the LTMO scale indicated a trend in which non-drinkers (Md = 4.64) were more long-term oriented in their sexuality than drinkers (Md = 4.57; U = 1182, z = -1.95, p = .051, r = -.14).

In addition, Spearman one-tailed correlations between the usage of smokers and drinkers (frequency and average consumption) and their level of sexual unrestrictedness were conducted. Results found no clear correlation between users’ smoking frequency and their level of sexual unrestrictedness, measured by the SOI-R, STMO or LTMO. Only the average smoking behavior correlated significantly with the SOI-R scale, showing a medium positive
relation \((r_s = .34, p = .025)\). For alcohol use, on the other hand, results showed that women who drank more frequently and who had a higher average consumption, also had higher scores on the SOI-R and vice-versa \((r_s \text{ Frequency} = .38, p < .001; r_s \text{ Average} = .36, p < .001)\). This medium positive correlation was also found when looking at the STMO scale \((r_s \text{ Frequency} = .36, p < .001; r_s \text{ Average} = .28, p < .001)\). Finally, also the small negative correlation between alcohol consumption and the LTMO indicated that drinking regularly is linked to being less long-term oriented sexually \((r_s \text{ Frequency} = -.11, p = .065; r_s \text{ Average} = -.139, p = .031)\).

### 3.3. Discussion Study 2

Results of this follow-up study confirmed that young women who smoke and drink are more unrestricted in their sexuality compared to non-users. Additionally, a higher alcohol consumption was positively correlated with a higher level of sexual unrestrictedness. Young women’s cigarette consumption, on the other hand, was associated less with their level of sexual unrestrictedness. These findings correspond with men’s perceptions, making no distinction between the sexual strategy of occasional and frequent smokers, while perceiving heavy and occasional drinkers differently.

### 4. General Discussion

#### 4.1. Discussion

Despite the more harmful health effects of cigarette and alcohol use for women, the traditional gender gap in smoking and drinking behavior is closing in well-developed countries. Therefore, this paper explored if female smoking and drinking can operate as a short-term mating strategy. By means of an experiment, we studied if cigarette and alcohol use affected the perceived overall unhealthiness and riskiness of women’s behavior (Hypothesis 1), if men perceived young female smokers and drinkers as more sexually unrestricted (Hypothesis 2), if smoking and drinking brought attractiveness benefits (Hypothesis 3), and if men’s perceptions were mediated by the perceived behavioral unhealthiness and riskiness (Hypothesis 4). A follow-up study verified if men’s perceptions corresponded with women’s actual behavior and sexual strategy (Hypothesis 5 and 6).
Consistent with hypothesis 2 and previous literature (Koukounas et al., 2014; Lindgren et al., 2008; Parks & Scheidt, 2000), the experiment confirmed that women who smoke and drink were actually perceived as being more unrestricted in their sexuality compared to non-users. However, the extent to which women smoke did not affect their impression, whereas a frequent drinker was perceived as more short-term oriented compared to an occasional drinker.

In addition, drinking enhanced women’s attractiveness. As stated in hypothesis 3a, drinking occasionally was considered more desirable in a woman than not drinking, both in a short-term and long-term mating context. Moreover, confirming hypothesis 3b, frequent drinking was also perceived as more attractive than not drinking, but only for short-term mating. For smoking, only a trend was visible, in which short-term attractiveness benefits were limited to not harming women’s desirability. More specifically, an occasional female smoker was considered equally attractive by men as a non-smoker, but only in short-term mating contexts. A woman’s long-term attractiveness, on the other hand, was negatively affected when smoking occasionally. Smoking frequently was found the least appealing in both mating contexts.

These attractiveness findings of drinking alcohol correspond with general risk-taking literature showing that heavy physical and social risk-taking are attractive only in short-term mating contexts (Bassett & Moss, 2004; Sylwester & Pawłowski, 2011), whereas moderate risk-taking can also be advantageous for long-term mating (Farthing, 2007). Moreover, as moderate drinking is often driven by social motivations and used for bonding with others (de Visser, Wheeler, Abraham, & Smith, 2013; Kuntsche, Knibbe, Gmel, & Engels, 2005), this might also be a preferred characteristic in a long-term romantic partner, explaining the high attractiveness of occasional drinking. Finally, similar results were found in a recent study, showing that a person’s general (i.e. long-term) attractiveness increased when drinking a moderate amount of alcohol, yet decreased when drinking more (Van Den Abbeele, Penton-Voak, Attwood, Stephen, & Munafo, 2015).

The second study confirmed the male perceptions of study 1 (hypothesis 5), showing that users of cigarettes and alcohol were more short-term oriented in their mating strategy than non-users. These results also agree with studies linking higher mating efforts to smoking
and drinking behavior, in both men and women (Hone & McCullough, 2015; Hone et al., 2013; Jones & Figueredo, 2007). Furthermore, the survey revealed that female users’ level of sexual unrestrictedness was not consistently correlated with their smoking frequency, yet was clearly related to their alcohol consumption. This also matches with the male impressions of study 1, in which female smokers were perceived as being more short-term oriented independent of their smoking frequency, whereas their impression was affected by the drinking frequency.

These findings show that female smoking and drinking behavior are perceivable short-term mating cues, affecting a woman’s attractiveness. In addition, there also appears to be a clear link between a woman’s sexual orientation and her cigarette and alcohol consumption. Yet, the question remains why. On the one hand, results indicated that smoking and drinking can be considered unhealthy and risky behaviors, affecting the overall behavioral impression of women. On the other hand, hypothesis 4, verifying if men’s perceptions are actually mediated by the perceived behavioral unhealthiness and riskiness, was only partially confirmed. As expected, the perceived sexual strategy was mediated in a positive manner. Accordingly, a higher smoking and drinking frequency led to a more sexually unrestricted impression through a higher perceived unhealthiness and riskiness. However, perceived riskiness only mediated the short-term and long-term attractiveness of the alcohol profiles, with no significant mediating effects on the attractiveness ratings of the smoking profiles. The fact that a higher perceived riskiness of drinking alcohol enhanced a woman’s short-term desirability corresponds with scientific literature showing that drinking alcohol can be considered socially risky behavior in women (cf. supra), increasing women’s short-term desirability (Sylwester & Pawłowski, 2011). Moreover, it could also indicate a higher willingness to take sexual risks. The finding that a higher perceived riskiness also raised a woman’s long-term attractiveness was rather unexpected. Possibly, this could point out that the perceived riskiness of drinking behavior remained rather moderate.

In the theoretical part, we mentioned that smoking and drinking might function as a short-term mating strategy because of its masculine connotation (Sylwester & Pawłowski, 2011). According to the social role theory, male and female gender roles are learned through cultural transmission and socialization. Consequently, women would also be socialized through these gender roles to find unhealthy consumption behaviors masculine (Eagly &
Wood, 1999; Waldron, 1997). Although we agree with this cultural approach in that women can use masculine behavior to signal information about themselves to others, we believe that it is not cultural transmission that makes smoking, drinking and other risk-taking typically male behavior. All over the world, young men engage most in risk-taking behavior (Kruger & Nesse, 2004). Moreover, as testosterone levels correlate with these risky behavior, there appear to be biological determinants present (Ronay & Hippel, 2010; Saad & Vongas, 2009; Stenstrom, Saad, Nepomuceno, & Mendenhall, 2011; Sylwester & Pawlowski, 2011). Furthermore, these biological determinants are also found in women. For instance, unrestricted women appear more masculine in body, behavior and mind (Campbell et al., 2009; Clark, 2004; Mikach & Bailey, 1999), while having higher testosterone levels (Edelstein, Chopik, & Kean, 2011; van Anders, Hamilton, & Watson, 2007). However, we do believe that cultural transmission affects which behaviors are considered suitable signaling behavior. Applied to this research, we believe that the positive perception of drinkers and drinking, and the more negative discourse about smoking partly explains why alcohol confirms our expectations more than using cigarettes.

Due to alterations in the brain chemistry, low levels of alcohol reduce stress, create a positive mood and make people less inhibited. Consequently, moderate drinkers are often more socially unrestricted and pleasant (Mitchell et al., 2012; National Institute on Alcohol Abuse and Alcoholism, 2010). In addition, moderate alcohol consumption is also often perceived as positive, due to studies indicating that occasional, moderate drinking can have positive effects on one’s health (Di Castelnuovo et al., 2006; Ellison, 2007; Gutjahr, Gmel, & Rehm, 2001; Koppes et al., 2005). Although recent research contradicts these health improving qualities of moderate alcohol consumption (Chikritzhs et al., 2015; Fekjær, 2013; Stockwell et al., 2016), the idea is still present among many consumers. Also, young adults are confronted with a large amount of advertisements, in which attractive people promote alcoholic beverages (Gunter, Hansen, & Touri, 2008; Snyder, Milici, Slater, Sun, & Strizhakova, 2006). Accordingly, drinking alcohol is widely accepted, with more than 90% of Flemish college and university students using alcohol (Lorant, Nicaise, Soto, & d’Hoore, 2013; Rosiers et al., 2014).
The discourse on smoking, on the other hand, is much more negative, as the dangers of cigarette use are stressed in many communications (e.g. in Belgium, every package of cigarettes contains a warning) and cigarette advertising is often no longer allowed. Additionally, although smoking briefly stimulates the smoker’s mind (National Institute on Drug Abuse, 2016), it does not have the same inhibiting effects as alcohol on the user’s behavior. Consequently, smoking is not always regarded in a positive manner (Chassin, Presson, Sherman, & Kim, 2003; Piko, Bak, & Gibbons, 2007), leading to ‘only’ 30% of the Flemish university and college students smoking cigarettes (Rosiers et al., 2014)

4.2. Future research and limitations

First of all, the first study did not take into account the smoking and drinking behavior of the participants. Consequently, in a future study, it would be relevant to find out if users and non-users perceive smokers and drinkers differently. Furthermore, the first study measured the perceived unhealthiness and riskiness of the behavioral profiles, yet did not explicitly focus on social riskiness. Also, the behavioral profiles of the first study described an active lifestyle. Future research could verify whether men’s perception of young women as a function of their smoking and drinking behavior differs when other characteristics are described. Moreover, we would also propose future studies to focus on the quantity of smoking and drinking behavior, next to the frequency. After all, the amount of alcohol and cigarettes used on one occasion could also have a high impact on people’s impression, especially when considering a short-term sexual relationship. In our second survey study, we only had a limited number of young women who abstained from drinking, or who choose to smoke. Although the lower amount of non-drinkers and smokers corresponds with recent studies (Lorant et al., 2013; Rosiers et al., 2014), and special care was given to the statistical assumptions, future studies should verify that the same results are present in larger samples.

Finally, the findings indicate that female smoking and drinking can operate as a short-term mating strategy. However, the studies in this paper are limited to exploring this hypothesis, showing that female smoking and drinking functions as a perceivable cue, affecting women’s attractiveness. Moreover, it also shows that women’s smoking and drinking behavior corresponds with this cue. However, more research is necessary to find out if this
link between cigarette/alcohol use and short-term mating is an actual signaling system, in which the cues are meant to indicate a short-term mating orientation (Donath, 2011). Corresponding with research on luxury consumption as a signaling system (Hudders, De Backer, Fisher, & Vyncke, 2014; Wang & Griskevicius, 2014), studies verifying if short-term mating motivations stimulate smoking and drinking behavior in women are necessary. In addition, more research is also necessary to clarify if smoking and drinking is a rather intentional than unintentional, rather implicit than explicit communicative signaling strategy. However, women’s smoking and drinking does not have to be conscious and deliberate for these behaviors to function as a sexually strategic signal.

4.3. CONCLUSION AND IMPLICATIONS

In conclusion, findings showed that smoking and (especially) drinking can operate as a short-term mating strategy, functioning as a mating cue and bringing attractiveness benefits in short-term mating contexts. As the traditional gender gap in youth smoking and drinking is closing, and given the harmfulness of both behaviors to women, these findings are of interest to social marketing professionals and institutions addressing youth cigarette and alcohol use. Not only do these findings give insight into less obvious female behavioral motivations. It also shows that emphasizing physical or social risks (for instance in social marketing campaigns) in order to prevent smoking and drinking, might not always have the desired effect. Even more, it may turn out to be contra productive.
5. REFERENCES


6. Appendix

Example of vignettes

Sophie likes to play tennis and follows weekly lessons. She especially enjoys playing a friendly game of tennis, but is less interested in winning. She also has a regular cooking evening with friends, in which they each take turns trying out a recipe. Sophie’s favorite food is pasta, and she likes trying out surprising combinations. Sophie does not drink alcohol. You will never see her taking a sip of an alcoholic beverage.

Sophie likes to play tennis and follows weekly lessons. She especially enjoys playing a friendly game of tennis, but is less interested in winning. She also has a regular cooking evening with friends, in which they each take turns trying out a recipe. Sophie’s favorite food is pasta, and she likes trying out surprising combinations. Occasionally, Sophie likes to drink alcohol.

Sophie likes to play tennis and follows weekly lessons. She especially enjoys playing a friendly game of tennis, but is less interested in winning. She also has a regular cooking evening with friends, in which they each take turns trying out a recipe. Sophie’s favorite food is pasta, and she likes trying out surprising combinations. Sophie drinks alcohol frequently. Both when he is alone or in company, she likes to drink alcoholic beverages.
CHAPTER 5

DRINKING HIGH AMOUNTS OF ALCOHOL AS A SHORT-TERM MATING STRATEGY.

THE IMPACT OF SHORT-TERM MATING MOTIVATIONS ON YOUNG ADULTS’ DRINKING BEHAVIOR.
Previous research indicates that drinking large quantities of alcohol could function as a short-term mating strategy for young adults in mating situations. However, no study investigated whether this is actually the case. Therefore, in this paper, the link between short-term mating motivations and drinking high amounts of alcohol is tested. First, a survey study (N = 345) confirmed that young adults who engage in binge drinking are more short-term oriented in their mating strategy than young adults who never engage in binge drinking. Also, the more short-term oriented young adults were in their mating strategy, the more often binge drinking behavior was conducted. In addition, an experimental study (N = 229) empirically verified that short-term mating motivations increase young adults’ drinking behavior, more so than long-term mating motivations. Results of the experiment clearly showed that young men and young women are triggered to drink more alcoholic beverages in a short-term mating situation, compared to a long-term mating situation. Furthermore, the mating situation also affected young adults’ perception of drinking behavior. Young adults in a short-term mating context perceived a higher amount of alcoholic beverages as heavy drinking compared to peers in a long-term mating context. These findings confirm that a high alcohol consumption functions as a short-term mating strategy for both young men and young women. Insights gained from this paper might be of interest to institutions aimed at targeting youth alcohol (ab)use.

1. INTRODUCTION

Drinking alcohol is harmful to one’s health. As drinking high amounts of alcohol causes intoxication, it impairs people’s physical coordination, consciousness, cognition, affect and behavior. Consequently, drinking high volumes of alcohol often leads to (severe) injuries, but also leads to sickness, alcohol poisoning or even coma (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2010; World Health Organization [WHO], 2014). Additionally, because of the toxic effects on organs and body tissues, repeated heavy alcohol use is linked to more than 200 diseases, depending on both the volume of alcohol consumed, as well as the drinking pattern (Rehm, Taylor, & Room, 2006; World Health Organization, 2014). Recent studies even show that the alleged health benefits of moderate alcohol consumption are nonexistent (Chikritzhs et al., 2015; Stockwell et al., 2016).

Despite these negative consequences, drinking alcohol (measured as lifetime alcohol use and past month alcohol use) is largely present among young adults (Center for Behavioral Health Statistics and Quality, 2015; Poelen, Scholte, Engels, Boomsma, & Willemsen, 2005; Rosiers et al., 2014). In addition, binge drinking (i.e. drinking high amounts of alcohol in a limited period of time) peaks during young adulthood (Center for Behavioral Health Statistics and Quality, 2015; Johnston, Bachman, & Schulenberg, 2012; Substance Abuse and Mental Health Services Administration, 2014). Corresponding with other risk-taking behavior (Nell, 2002), this might indicate that there are underlying motivations and benefits that surpass the risk for injuries and alcohol-related harm.

Research shows that there is a strong relationship between drinking alcohol and engaging in short-term sexual relations (e.g. Grello, Welsh, & Harper, 2006; Lindgren, Pantalone, Lewis, & George, 2009). In addition, recent studies suggest that the high prevalence of heavy alcohol consumption among young adults might be (partially) explained because risky drinking could function as a short-term mating strategy (Vincke, 2016a, 2016b). Accordingly, a high alcohol consumption might be engaged in by sexually
unrestricted young adults as a signal in mating situations. However, to date, no research investigated whether drinking high amounts of alcohol is actually used by young adults as a short-term mating strategy. Therefore, in this paper, two studies are conducted. The first study verifies that binge drinking is related to young adults’ level of sexual unrestrictedness. The second study empirically investigates if short-term mating motivations trigger young adults’ drinking behavior. The goal of this study is to contribute to the large area of research focusing on youngsters’ drinking motivations (e.g. Cooper, Frone, Russel, & Mudar, 1995; Cooper, 1994; Cooper et al., 2008; Diep, Tan, Knibbe, & Vries, 2016; Kuntsche et al., 2014; Kuntsche, Knibbe, Gmel, & Engels, 2006; Read, Wood, Kahler, Maddock, & Palfai, 2003; Wahesh, Lewis, Wyrick, & Ackerman, 2015; Wardell, Ramchandani, & Hendershot, 2016; White, Anderson, Ray, & Mun, 2016) by investigating if indeed drinking high amounts of alcohol functions as a short-term mating strategy for young adults.

1.1. HUMAN SEXUALITY AND RISKY COURTSHIP BEHAVIOR

Human sexuality ranges from an unrestricted short-term oriented mating strategy to a more restricted, long-term oriented sexuality (Geary, 2006; Simpson & Gangestad, 1991). Due to differences in minimum parental investment and fertility, women are generally more long-term oriented, whereas men often follow a more sexually unrestricted mating orientation (Buss & Schmitt, 1993; Trivers, 1972). However, depending on personal characteristics (e.g. attractiveness) and environmental characteristics (e.g. level of uncertainty), other mating strategies can be beneficial for both men and women (Buss & Schmitt, 1993; Gangestad & Simpson, 2000).

Men and women also search for different traits in short-term and long-term mating partners. Accordingly, both sexes engage in conspicuous signaling behavior to demonstrate qualities, depending on the other sex’ mating preferences and the sexual strategy that is being followed (Geary, 2006; Saad, 2013). Research shows that this includes risk-taking behavior. For instance, when searching for a short-term mating partner, high quality genes
are a priority for women (Buss & Schmitt, 1993; Li, Bailey, Kenrick, & Linsenmeier, 2002; Li & Kenrick, 2006). Corresponding with this mating preference, physical risk-taking (e.g. in traffic, skateboarding, etc.) increases in the presence of women and even mere female cues (e.g. pictures of women) (Frankenhuis, Dotsch, Karremans, & Wigboldus, 2010; Greitemeyer, Kastenmüller, & Fischer, 2013; Pawlowski, Atwal, & Dunbar, 2008; Ronay & Hippel, 2010). In addition, physical risk-taking also enhances male desirability, especially when it concerns short-term mating (Bassett & Moss, 2004; Kelly & Dunbar, 2001; Sylwester & Pawłowski, 2011). For long-term mating, risk avoiders are found more attractive (Bassett & Moss, 2004; Sylwester & Pawłowski, 2011; Wilke, Hutchinson, Todd, & Kruger, 2006), except when the risky behavior is more moderate. Indeed, moderate risk-taking allows the displaying of qualities without potential negative outcomes for the partner and family (Farthing, 2007).

As women are generally more long-term oriented in their sexuality, they are often demanding of a long courtship before consenting to sex. However, sexually unrestricted men benefit from small mating efforts (Buss, 2007). Therefore, men following a short-term mating strategy search for cues indicating sexual willingness and rapid sexual consent (Buss & Schmitt, 1993; Regan, Levin, Sprecher, Christopher, & Cate, 2000). Research suggests that women with a short-term oriented mating strategy use signaling strategies analogous to men – such as engaging in risky behavior - to indicate that they are also more masculine and (therefore) more unrestricted in their sexuality (Sylwester & Pawłowski, 2011). Corresponding with this line of reasoning, studies show that sexually unrestricted women are indeed perceived to be more masculine (Campbell et al., 2009; Clark, 2004; Mikach & Bailey, 1999; Scarbrough & Johnston, 2005). Moreover, also in women, high risk-taking is considered more attractive in short-term mating contexts than being a risk avoider (Bassett & Moss, 2004; Sylwester & Pawłowski, 2011), especially when it concerns physical and social risk takers (Sylwester & Pawłowski, 2011). For long-term mating, risk avoiders are preferred, except when the physical risk contains altruistic motives (Farthing, 2005).
1.2. **Alcohol Use as Courtship Behavior**

Given the physical risks inherent to drinking large amounts of alcohol, drinking behavior could be used by young adults to signal desirable traits to the opposite sex, especially in short-term mating situations. Several studies indicate that this is the case for both young men and young women.

According to a large amount of studies, there is a strong link between consuming alcohol and engaging in casual sexual behavior (Cooper, 2002, 2006; Grello et al., 2006; Lindgren et al., 2009; Paul, McManus, & Hayes, 2000; Turchik, Garske, Probst, & Irvin, 2010). In addition, research shows a strong correlation between drinking alcohol and having a short-term oriented mating strategy, both when looking at drinking frequency and average drinking behavior (Vincke, 2016a, 2016b). Also studies on drinking games confirm that a higher alcohol consumption is linked to being more sexually unrestricted, in both young men and young women (Hone & McCullough, 2015; Hone et al., 2013).

Similarly, research indicates that young men and young women who are actively dating drink more alcohol, both weekly as on social occasions, compared to young adults who are in a steady relationship or not dating at all (Devos-Comby, Daniel, & Lange, 2013; Pedersen, Lee, Larimer, & Neighbors, 2009). Also, when wanting to make an attractive impression in social situations, both sexes drink more alcoholic beverages (O’Grady, Harman, Gleason, & Wilson, 2012). According to some studies, young adults even report having sexual motivations to drink alcohol in the company of others (Lindgren et al., 2009) and to play drinking games (Johnson & Sheets, 2004).

In addition, research on the attractiveness of alcohol drinkers shows that pictures of youngsters who have consumed a moderate amount of alcohol are considered more attractive than when the person in the picture is completely sober (Van Den Abbeele, Penton-Voak, Attwood, Stephen, & Munafo, 2015). As this study of Van Den Abbeele et al. (2015) only assesses the general attractiveness, without making a distinction between
short-term and long-term desirability, the attractiveness benefit is no longer present when having consumed a high dose of alcohol (Van Den Abbeele et al., 2015). Similarly, a person reporting using alcohol in a risky manner is not considered attractive as a potential long-term partner (Farthing, 2005). However, research differentiating between young adults’ short-term and long-term attractiveness shows that heavy drinking behavior does bring attractiveness benefits to young men and women in short-term mating contexts, while clearly harming a young adult’s long-term desirability (Vincke, 2016a; Vincke, 2016b). This confirms the literature on risk-taking, showing that high risk-taking is attractive only in short-term mating contexts, whereas moderate risk-taking is also considered desirable in a long-term mating partner (Bassett & Moss, 2004; Farthing, 2005, 2007; Sylwester & Pawłowski, 2011).

Finally, studies show that alcohol consumption serves as a short-term mating cue. Both men and women who drink alcohol are perceived as being more sexually available and interested in sexual encounters compared to peers who do not drink (Abbey, 2002; Koukounas, Djokic, & Miller, 2014). Moreover, young adults who engage in frequent drinking behavior are perceived as having a more unrestricted sexuality compared to occasional drinkers and abstainers, due to a higher perceived riskiness (Vincke, 2016a; 2016b).

Based on the above research, recent studies suggest that risky drinking behavior could function as a short-term mating strategy for young adults (Vincke, 2016a, 2016b). Accordingly, in actual mating situations, young adults following a short-term mating strategy might drink high amounts of alcohol as a signal to the opposite sex. However, to date, no research investigated if a high alcohol consumption is actually used by young adult as a mating strategy in short-term mating contexts.
1.3. **Current research**

Previous research showed a clear link between drinking alcohol and having an unrestricted sexuality (Vincke, 2016a, 2016b). However, studies focusing on heavy episodic drinking behavior and mating strategies are limited to drinking games contexts (Hone & McCullough, 2015; Hone et al., 2013). Therefore, as an additional verification of the link between drinking high amounts of alcohol on an occasion and a short-term mating orientation, an online survey was conducted on binge drinking behavior. In this survey, we expect binge drinkers to be more short-term oriented in their mating strategy compared to peers who do not engage in binge drinking behavior (hypothesis 1). In addition, we also predict that the more short-term oriented binge drinkers are in their mating orientation, the more they engage in binge drinking behavior. Accordingly, a positive correlation is expected between binge drinkers’ level of sexual unrestrictedness and the amount of binge drinking behavior (hypothesis 2).

A second study empirically investigated if short-term mating motivations trigger young adults’ alcohol consumption. More specifically, based on both risk-taking and alcohol consumption literature, we hypothesize that young men and young women will be willing to consume more alcoholic beverages in a short-term mating context than a long-term mating context (Hypothesis 3). Also, facilitating the consumption of high amounts of alcohol, we expect that a short-term mating motivation will affect young men and women’s perception of heavy drinking behavior. A higher amount of alcoholic beverages will be perceived as heavy in a short-term mating situation, compared to a long-term mating situation (Hypothesis 4). Finally, we hypothesize that both the self-reported consumption of alcoholic beverages, as well as the perception of heavy drinking will be positively mediated by the extent to which young adults are motivated to pursue a short-term mating relationship (hypothesis 5). The more young men and women are interested in casual sexual encounters, the more a short-term mating situation will increase young adults’ willingness
to drink and their heavy drinking perception. To verify these hypotheses, two studies were conducted.

2. Study 1: The Sexual Unrestrictedness of Binge Drinkers

2.1. Design

Previous survey studies (Vincke, 2016a, 2016b) already measured the link between young adults’ mating orientation and their general drinking behavior. To confirm that consuming large quantities of alcohol on a specific occasion is also related to having a short-term mating orientation in both young men and women, a survey study on binge drinking behavior was conducted.

2.2. Respondents

A total of 345 young adults between the age of 18 and 26 completed the questionnaire, with a mean age of 21.26 years (SD = 1.85). Of this sample, 45.5% were male and 54.5% female. Twenty-two percent of the respondents (n = 77) reported to occasionally engage in binge drinking behavior. More specifically, both men (n = 41) and women (n = 36) indicated engaging in binge drinking three to five times in the past 30 days. However, on average, men reported binge drinking one or two times a week, whereas women’s binge drinking behavior was limited to two or three times a month. All 77 binge drinkers in the sample indicated having a heterosexual orientation. In Belgium, alcohol can be legally sold to youngsters from 16 years on. Only when selling liquor, the age limit rises to 18 years (www.health.belgium.be), making all participants legal alcohol consumers.
2.3. **Measures**

The questionnaire started with a short introduction, explaining that the following definition applied to the questions regarding binge drinking (‘By binge drinking we mean drinking high amounts of alcohol in a short period of time. Drinking five or more alcoholic drinks in two hours’ time is considered binge drinking behavior’). Subsequently, respondents were asked if they occasionally engaged in binge drinking behavior. Those who indicated engaging in the excessive drinking behavior were asked about the frequency of their binge drinking (‘Think back to the last 30 days. On how many days have you engaged in binge drinking behavior?’). Answers were given on a 7-point scale with fixed categories, ranging from ‘not a single day’ to ‘all days’. A following question assessed the average binge drinking behavior (‘How often do you engage in binge drinking behavior’). A scale with 9 categories was presented (Less than 1 day per year, 1 to 5 days per year, 6 to 11 days per year, 1 day per month, 2 to 3 days per month, 1 or 2 days per week, 3 or 4 days per week, almost every day, daily).

To assess respondents’ mating orientation, respondents filled in the revised Sociosexual Orientation Inventory scale (SOI-R; Penke & Asendorpf, 2008) containing nine questions: three questions focused on a person’s attitude towards unrestricted sex (e.g. I can imagine myself being comfortable and enjoying “casual” sex with different partners.), the three following questions addressed a person’s sexual desire (e.g. How often do you experience sexual arousal when you are in contact with someone with whom you do not have a committed romantic relationship?), whereas the three final questions focused on past behavioral experiences (e.g. With how many different partners have you had sexual intercourse on one and only one occasion?). A higher score on the SOI-R indicated a higher level of sexual unrestrictedness. Young adults’ level of sexual unrestrictedness was also measured by means of the Short-Term Mating Orientation scale (STMO) and Long-Term Mating Orientation scale (LTMO) (Jackson & Kirkpatrick, 2007). The STMO consists of 10 statements (e.g. I can imagine myself enjoying a brief sexual encounter with someone I find...
very attractive.), whereas the LTMO contains seven statements (e.g. I would like to have a romantic relationship that lasts forever.). All statements were measured on a 7-point scale ranging from 1 (I completely disagree) to 7 (I completely agree). All scales had a high internal consistency ($\alpha_{SOI-R} = .85; \alpha_{STMO} = .90; \alpha_{LTMO} = .78$).

2.4. Results

2.4.1. The Mating Orientation of Binge Drinkers

To verify whether young men and young women who drink high amounts of alcohol are more unrestricted in their sexuality compared to those peers who do not engage in binge drinking, three two-way, full factorial, univariate ANOVAs were conducted (i.e. for all three scales). SOI-R, STMO and LTMO served as dependent variables, whereas being a binge drinker or not and the participants’ sex functioned as the independent variables.

Results showed a significant main effect of sex of the participants for both the SOI-R ($F(1,341) = 42.31, p < .001, \eta^2_p = .110$), STMO ($F(1,341) = 38.83, p < .001, \eta^2_p = .102$) and LTMO ($F(1,341) = 11.79, p = .001, \eta^2_p = .033$). On all three scales, men indicated being more sexually unrestricted than women. More specifically, men ($M = 4.04, SD = 1.25$) scored higher on the SOI-R than women ($M = 2.99, SD = 1.15$) and men ($M = 4.20, SD = 1.16$) scored higher on the STMO than women ($M = 3.22, SD = 1.21$). Women ($M = 4.45, SD = 0.59$), on the other hand, had a higher score on the LTMO compared to men ($M = 4.24, SD = 0.61$).

In addition, results also showed significant main effects of being a binge drinker on both the SOI-R ($F(1,341) = 17.27, p < .001, \eta^2_p = .048$) and the STMO ($F(1,341) = 10.89, p = .001, \eta^2_p = .031$), with a slightly nonsignificant main effect for LTMO ($F(1,341) = 3.67, p = .056, \eta^2_p = .011$). As expected, results showed that binge drinkers ($M = 4.03, SD = 1.35$) scored significantly higher on the SOI-R compared to peers who do not engage in heavy episodic drinking ($M = 3.31, SD = 1.24$). Similarly, binge drinkers ($M = 4.13, SD = 1.16$) had higher short-term oriented mating tendencies on the STMO scale than peers who do not
drink heavily ($M = 3.53, SD = 1.28$). Finally, binge drinkers ($M = 4.22, SD = 0.56$) indicated being slightly less long-term oriented in their sexuality than non-binge drinkers ($M = 4.39, SD = 0.61$) on the LTMO. No significant interaction effects between binge drinking and the sex of the participants were present for all three mating orientation scales ($F_{SOI-R}(1, 341) = 0.02, p = .885, \eta^2_p < .001; F_{STMO}(1,341) = 0.00, p = .961, \eta^2_p < .001; F_{LTMO}(1,341) = 2.67, p = .103, \eta^2_p = .008$).

### 2.4.2. The correlation between binge drinking behavior and the level of sexual unrestrictedness

In addition, one-tailed correlations between binge drinking behavior (both the frequency and the average binge drinking behavior) and the respondents’ level of sexual unrestrictedness were conducted. Given the ordinal nature of the binge drinking scales, spearman correlations were used. Results are interpreted, based on both significance level ($p$-value) and whether the 95% confidence intervals exclude zero (Field, 2013).

Results (see Table 1) showed clear positive correlations between average binge drinking and binge drinking frequency and SOI-R. Similar positive correlations were found for the binge drinking measures and the STMO. No significant correlations were present for the LTMO. Subsequently, a split file was conducted on sex of the participants (see Table 1). For men, spearman correlations showed a clear positive correlation between the binge drinking measures (both average binge drinking and binge drinking frequency) and SOI-R, yet no significant correlations with STMO or LTMO. For young women, on the other hand, a significant positive correlation was present between the two binge drinking measures and STMO, but not for SOI-R. Also a significant positive correlation was present between LTMO and binge drinking frequency, but the 95% confidence interval included zero. Accordingly, a higher level of sexual unrestrictedness is linked to more binge drinking behavior among young adults. This positive correlation is present via the SOI-R in men, and via the STMO in women, both when looking at binge drinking frequency and average binge drinking.
Table 1: The correlation between binge drinking and the level of sexual unrestrictedness

<table>
<thead>
<tr>
<th></th>
<th>Average binge drinking</th>
<th>Binge drinking frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$r_s$  df  p  95% CI</td>
<td>$r_s$  df  p  95% CI</td>
</tr>
<tr>
<td><strong>All participants</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOI-R</td>
<td>.38  77  &lt; .001 [.179, .549]</td>
<td>.35  77  .001 [.131, .538]</td>
</tr>
<tr>
<td>STMO</td>
<td>.33  77  .002 [.109, .532]</td>
<td>.30  77  .005 [.073, .505]</td>
</tr>
<tr>
<td>LTMO</td>
<td>-.14 77  .119 [-.347, .089]</td>
<td>-.12 77  .151 [-.329, .106]</td>
</tr>
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</table>

| **Male participants**|                        |                          |
| SOI-R               | .32  41  .021 [.005, .569] | .31  41  .023 [.011, .585] |
| STMO                | .16  41  .160 [-.143, .450] | .16  41  .152 [-.153, .466] |
| LTMO                | -.17 41  .147 [-.484, .149] | -.22 41  .083 [-.468, .069] |

| **Female participants**|                        |                          |
| SOI-R               | .24  36  .084 [-.111, .560] | .17  36  .168 [-.214, .526] |
| STMO                | .36  36  .015 [.029, .652]  | .33  36  .026 [.014, .597]  |
| LTMO                | .19  36  .131 [-.166, .502] | .33  36  .025 [-.030, .628] |

As the average binge drinking scale (cf. measures) consists of nine categories with different timeframes, additional analyses were conducted to verify that the different timeframes caused no bias in the correlation analyses. First, the average drinking scale was rescaled to represent days drinking per month as timeframe. Accordingly, 1 (less than 1 day per year) became 0.08333 (1/12 months), 2 (1 to 5 days per year) became 0.25 (3/12 months), 3 (6 to 11 days per year) became 0.70833 (8.5/12 months), 4 (1 day per month) remained 1, 5 (2 to 3 days per month) became 2.5, 6 (1 or 2 days per week) stayed 6 (1.5 * 4 weeks), 7 (3 or 4 days per week) became 14 (3.5 * 4 weeks), 8 (almost every day) became 22.5 (0.75 * 30 days) and 9 (daily) became 30.

Next, Pearson correlation analyses were conducted on the complete sample. Results confirmed the Spearman correlations, showing positive correlations between average binge drinking and SOI-R ($r(77) = .33, p = .002, 95\% CI [.133, .506]$) and STMO ($r(77) = .29, p = .005, 95\% CI [.108, .457]$). The correlation with LTMO was nonsignificant ($r(77) = -.11, p =
A split file on sex of the participants showed no differences between the two sexes: for young men, there were no significant correlations between average binge drinking and SOI-R \( r(41) = .26, p = .051, 95\% \text{ CI } [-.018, .537] \), STMO \( r(41) = .17, p = .140, 95\% \text{ CI } [-.066, .398] \) or LTMO \( r(41) = -.043, p = .396, 95\% \text{ CI } [-.340, .248] \). Also for young women, there were no correlations between average binge drinking and SOI-R \( r(36) = .22, p = .100, 95\% \text{ CI } [-.109, .532] \), STMO \( r(36) = .23, p = .087, 95\% \text{ CI } [-.080, .538] \) and LTMO \( r(36) = .17, p = .161, 95\% \text{ CI } [-.246, .537] \).

2.5. DISCUSSION

In this survey, we confirmed the relation between drinking high amounts of alcohol and having a short-term mating orientation. As expected, binge drinkers were sexually more unrestricted compared to peers who did not engage in drinking large quantities of alcohol in a single session. Additionally, in both young men and young women, the level of sexual unrestrictedness rose as the amount of binge drinking increased, and vice versa. This was especially the case when looking at binge drinking frequency. However, verifying the link between drinking high amounts of alcohol and young adults’ sexual strategy does not suffice to state that this behavior functions as a short-term mating strategy. Therefore, a second study empirically investigated if short-term mating motivations increase young adults’ drinking behavior.

3. STUDY 2: THE IMPACT OF SHORT-TERM MATING ON YOUNG ADULTS’ DRINKING BEHAVIOR

3.1. DESIGN AND PARTICIPANTS

A 2 (sex) x 2 (short-term mating prime, long-term mating prime) between-subjects design was used to verify the impact of mating motivations on young adults’ alcohol consumption. To activate a specific motivation, a guided visualization task was used,
combining priming scenario’s with empathy questions. Using priming to activate short-term and long-term mating motivations is based on both risk-taking and conspicuous consumption literature (Greitemeyer et al., 2013; Sundie et al., 2011). A visualization task was chosen as priming technique because it has proven useful in manipulating emotions and motivations in previous similar research (Maner, Gailliot, Rouby, & Miller, 2007; Wang & Griskevicius, 2014). Young adults who drink alcohol were contacted to take part in the online experiment. Given the heterosexual perspective in the mating scenario’s, participants with a homosexual orientation were not taken into account, as well as respondents with largely incomplete questionnaires. Also participants who did not complete the visualization task were removed from the dataset, as well as nondrinkers. No subjects were excluded based on the manipulation check. As a consequence, our final sample consisted of 229 young adults between the age of 18 and 27 years old (M = 21.18, SD = 1.49), of which 32.3% were male (n = 74) and 67.7% (n = 155) female. In Belgium, the legal drinking age is 18 for spirits, and 16 for all other alcohol (www.health.belgium.be).

3.2. MATERIALS

3.2.1. PRIMING METHODOLOGY

Participants were randomly assigned to one of the two between-subject conditions: (1) short-term mating (2) long-term mating. In each condition, participants were asked to read a short priming story of circa 300 words. Each story consisted of four parts, in which the respondent read a brief description about a situation, followed by a question asking to write down (briefly) how they would envision the situation. More specifically, a first question asked the participants to describe the attractive opposite-sex person in the story. Participants were instructed to keep that person in mind when reading the rest of the story. The following questions assessed how the participants would feel in that specific situation.

Participants in the short-term mating condition read a story in which they were single, yet only interested in casual relationships. Then, on a Friday evening, the main
character makes eye contact with a beautiful man/woman in a bar. He/she tells you that he/she is traveling through Europe. The main character hopes that something more will happen that night. The long-term mating condition tells a similar story, but here the participants were instructed to envision that they were single and searching for a committed relationship. On a Friday evening, they recognize an attractive man/woman at the bar they know from the past, and for whom they used to have romantic feelings. The main character addresses him/her and they start talking. The main character feels that they really understand each other, and wants to spend more time together. To ensure that the priming scenarios elicited the right motivations and feelings, two pretest studies were conducted.

3.2.2. Manipulation pretest 1

Pretest 1 explored whether a sexual strategy prime can alter young adults’ sociosexual orientation, using a 2 (sex; between-subject) x 2 (test session; control vs experimental; within-subject) x 2 (short-term mating prime vs long-term mating prime; between-subject) mixed-subjects experimental design. Forty-five young adults between the age of 20 and 27 (M = 22.11, SD = 1.17, 38% male, 62% female) took part in the experiment. Each participant completed two testing sessions. In the first testing session, participants were asked to fill in the STMO and LTMO scale (Jackson & Kirkpatrick, 2007). In the second, experimental session, the same participants were asked to read one of the two priming scenarios (short-term mating or long-term mating), followed by the STMO and LTMO. The second session took place one day after the first session. STMO and LTMO were measured on a 9-point Likert scale ranging from 1 (I completely disagree) to 9 (I completely agree). The STMO and LTMO had sufficient internal consistency in both testing sessions (αSTMO1 = .87, αLTMO1 = .80, αSTMO2 = .90, αLTMO2 = .94). Both testing sessions were filled in on a paper questionnaire.

To investigate if young adults’ level of sexual unrestrictedness rose in the short-term mating prime condition, a two-way mixed Analysis of Variance (mixed ANOVA) was
conducted. STMO1 (first session) and STMO2 (second session) were used as the variables of the within-subjects factor ‘STMO’, with priming version as between-subjects factor. Results showed a significant interaction between STMO and priming version ($F(1, 43) = 5.81, p = .020, \eta_p^2 = .119$). When reading the short-term mating prime, participants scored higher on the STMO2 ($M = 5.03, SD = 1.64$) than the STMO1 ($M = 4.61, SD = 1.23; p = .050$). In the long-term mating prime condition, there were no significant differences between STMO1 ($M = 4.36, SD = 1.50$) and STMO2 ($M = 4.10, SD = 1.64; p = .178$).

Additionally, a second two-way mixed ANOVA was conducted to investigate if mating primes affected young adults’ long-term mating orientation. LTMO1 and LTMO2 were used as the within-subjects factor ‘LTMO’, with priming version as between-subjects factor. Results found no significant interaction between LTMO and priming version ($F(1, 43) = 1.16, p = .288, \eta_p^2 = .026$). Yet, pairwise comparisons did show that participants who read a long-term mating prime scored higher on LTMO2 ($M = 7.83, SD = 1.00$) than LTMO1 ($M = 7.40, SD = 1.51; p = .010$). No such differences were found between LTMO1 ($M = 7.56, SD = 1.29$) and LTMO2 ($M = 7.73, SD = 0.87; p = .306$) in the short-term mating prime condition.

### 3.2.3. Manipulations pretest 2

A second online manipulation pretest was conducted, using a different sample. Here also, a 2 (sex; between-subject) x 2 (test session; control vs experimental; within-subject) x 2 (short-term mating prime vs long-term mating prime; between-subject) mixed-subjects experimental design was used. In total, 123 young adults between 18 and 27 years old ($M = 21.35, SD = 1.33$) took part, of which 21% male and 79% female.

When starting the online experiment, each participant was asked to fill in their sex, age and relationship status (in a relationship or single). Next, a short scale measured participants’ sociosexual orientation, using the attitudinal items of the Revised Sociosexual Orientation Inventory (Penke & Asendorpf, 2008). Young adults were asked to indicate their level of sexual unrestrictedness on three questions (e.g. *Sex without love is OK.*), followed
by a 7-point Likert scale ranging from 1 (I completely disagree) to 7 (I completely agree). A higher score indicated a higher level of sexual unrestrictedness. Subsequently, participants read one of the two primes, either the short-term mating prime or long-term mating prime, with visualization questions.

To ensure that the visualization task elicited the right feelings, participants were asked to indicate which emotions they felt after reading the scenario. A list of seven emotions was presented: (1) sexual arousal, (2) sexual desire, (3) romantic feelings, (4) amorousness, (5) enthusiasm, (6) guilt, (7) confusion. Guilt and confusion were added to the list of emotions to verify whether a mating prime does not lead to negative emotions when conflicting with the own mating strategy. Additionally, a second question assessed to what extent the scenario elicited the following motivations: (8) making an attractive impression, (9) pursuing a short-term relationship, affaire or one-night stand with someone you are interested in, (10) pursuing a romantic, long-term relationship with someone you are interested in, (11) enjoying yourself, having fun. The order of the emotions and motivations was randomized. Answers were given on a 5-point Likert scale ranging from 1 (Not at all) to 5 (Very much). Subsequently, participants were asked to fill in the SOI-R for the second time. Both the scales had sufficient internal consistency ($\alpha_{SOI-R1} = .70$, $\alpha_{SOI-R2} = .76$).

To investigate if the mating prime affected the participants’ level of sexual unrestrictedness, a two-way mixed ANOVA was conducted. SOI-R1 (testing session) and SOI-R2 (experimental session) formed the within-subjects factor ‘SOI-R’, priming version was the between-subjects factor. Results showed a significant interaction between SOI-R and priming version ($F(1, 121) = 5.96, p = .016, \eta_p^2 = .047$). Pairwise comparisons indicated that young adults’ level of sexual unrestrictedness rose significantly between the testing session ($M = 3.99, SD = 1.37$) and experimental session ($M = 4.33, SD = 1.36$) when reading a short-term mating prime ($p < .001$). There was no significant difference in young adults’ sexual orientation when reading a long-term mating prime ($M_{SOI-R1} = 4.28, SD_{SOI-R1} = 1.50$; $M_{SOI-R2} = 4.32, SD_{SOI-R1} = 1.48; p = .62$). Additional three-way mixed ANOVAs also confirmed
that nor the sex of the participants ($F(1, 119) = 0.02, p = .902, \eta^2_p < .001$) nor their relationship status ($F(1, 119) = 2.04, p = .156, \eta^2_p = .017$) affected the impact of the priming scenarios on their sociosexual orientation.

In addition, a two-way mixed ANOVA with all seven emotions as within-subjects variables was conducted. Priming version functioned as between-subjects factor. Results showed a significant interaction effect between the emotions and the priming version ($F(3.51, 425) = 6.02, p < .001, \eta^2_p = .047$). As the assumption of sphericity was violated ($p < .001$), the Greenhouse-Geisser correction was used ($\varepsilon_{\text{Greenhouse-Geisser}} = .59$). Pairwise comparisons (see Table 2) further clarified that sexual arousal was significantly higher in the short-term mating condition ($p = .004$), whereas amorrousness was higher in the long-term mating condition ($p = .020$). Romantic feelings were also slightly higher when reading a long-term mating prime ($p = .093$). As intended, the level of desire ($p = .631$) and enthusiasm ($p = .856$) did not differ significantly between the two priming conditions. Also, the priming conditions did not significantly differ in the extent to which participants felt confused ($p = .435$). Young adults did feel significantly more guilty in a short-term mating condition than a long-term mating condition ($p = .020$). However, both scores remained relatively low. Even more, guilt was the emotion the least present in both conditions. There were also no significant three-way interactions with sex ($F(3.48, 414.47) = 0.76, p = .535, \eta^2_p = .006$; Greenhouse-Geisser correction) or relationship status ($F(3.48, 414) = 0.42, p = .767, \eta^2_p = .004$; Greenhouse-Geisser correction). Accordingly, the elicited emotions in the two mating contexts did not differ between young men and young women. Moreover, also relationship status did not affect the extent to which emotions were aroused in the two mating conditions, even in the case of guilt and confusion.

Similarly, a two-way mixed ANOVA with all four motivations as within-subjects factor and priming version as between-subjects factor was conducted. Results indicated a significant interaction effect between the motivations and priming version, using the Huynh-Feldt correction ($\varepsilon_{\text{Greenhouse-Geisser}} = .79$), $F(2.42, 293.25) = 6.96, p < .001, \eta^2_p = .054$. 242
Pairwise comparisons of the interaction effect (see Table 2) showed that there were no significant differences between the two mating conditions in the extent to which participants wanted to make an attractive impression ($p = .846$), felt like having fun ($p = .766$) or wanted to pursue a long-term relationship ($p = .118$). Participants in the short-term mating condition were significantly more motivated to pursue a short-term relationship ($p = .001$). Here also, there was no significant interaction with sex ($F(2.46, 292.14) = 0.72, p = .513, \eta^2_p = .006$; Huynh-Feldt correction) or relationship status ($F(2.37, 281.57) = 0.04, p = .973, \eta^2_p < .001$; Huynh-Feldt correction). Based on the two manipulation pretests, we decided to use the two mating scenario’s in the visualization task, to elicit short-term and long-term mating motivations.

### Table 2: Elicited emotions and motivations depending on the mating condition

<table>
<thead>
<tr>
<th></th>
<th>Short-term Mating</th>
<th>Long-term Mating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M(SD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual arousal</td>
<td>3.56 (0.97)</td>
<td>3.06 (0.89)</td>
</tr>
<tr>
<td>Desire</td>
<td>3.75 (0.92)</td>
<td>3.67 (0.78)</td>
</tr>
<tr>
<td>Romantic feelings</td>
<td>3.07 (0.83)</td>
<td>3.33 (0.87)</td>
</tr>
<tr>
<td>Amorousness</td>
<td>2.68 (0.88)</td>
<td>3.19 (0.91)</td>
</tr>
<tr>
<td>Enthusiasm</td>
<td>3.95 (0.80)</td>
<td>3.92 (0.86)</td>
</tr>
<tr>
<td>Guilt</td>
<td>2.03 (0.99)</td>
<td>1.64 (0.84)</td>
</tr>
<tr>
<td>Confusion</td>
<td>2.78 (1.16)</td>
<td>2.63 (1.03)</td>
</tr>
<tr>
<td>Making an attractive impression</td>
<td>4.00 (0.81)</td>
<td>3.97 (0.96)</td>
</tr>
<tr>
<td>Pursuit of a short-term relationship</td>
<td>2.71 (1.15)</td>
<td>2.08 (0.93)</td>
</tr>
<tr>
<td>Pursuit of a long-term relationship</td>
<td>3.25 (1.15)</td>
<td>3.58 (1.12)</td>
</tr>
<tr>
<td>Enjoying yourself, having fun</td>
<td>4.08 (0.68)</td>
<td>4.13 (0.81)</td>
</tr>
</tbody>
</table>
3.2.4. Alcohol measures

To assess the drinking behavior of young adults in short-term and long-term mating situations, participants were instructed to imagine spending the evening in the bar, as described in the priming scenario. Subsequently, they were asked to indicate the maximum amount of alcoholic drinks that they would drink in a period of two hours’ time. A second series of questions assessed respondents’ perceptions concerning drinking behavior. More specifically, it was asked which amount of alcoholic drinks they considered as heavy drinking, in a period of two hours. For both men and women separately, participants were instructed to fill in a number between zero and 20 for three categories (beer, wine and spirits). For both men ($\alpha = .87$) and women ($\alpha = .89$), an index variable computed a mean score of perceived heavy drinking of the three variables.

3.2.5. Sexual strategy

To measure participants’ mating orientation, the three attitudinal items of the Revised Sociosexual Orientation Inventory were used (cf. Manipulations pretest 2, $\alpha = .73$).

3.2.6. Manipulation check

To ensure that the priming scenario’s elicited the right motivations in the actual experiment, the second question from pretest 2 was reused as manipulation check. This question assessed to what extent the scenario elicited the following motivations: (a) making an attractive impression, (b) pursuing a short-term relationship, affaire or one-night stand with someone you are interested in, (c) pursuing a romantic, long-term relationship with someone you are interested in, (d) enjoying yourself, having fun. Answers were given on a 5-point Likert scale ranging from 1 (Not at all) to 5 (Very much).
3.3. **PROCEDURE**

Participants agreeing to take part in the experiment were randomly assigned to one of the two priming conditions. First, participants were asked about their sex, age, sexual orientation and whether they drank alcohol. This was followed by the SOI-R. Subsequently, participants read the priming scenario with visualization questions, and filled in the manipulation check, followed by the measures of alcohol consumption.

3.4. **RESULTS**

3.4.1. **MANIPULATION CHECK**

To verify the functioning of the priming scenarios in the experiment, a three-way mixed ANOVA was conducted. Sex and priming version functioned as the between-subjects factor, the four motivations as within-subjects factor. Results showed a significant interaction effect between priming version and the motivations \( (F(2.61, 588.16) = 21.06, p < .001, \eta^2_p = .086) \). The three-way interaction with priming version and sex was slightly nonsignificant \( (F(2.61, 588.16) = 2.33, p = .082, \eta^2_p = .010) \). As the assumption of sphericity was violated \( (p < .001; \epsilon_{\text{Greenhouse-Geisser}} = .85) \), a Huynh-Feldt correction was used.

Pairwise comparisons (see Figure 1) indicated that the participants in the two mating conditions did not differ in their motivation to make an attractive impression \( (p = .178) \) or their motivation to have fun \( (p = .351) \). However, young adults were more motivated to pursue a short-term relationship in the short-term mating condition \( (p < .001) \), and more motivated to pursue a romantic relationship in the long-term mating condition \( (p = .003) \).
3.4.2. The impact of short-term mating on the amount of alcoholic drinks

To verify whether short-term mating intentions increase the amount of alcoholic beverages that male and female young adults want to consume, a three-way interaction moderation analysis was conducted, using model 3 of the PROCESS procedure of Hayes (Hayes, 2013; http://www.afhayes.com). A three-way interaction was chosen to include the sociosexual orientation (measured by SOI-R-) of the participants as a moderating variable in the analyses, next to sex. Maximum amount of alcoholic beverages consumed functioned as the outcome variable Y, priming version as the independent variable X. Both sex of the participants (M) and their sociosexual orientation (W) served as moderating variables. Results found no significant three-way interaction between priming version, sex and SOI-R (B = -.31 ,SE = .69, t(220) = -.45, p = .66) on the maximum amount of alcoholic beverages consumed.

Figure 1: Elicited motivations depending on the mating condition
As the two-way interactions of moderation analyses are conditional, a two-way univariate ANOVA was used for follow-up, with priming version and sex of the participant as between-subjects factor. Results showed a significant main effect of priming version on the amount of alcoholic drinks ($F(1, 225) = 7.54, p = .007, \eta_p^2 = .032$), but no significant priming x sex interaction ($F(1,225) = 0.05, p = .830, \eta_p^2 < .001$). Accordingly, both young men and women intended to drink a higher amount of alcoholic beverages in the short-term mating condition ($M = 4.14, SD = 2.38$) than in the long-term mating condition ($M = 3.29, SD = 1.79$).

### 3.4.3. The Impact of Short-term Mating on the Perception of Heavy Drinking

Statistical analyses were similar to hypothesis 3, with perceived heavy drinking as independent variable in both the three-way interaction (model 3, PROCESS) and the two-way univariate ANOVA. Separate analyses were performed for perceived heavy drinking in women, and perceived heavy drinking in men.

Results showed no significant three-way interaction between priming version, sex and SOI-R for both perceived heavy drinking in women ($B = -.25, SE = .45, t(220) = -.55, p = .580$) and in men ($B = -.13, SE = .68, t(220) = -.19, p = .853$). Follow-up two-way univariate ANOVAs also showed no significant interaction between priming version and sex of the participants ($F_{Female\ drinking}(1, 225) = 1.61, p = .206, \eta_p^2 = .007; F_{Male\ drinking}(1, 225) = 0.03, p = .854, \eta_p^2 < .001$). A significant main effect, on the other hand, was present for male drinking ($F(1, 225) = 3.95, p = .048, \eta_p^2 = .017$). For the perception of female heavy drinking, there was only a significant main effect on the .1 significance level ($F(1, 225) = 2.78, p = .097, \eta_p^2 = .012$). When performing a follow-up independent t-test, significant differences were present for both the perception of male drinking behavior ($t(227) = 2.26, p = .025, r = .15$) and female drinking behavior ($t(227) = 2.15, p = .032, r = .14$). For both male and female drinking, participants perceived a higher amount of alcoholic beverages as heavy drinking in the short-term mating condition compared to the long-term mating condition (cf. Figure 2).
3.4.4. The mediating impact of short-term mating motivations on alcohol measures

To investigate if the desire to engage in a short-term relationship positively mediates the relation between priming version and the alcohol measures, mediation analyses were conducted, using model 4 of the PROCESS procedure of Hayes. Bias-corrected bootstrapping (with 5000 bootstrap samples) was used to generate 95% confidence intervals around the indirect effects of participants’ desire to have a short-term relationship on the amount of alcoholic beverages and on the perceived heavy drinking. Mediation is present when the confidence intervals exclude zero. Number of drinks, perceived heavy drinking for women and perceived heavy drinking for men were used as separate outcome variables, with priming version as independent variable.

Results (see Table 3) revealed a significant positive indirect effect of the short-term mating priming on the amount of alcoholic beverages, via their motivation to pursue a short-term relationship. These findings indicate that in a short-term mating condition, the

Figure 2: The perception of heavy drinking depending on the mating condition.
motivation to have a short-term sexual relationship rises, leading to a willingness to drink a higher amount of alcoholic beverages in a mating situation. Remarkably, no such mediation was found for perception of heavy drinking in women or men.

Given the absence of mediation for the heavy drinking perception, additional mediation analyses were conducted using young adults’ desire to pursue a long-term relationship as a mediator. Results indicated a negatively mediated relation between being in a long-term mating condition and the perception of heavy drinking in women (see Table 3). These findings reveal that in a long-term mating condition, the perception of heavy drinking in women lowers as the desire to go on a romantic date for a long-term relationship rises. No other indirect effects of the desire to pursue a long-term relationship were present.

In addition to these simple mediations, six moderated mediations were conducted, using model 14, to investigate if the mediating effect of short-term mating motivations and long-term mating motivations on the alcohol measures was moderated by sex of the participants. The analysis (5000 bootstraps; 95% bias-corrected confidence intervals) showed no significant moderated mediations.
Table 3: The mediating impact of the desire to pursue a short-term or long-term relationship on the alcohol measures

<table>
<thead>
<tr>
<th>Mediator (× moderator)</th>
<th>Alcohol measures</th>
<th>a*b</th>
<th>SE</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desire to pursue a short-term relationship (Model 4)</td>
<td>Amount of alcoholic beverages*</td>
<td>.349</td>
<td>.114</td>
<td>.157</td>
<td>.611</td>
</tr>
<tr>
<td></td>
<td>Perceived heavy drinking for women</td>
<td>.065</td>
<td>.094</td>
<td>-.111</td>
<td>.263</td>
</tr>
<tr>
<td></td>
<td>Perceived heavy drinking for men</td>
<td>.138</td>
<td>.123</td>
<td>-.091</td>
<td>.403</td>
</tr>
<tr>
<td>Desire to pursue a long-term relationship (Model 4)</td>
<td>Amount of alcoholic beverages</td>
<td>-.117</td>
<td>.086</td>
<td>-.322</td>
<td>.020</td>
</tr>
<tr>
<td></td>
<td>Perceived heavy drinking for women*</td>
<td>-.108</td>
<td>.065</td>
<td>-.264</td>
<td>-.003</td>
</tr>
<tr>
<td></td>
<td>Perceived heavy drinking for men</td>
<td>-.134</td>
<td>.084</td>
<td>-.343</td>
<td>.002</td>
</tr>
<tr>
<td>Desire to pursue a short-term relationship × sex (Model 14)</td>
<td>Amount of alcoholic beverages</td>
<td>.180</td>
<td>.224</td>
<td>-.255</td>
<td>.627</td>
</tr>
<tr>
<td></td>
<td>Perceived heavy drinking for women</td>
<td>.274</td>
<td>.186</td>
<td>-.067</td>
<td>.664</td>
</tr>
<tr>
<td></td>
<td>Perceived heavy drinking for men</td>
<td>-.127</td>
<td>.249</td>
<td>-.626</td>
<td>.356</td>
</tr>
<tr>
<td>Desire to pursue a long-term relationship × sex (Model 14)</td>
<td>Amount of alcoholic beverages</td>
<td>.168</td>
<td>.198</td>
<td>-.179</td>
<td>.633</td>
</tr>
<tr>
<td></td>
<td>Perceived heavy drinking for women</td>
<td>.019</td>
<td>.127</td>
<td>-.224</td>
<td>.293</td>
</tr>
<tr>
<td></td>
<td>Perceived heavy drinking for men</td>
<td>.216</td>
<td>.189</td>
<td>-.098</td>
<td>.645</td>
</tr>
</tbody>
</table>

*= significant indirect effect

\[ a*b = \text{indirect effect of X on Y through M; } \]

\[ \text{LLCI = lower level confidence interval; ULCI = upper level confidence interval} \]

3.5. Discussion

The results of this experimental study showed that a short-term mating condition affects young adults’ drinking behavior and perception. Both young men and young women wanted to consume more alcoholic beverages when being in a short-term mating situation, compared to being in the company of a potentially long-term partner. Also a higher amount of alcoholic drinks was perceived as heavy in a short-term mating context, compared to a long-term mating context. Additionally, analyses revealed that the increase in drinking behavior in short-term mating contexts can be assigned to the desire to engage in short-term relationships. This mediating impact was not present in young adults’ perception of heavy drinking.
4. **General Discussion**

4.1. **Discussion**

Both risk-taking and alcohol literature indicate that drinking high amounts of alcohol could function as a short-term mating strategy for young adults in mating situations. Therefore, a confirmatory survey study verified that binge drinking behavior is indeed related to having an unrestricted sexuality (hypothesis 1 and hypothesis 2). A second experimental study empirically tested whether short-term mating motivations increase young adults’ drinking behavior (hypothesis 3 to 5).

Confirming hypothesis 1 and 2, the first study clearly showed that binge drinkers are more short-term oriented in their sexuality compared to peers who do not engage in binge drinking behavior. Moreover, the more sexually unrestricted young men and young women are in their mating orientation, the more frequently binge drinking is engaged in. These findings correspond with the literature on drinking games, in which high mating efforts are linked with participation and higher drinking behavior in drinking games (Hone & McCullough, 2015; Hone et al., 2013). It also supplements previous research on mating orientation and general drinking behavior (Vincke, 2016a, 2016b), showing a clear link between drinking behavior and having a short-term oriented mating strategy.

Furthermore, the experiment indicated that in a short-term mating context, young adults are triggered to consume a higher number of alcoholic beverages compared to a long-term mating context. Mediation analyses also confirmed that being motivated to engage in a short-term mating relationship (like a one-night stand or an affair) increases young men’s and women’s drinking behavior. These findings indicate that young adults actually use a high alcohol consumption as a short-mating strategy.

Moreover, also the perception of young men and women changed, as a higher number of alcoholic beverages was perceived as heavy drinking in a short-term mating
condition. Possibly, this shift in perceived heavy drinking enables and even stimulates young adults into drinking higher amounts of alcohol when being in a short-term mating situation. Remarkably, follow-up mediation analyses could not confirm that a higher motivation to pursue a short-term sexual relationship was linked to a perception of higher amounts of alcohol consumption as heavy. The mediation analyses did find that the more young adults were motivated to pursue a long-term relationship, the sooner women’s drinking was perceived as heavy. The level of romantic motivation did not affect the perception of men’s drinking behavior. Accordingly, more research is necessary to clarify why a short-term mating context affects young adults’ perception of heavy drinking.

Additionally, it would also be interesting to investigate why short-term mating motivations trigger young adults’ willingness to drink more alcoholic beverages. As a short-term mating context, in which you interact with an attractive person of the opposite sex (who also shows interest in you), increases (heterosexual) young adults’ drinking behavior, results suggest that both young men and young women use alcohol consumption to enhance their attractiveness. This corresponds with studies showing that frequent drinking behavior increases young adults’ short-term attractiveness while harming their desirability as a long-term romantic partner (Vincke, 2016a, 2016b). Also the literature on risk-taking suggests that high risk-taking behavior is engaged in to signal qualities to potential short-term mating partners (Bassett & Moss, 2004; Sylwester & Pawłowski, 2011).

However, it remains unclear which mate qualities are being signaled by drinking high amounts of alcohol. For instance, as heavy drinking behavior can be considered physically risky, research could investigate if drinking behavior could be used to signal certain physical qualities. However, as drinking alcohol is still considered typical masculine behavior (de Visser & McDonnell, 2012; de Visser & Smith, 2007; Holmila & Raitasalo, 2005; Rolfe, Orford, & Dalton, 2009), alcohol use could also be considered social risk-taking for women, engaging in non-conformist behavior that can damage one’s reputation (Sylwester & Pawłowski, 2011). As drinking alcohol also has financial consequences (price of beverage,
amount of money spent on one occasion), it would also be interesting to investigate if these other aspects also function as elements of a specific mating strategy. For instance, spending a lot of money on drinks could function as conspicuous consumption to indicate resources.

As all individuals already have a particular sociosexual orientation, using a priming methodology to activate short-term mating and long-term mating motivations could be considered a limitation of this paper. However, two manipulation pretests confirmed that a mating prime can alter young adults’ mindsets in a predictable manner, independent of their sex or current relationship status. In addition, a manipulation check in the actual experiment also confirmed that the participants in the two conditions did not differ in their desire to make an attractive impression or have a pleasant time, yet they did differ in their motivation to pursue a short-term or long-term relationship. We also took into account the sociosexual orientation of the participants (filled in prior to the manipulation) in both conditions as a moderator in all statistical analyses. The fact that there was no moderating impact indicates that the participants were capable of empathizing with another mating orientation than their actual mating strategy. However, studying the impact of short-term mating motivations on young adults’ drinking behavior in more natural circumstances could be beneficial.

Also, in the first study, binge drinking behavior was defined to the participants as drinking five alcoholic beverages in two hours’ time. For reasons of simplicity, no distinction was made between male and female drinking behavior. However, many binge drinking definitions make this distinction. For instance, according to the National Institute on Alcohol Abuse and Alcoholism, binge drinking is engaged in when drinking five or more alcoholic drinks (men) or four or more alcoholic drinks (women) in a period of two hours’ time (NIAAA, 2015). The lower number of drinks for women is based on physiological differences, leading to higher blood alcohol levels compared to men when drinking similar quantities (Courtney & Polich, 2009; Mancinelli, Vitali, & Ceccanti, 2009). Future research should take this distinction into account. In addition, as these binge drinking definitions are based on
standard alcoholic drinks, containing a fix amount of pure alcohol, future survey studies would also benefit from including a definition of a standard alcoholic drink.

Finally, the findings of this paper could be used in social marketing campaigns targeting youth alcohol (ab)use. As young adults appear to use a high alcohol consumption as a short-term mating strategy in mating situations, it could be advantageous to address the expected benefits of heavy drinking. Accordingly, it might be beneficial to convince young adults that drinking high amounts of alcohol is not attractive, even for a short-term sexual encounter. Studies already showed that a positive drinker image is linked to an increased (future) alcohol consumption (Blanton, Gibbons, Gerrard, Conger, & Smith, 1997; Gerrard et al., 2002; Spijkerman, van den Eijnden, Vitale, & Engels, 2004). Therefore, future studies could verify whether lowering the short-term attractiveness of heavy episodic drinking decreases sexually unrestricted young adults’ intention to drink high amounts of alcohol when pursuing a short-term relationship. Moreover, if high alcohol quantities are used as a short-term mating strategy by young adults’ because of its risk-taking nature, emphasizing the risks of drinking high amounts of alcohol in social marketing campaigns might be the wrong approach. Instead of functioning as a warning, this might encourage young adults to use drinking in short-term mating situations.

4.2. CONCLUSION

This paper is part of a series of studies verifying if alcohol use can be considered a short-term mating strategy of young adults. The first study confirmed that there is a strong relationship between drinking high amounts of alcohol and pursuing a short-term mating strategy. The second study showed that short-term mating motivations trigger both young men and young women to increase their drinking behavior. Also young adults’ perception of what can be considered heavy drinking is affected in a short-term mating context, making them more acceptant towards drinking high amounts of alcoholic beverages. Given the prevalence and harmfulness of drinking high amounts of alcohol, these findings are of
interest to social marketing professionals and institutions. By giving insight in less obvious drinking motivations, youth drinking behavior can be addressed more effectively.
5. REFERENCES


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CHAPTER 6

WHAT ALCOHOL SAYS ABOUT YOU.

AN EXPERIMENTAL STUDY ON QUALITIES SIGNALED BY HEAVY EPISODIC DRINKING.
CHAPTER 6: WHAT ALCOHOL SAYS ABOUT YOU.
AN EXPERIMENTAL STUDY ON QUALITIES SIGNALED BY HEAVY EPISODIC DRINKING.

Previous research indicated that risky drinking behavior can function as a short-term mating signaling strategy. However, no study investigated which qualities young adults actually signal when engaging in heavy episodic drinking (also called binge drinking). Therefore, an experimental study (N = 376) was conducted, using a factorial survey approach. The experiment confirmed that as young adults consumed a higher amount of alcoholic beverages, they were perceived as being more sexually unrestricted. In addition, both male and female binge drinkers were considered more attractive as a short-term mating partner, whereas a non-drinker was more desirable as a long-term mating partner.

Heavy episodic drinking did not harm a young man’s short-term attractiveness compared to not drinking, but clearly lowered his long-term attractiveness. Also, both moderate and binge drinking increased a woman’s desirability as a short-term sexual partner, whereas drinking very heavily harmed a woman’s long-term attractiveness. Furthermore, heavy episodic drinking did not consistently signal physical fitness indicators. On the contrary, binge drinkers were even perceived as being less disease resistant. However, heavy episodic drinking did clearly signal certain mental qualities, as the perceived adventurousness, braveness and risk-proneness rose with the amount of alcoholic beverages. Remarkably, drinking more than the ‘official’ binge drinking cut-off (more than six alcoholic drinks for men and more than four alcoholic drinks for women) did not affect a young adult’s impression differently compared to drinking exactly six or four alcoholic beverages.
1. INTRODUCTION

Because of the inhibiting effects, drinking low doses of alcohol can have relaxing effects, inducing talkativeness and positive feelings (Health Promotion Agency [HPA], 2015; National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2015). However, heavy episodic drinking (or so-called binge drinking), in which individuals drink high amounts of alcohol in a short period of time, impairs the functioning of the brain, leading to intoxication and an increased risk of sickness, coma, injury and even death (HPA, 2015; NIAAA, 2015; Vonghia et al., 2008; WHO, 2014). Moreover, because of the toxic effects on organs and body tissues, chronic heavy alcohol use is linked to more than 200 diseases, including gastrointestinal diseases and cancers (HPA, 2015; Rehm, 2011; Rehm, Taylor, & Room, 2006; WHO, 2014). Nevertheless, despite these harmful consequences, heavy episodic drinking is highly prevalent among young adults (Center for Behavioral Health Statistics and Quality, 2015; Johnston, O’Malley, Bachman, Schulenberg, & Miech, 2015; Rosiers et al., 2014; TNS Opinion & Social, 2010). This indicates that there might be certain gains related to this risky consumption behavior that outweigh potential – acute and long-term – harmful consequences.

To gain more insight in the underlying motivations of young adult heavy drinkers, recent studies investigated drinking behavior from an evolutionary, signaling perspective. These studies indicated that drinking high amounts of alcohol can operate as a short-term mating signaling strategy for both young male and young female adults (Vincke, 2016a, 2016b, 2017). However, these studies only investigated the functioning of a frequent drinking pattern as a short-term mating cue (Vincke, 2016a, 2016b), without investigating how heavy episodic drinkers are perceived. Nonetheless, as short-term mating often consists of occasional sexual encounters, research should also focus on the perception of heavy drinking on one specific occasion. Therefore, by means of an experimental study, this paper explores the perception of young adult binge drinkers. As signals can be considered cues that intend to indicate certain qualities and traits, with the aim of affecting receivers’
beliefs and/or behavior (Donath, 2011; Dunham, 2011; Maynard Smith & Harper, 2003), we
investigate the impact of heavy episodic drinking on young adults’ perceived qualities,
perceived mating orientation and attractiveness.

1.1. DRINKING BEHAVIOR AS A SHORT-TERM SEXUAL SIGNALING STRATEGY

Due to differences in obliged minimum parental investment and de facto differences
in reproductive potential, women are generally more long-term oriented in their mating
strategy, whereas men may benefit more from having a more short-term oriented, sexually
unrestricted mating orientation (Buss, 2012; Trivers, 1972). However, depending on the
environmental circumstances (e.g. harshness of the environment) and personal
characteristics (e.g. physical attractiveness), both sexes may engage in alternative mating
strategies (Buss & Schmitt, 1993; Gangestad & Simpson, 2000). Moreover, depending on
the temporal context of the mating relationship, men and women search for different
qualities and traits in a partner (Buss & Schmitt, 1993). Consequently, to attract potential
partners, both men and women engage in signaling behavior to demonstrate their
possession of desired qualities, taking into account these mating preferences (Geary, 2006;
Miller, 2009; Saad, 2013). Research indicates that risky drinking behavior may also function
as a short-term mating signaling strategy to advertise specific qualities.

First of all, a series of survey studies confirmed that both drinking behavior in
general (Vincke, 2016a, 2016b) and binge drinking behavior in particular (Vincke, 2017) are
related to having a short-term oriented mating strategy in both young men and young
women. These findings correspond with studies showing that there is a strong link between
drinking alcohol and having casual sexual relations (Cooper, 2002, 2006; Grello, Welsh, &
Harper, 2006; Lindgren, Pantalone, Lewis, & George, 2009; Paul, McManus, & Hayes, 2000;
Santos Jr. et al., 2014; Turchik, Garske, Probst, & Irvin, 2010). Also studies on drinking games
showed that higher mating efforts are linked to drinking a higher amount of alcohol (Hone
& McCullough, 2015; Hone, Carter, & Mccullough, 2013). In addition, a recent study
empirically verified that short-term mating motivations increase young adults’ drinking behavior. More specifically, both young men and young women were triggered to drink more alcoholic beverages when interacting with an attractive opposite-sex person in a short-term mating context, more so than in a long-term mating context (Vincke, 2017). This finding complements research showing that young adults who are dating consume more alcohol when going out compared to peers in a committed relationship (Devos-Comby, Daniel, & Lange, 2013).

Other research confirmed that a risky drinking pattern, characterized by frequent drinking behavior, functioned as a cue indicating a short-term oriented mating strategy in both young men and women (Vincke, 2016a, 2016b). Frequent drinking also brought some short-term attractiveness advantages (Vincke, 2016a, 2016b), yet harmed a person’s general and long-term attractiveness (Farthing, 2005; Vincke, 2016a, 2016b; Wilke, Hutchinson, Todd, & Kruger, 2006).

1.2. DRINKING TO ADVERTISE QUALITIES

According to the strategic pluralism model (Gangestad & Simpson, 2000) and the genetic benefit hypothesis (Buss, 2012; Greiling & Buss, 2000) women search for indicators of genetic quality in short-term mating partners, as these so-called ‘good genes’ enhance the offspring’s chances of survival and/or sexual attractiveness, and therefore their general fitness. Consequently, when searching for a short-term mating partner, women prefer a physically attractive man with phenotypic traits that signal good genes (Buss, 2012; Li & Kenrick, 2006), such as masculine features (e.g. muscularity, physical prowess, deep voice, tallness) and symmetry (Baran Mandal, 2012; Buss, 2012; Gangestad & Simpson, 2000; Geher, Kaufmann, & Fisher, 2013; Miller & Todd, 1998; Neff & Pitcher, 2005; Roberts & Little, 2008; Wilson & Nussey, 2010). Additionally, women are also attracted to men who are confident, daring, exciting, assertive, dominant and adventurous, as these traits also
function as potential good-gene indicators (Geher et al., 2013; Kruger, Fisher, & Jobling, 2003; Roberts & Little, 2008).

As substance use, including alcohol, is harmful to one’s health, individuals could use risky drinking behavior to demonstrate that they possess good genes and are genetically equipped to withstand the detrimental physical effects of toxic substances (Borkowska & Pawlowski, 2014; Sylwester & Pawlowski, 2011). This reasoning corresponds with the costly signaling theory (Bliege Bird, Smith, & Bird, 2001; Hawkes & Bliege Bird, 2002) and handicap principle (Zahavi, 1975; Zahavi & Zahavi, 1997) stating that costly behavior – in terms of wasting energy, resources but also taking risks – can be used to reliably signal certain qualities that cannot be directly observed. More specifically, as the cost inherent to the hazardous behavior is quality-dependent, individuals low in terms of this particular quality cannot afford the cost of the conspicuous signaling behavior. Accordingly, through behaving in a costly manner, individuals can show bravery, risk-proneness, physical prowess, health and other desirable characteristics related to that specific behavior (Bliege Bird et al., 2001; Donath, 2011; Zahavi & Zahavi, 1997). As research already showed that excessive drinking in a short period of time immediately impairs the immune system (Afshar et al., 2015), this would mean that engaging in heavy episodic drinking without passing out could actually signal genetic quality and health (Aung, 2016).

Dewitte (2011) already explored whether adolescent smoking could function as a costly signal of dispositional health. His study confirmed that healthy adolescents, suffered less from the harmful side-effects of smoking compared to less healthy peers. Additionally, an individual’s smoking status was also used as an indicator of an adolescent’s health, unless other indices of health were available (such as an active lifestyle). The study of Borkowska and Pawloski (2014) on the other hand, contradicted that substance use reflects genetic quality, as they found no relationship between bodily symmetry - i.e. a phenotypic indicator of genetic quality – and substance use frequency. However, the authors indicate
that the use of symmetry as a measure of overall genetic quality is questionable, as it is also affected by developmental noise.

Nonetheless, as heavy episodic drinking can be considered physically risky behavior, binge drinking could also be used to signal mental qualities related to risk-taking tendencies, including courage and bravery (Ellis et al., 2012). Corresponding with this assumption, research showed that young adults who engage in substance use are also more prone to take other risks (Borkowska & Pawloski, 2014; Donohew, Zimmerman, Cupp, & Novak, 2000; Sargent, Tanski, Stoolmiller, & Hanewinkel, 2010; Zuckerman & Kuhlman, 2000). Similar reasoning is also found in the crazy bastard hypothesis, which states that young men voluntarily engage in (non-violent) risky behaviors to enhance their reputation. By demonstrating their risk-proneness and their indifference to the possibility of harm, young men are perceived to be more formidable and tough compared to peers who are more risk-averse (Fessler, Tiokhin, Holbrook, Gervais, & Snyder, 2014).

As men search for cues of fertility and youth in both short-term and long-term mating partners (Buss, 2012; Li & Kenrick, 2006), risky drinking seems less relevant for women as a mating signal. However, because women are generally more sexually restricted and demanding of a long courtship before agreeing to engage in sexual activities (Schmitt, 2005), sexually unrestricted men may also search for cues indicating sexual availability and willingness (Buss, 2012; Goetz, Easton, Lewis, & Buss, 2012; Regan, Levin, Sprecher, Christopher, & Cate, 2000). Given that alcohol reduces sexual inhibitions (HPA, 2015), and is linked to sexual risk-taking such as hook-ups and one-night stands (Fielder, Walsh, Carey, & Carey, 2013; Grello et al., 2006; Labrie, Hummer, Ghaidarov, Lac, & Kenney, 2014; Paul et al., 2000; Zuckerman & Kuhlman, 2000), female risky drinking might attract sexually unrestricted men’s attention as it could signal openness to casual sex. Indeed, women who drink alcohol appear to be more receptive towards immediate flirtatious behavioral contact, especially when the man is attractive (Lannutti & Camero, 2007). Research also shows that alcohol increases women’s interest in short-term, sexual relations (Zawacki,
2011), leading to a more open posture when interacting with men (Parks, Hequembour, & Dearing, 2008) and more sexual approach behaviors (Testa, Vanzile-Tamsen, Livingston, & Buddie, 2006). However, as the crazy bastard hypothesis also applies to female physical risk-taking, heavy (episodic) alcohol use by women could also signal mental qualities related to risk-proneness, as well as physical qualities related to formidability and size (Fessler et al., 2014). As a consequence, the signaling value of both male and female risky drinking remains unclear.

1.3. CURRENT RESEARCH

Recent studies on the functioning of alcohol as a short-term mating signal are limited to investigating the impact of drinking frequency on young adults’ perception. However, the decision to engage in short-term mating relations – such as casual sex, one nights stands, affaires – is often based on first impressions without any knowledge of individuals’ drinking frequency. Therefore, this paper aims to investigate which characteristics are being signaled by engaging in heavy episodic drinking.

Based on recent studies on the signaling function of risky drinking behavior, we expect heavy episodic drinking to function as a cue of an unrestricted sexuality in both young men and women (hypothesis 1). In addition, we also believe that heavy episodic drinking will bring attractiveness advantages in a short-term mating context, but not in a long-term mating context (hypothesis 2). Furthermore, this paper also investigates whether heavy episodic drinking signals physical qualities, mental qualities or both in young men and young women (research question 1).
2. **Method**

2.1. **Design**

An online experiment with a 2 (sex participants, between) x 2 (sex profile, within) x 2 (alcohol quantity, between) mixed-subjects design was conducted to investigate the perception of heavy episodic drinkers. Similar to previous research on the perception of young adults as a function of their drinking behavior (Vincke, 2016a, 2016b), a factorial survey approach was used. Accordingly, behavioral profiles of specific persons (vignettes) varying an experimental factor were presented, to assess the impact of that experimental factor on participants’ evaluations of those profiles (Auspurg & Hinz, 2015). All participants were asked to assess one male and one female profile.

2.2. **Participants**

Young adults between the age of 18 and 30 were contacted to participate in the online experiment. Given the attractiveness related questions, participants with a homosexual orientation were excluded from the sample, as well as participants outside the young adult age category. Also participants who did not complete the assessment of the two profiles were omitted from the data set. Consequently, the final sample consisted of 376 young adults, with a mean age of 21.81 years old ($SD = 2.46$). Of this sample, 46% were male ($n = 173$) and 54% female ($n = 203$). Only two persons indicated never drinking any alcohol. Of the 374 alcohol consumers, 235 participants (63%) drank alcohol on a weekly basis. In Belgium, the legal drinking age is 18 year for spirits, and 16 year for all other non-distilled alcoholic beverages (www.health.belgium.be).
2.3. **Materials**

**Behavioral profiles.** To assess the impact of the amount of alcohol consumed on young adults’ impression, one male and one female profile set was constructed. Each set consisted of four versions, varying how many alcoholic beverages were consumed in two hours’ time. All four profiles within each set were identical, except for the final sentence mentioning the number of alcoholic drinks. All profiles described a typical Friday night, where the main character (you) met his/her friends in a bar. However, a new person was present, someone you never met. This person came along with a friend of yours. The final sentence stated which amount of alcoholic beverages this new person had consumed in two hours’ time. In the male profile set, this new person was a young man, whereas in the female profile set, this new person was a young woman. In addition, in the male behavioral profile set, the final sentence stated that the man had consumed either (a) not a single glass of alcohol in two hours’ time, (b) three glasses of alcohol in two hours’ time, (c) six glasses of alcohol in two hours’ time, or (d) nine glasses of alcohol in two hours’ time. In the female behavioral profile set, the vignettes mentioned that the new woman had consumed either (a) not a single glass of alcohol in two hours’ time, (b) two glasses of alcohol in two hours’ time, (c) four glasses of alcohol in two hours’ time, or (d) six glasses of alcohol in two hours’ time. No additional information was given about lifestyle or hobbies to avoid giving unintentional cues about physical or mental characteristics. The behavioral profiles were presented in a completely random order: both the male and female profile sets were randomized, as well as the a, b, c, or d version (i.e. number of alcoholic drinks) within each profile set.

**Choice of amount of drinks.** As the goal of this paper is to investigate if a young adult’s impression is affected by the amount of alcohol he/she consumes in a short period of time, we decided to make four categories: no alcohol, medium alcohol use, heavy alcohol use, very heavy alcohol use. According to the National Institute on Alcohol Abuse and Alcoholism in the United States (NIAAA), binge drinking occurs when drinking four standard
alcoholic drinks in two hours’ time for women, or five standard alcoholic drinks for men. Given that the amount of pure alcohol in standard drinks in Belgium (10 gram) is lower than in many other countries (e.g. 14 gram in the US), the definition of binge drinking in Belgium is six drinks in two hours’ time for men and four drinks in two hours’ time for women (VAD, 2009). As six alcoholic drinks are considered heavy drinking on a specific occasion for men, we decided to study the impressions when consuming 0 (no alcohol) / 3 (medium) / 6 (heavy) / 9 (very heavy) glasses of alcohol for young men (= 6 glasses + - 3). As drinking four alcoholic beverages in two hours’ time is the cut-off for heavy episodic drinking in women, we chose the following ratios for the female behavioral profiles set: 0 (no alcohol) / 2 (medium) / 4 (heavy) / 6 (very heavy) glasses of alcohol (= 4 alcoholic beverages + - 2).

In addition, the binge drinking definitions are based on standard alcoholic drinks, in which all alcoholic drinks contain the same amount of pure alcohol, yet differ in volume depending on the alcohol content. Consequently, when professionally served (for instance, in a bar) a glass of beer (25 cl) contains the same amount of alcohol as a glass of wine (10 cl) or a glass of distilled spirits (3.5 cl). Therefore, we preferred to keep the behavioral profiles general, without mentioning a specific alcoholic beverage. This way, we could also avoid potential biases due to alcohol-specific expectations. For instance, according to a small pretest conducted among 39 young adults ($M = 21.18, SD= 1.85$; 16 men and 23 women), beer, whisky and brandy are considered very masculine drinks, whereas fruit beer and wine (white, rosé and sparkling) are considered feminine drinks. Beer, on the other hand, is perceived as a very cheap drink, while champagne, cocktails and spirits are considered very expensive drinks.

2.4. Measures

Characteristics. To investigate if a higher amount of alcoholic beverages signals specific qualities, participants were asked to assess the new person in the behavioral profiles on nine features: four physical qualities, four mental qualities and mating
orientation. Each trait was presented by means of a 7-point semantic differential, showing the two extremes of each characteristic. All characteristics were presented in a random order, with the question: ‘How do you think about this person? Indicate to what extent the following features may apply.’

To assess the perception of physical qualities, the following characteristics were presented: (a) disease resistance (b) physical prowess (c) stature (d) physical attractiveness. First of all, an individual’s defense against parasitic infections was an important fitness component in the ancestral environment for both men and women (Thornhill & Gangestad, 2006). Additionally, research indicates that physical prowess and stature can be considered physical indicators of genetic quality, especially in men (Brewer & Riley, 2009; Buss, 2012; Frederick & Haselton, 2007; Gangestad & Simpson, 2000; Sear, 2006; Thornhill & Gangestad, 2006). However, these two characteristics were also used to test the crazy bastard hypothesis in both young men and women, verifying that higher risk-taking leads to a higher perception of formidability (Fessler, Holbrook, et al., 2014; Fessler, Tiokhin, et al., 2014). Finally, also physical attractiveness functions as an indicator of underlying genetic fitness, signaling information about an individual’s health and fertility (Kokko, Brooks, Jennions, & Morley, 2003; Li & Kenrick, 2006; Miller & Todd, 1998).

In addition, specific mental qualities were assessed through four characteristics: (a) adventurousness (b) braveness (c) risk-taking tendencies (d) confidence. As women search for good gene indicators in short-term mating partners (Baran Mandal, 2012; Buss, 2012; Gangestad & Simpson, 2000), and given that women prefer brave, adventurous and confident men, who engage in risk-taking behavior (Bassett & Moss, 2004; Geher et al., 2013; Kruger et al., 2003; Sylwester & Pawłowski, 2011), we assume that these characteristics also function as indicators of (mental) genetic quality (Geher et al., 2013). Also in women, these mental traits might function as indicators of good genes as recklessness appears to correlate with women’s short-term attractiveness (Goetz et al., 2012).
The perceived sexual strategy of binge drinkers was measured by means of a 7-point semantic differential with ‘Rather interested in a committed, long-term relationship’ on the one end of the differential, and ‘Rather interested in short-term relationships, affaires and one-night stands’ on the other end of the differential.

**Sexual attractiveness.** To assess the attractiveness of the new person in the profile as a function of the amount of alcoholic drinks, participants were asked the following: How attractive would you find this person as a potential partner in the following situations? (a) a short-term relationship (a date, a one-night stand, casual relationship etc.) and (b) a long-term relationship (loyal, committed relationship). Both questions were answered on a 7-point Likert-type scale, ranging from 1 (not attractive) to 7 (attractive).

**Alcohol measures.** For the two behavioral profiles (one male and one female), respondents were asked to indicate how they perceived the drinking behavior of the person in the behavioral profile. More specifically, participants read ‘What do you think about drinking X glasses of alcohol in two hours’ time for a man/woman?’ In the questionnaire, X was replaced by the actual number of drinks that was mentioned in the presented profiles. Participants could indicate their answers on a 5-point Likert scale (very little, little, moderate, a lot, very much). In addition, respondents were also asked to indicate if they consumed alcohol or not.

3. **PROCEDURE**

When agreeing to participate in the online experiment, participants read a short introduction, explaining that they would be taking part in a two-part study. In the first part, they would assess two persons on a series of characteristics, based on very little information. They were encouraged to answer spontaneously and intuitively. The second part of the study focused on aesthetic preferences, through attention. This second part functioned as filler questions, to distract participants from the actual study.
After reading the introductory text, participants were asked to indicate their sex (necessary as only opposite sex participants were asked to fill in the attractiveness questions). This was followed by a short explanation about the behavioral profiles that the participants would be reading, stating that the people in these profiles were all young adults, and that the alcoholic beverages mentioned in the profiles referred to standard alcoholic drinks (with examples). Next, participants read and assessed their first behavioral profile (either male or female). All participants filled in the list of characteristics (mental, physical, mating orientation). Opposite-sex participants were also asked to fill in the attractiveness question. This was followed by the second part of the study (the filler questions), in which respondents were presented two visual displays. Each visual display consisted of three images, showing three variants of an abstract composition (for instance, a dotted pattern with a varying degree of symmetry). On these two displays, participants were asked to click on the image that drew their attention most. The second behavior profile followed these filler questions. Subsequently, the manipulation check questions appeared, asking how participants perceived the drinking behavior of the young adults in the behavioral profiles. Finally, participants were asked to indicate their age, sexual orientation and own drinking behavior.

4. RESULTS

4.1. MANIPULATION CHECK

To ensure that a higher number of drinks in the profiles was perceived as drinking more heavily, two two-way ANOVAs were conducted (one for the male profile and one for the female profile). Sex of the participants and amount of alcoholic drinks (i.e. profile version) functioned as the between-subjects variables, with the perceived level of drinking as the independent variable.
Results showed significant main effects of amount of alcoholic drinks for both the male ($F(2, 268) = 81.93, \ p < .001, \ \eta^2_p = .38$) and female profile ($F(2, 268) = 77.85, \ p < .001, \ \eta^2_p = .37$), yet no significant interaction with sex of the participants was present ($F_{\text{Male profile}}(2, 268) = 0.39, \ p = .675, \ \eta^2_p = .003; F_{\text{Female profile}}(2, 268) = 0.78, \ p = .461, \ \eta^2_p = .006$). Tukey post-hoc testing (see Figure 1) confirmed that in both the male and female profiles, a higher amount of alcoholic drinks was perceived as drinking more heavily compared to any lower amount of alcoholic beverages. This was found for all quantities (all $p$s $< .001$).

![Figure 1: Perceived drinking behavior as a function of amount of alcohol](image)

**4.2. Heavy episodic drinking as a short-term mating cue**

To verify that drinking large amounts of alcohol on one occasion functions as a cue of having an unrestricted sexuality (H1), two two-way ANOVAs were conducted (one for the male profile and one for the female profile). The perceived level of sexual unrestrictedness functioned as dependent variable, whereas the amount of alcoholic drinks and sex of the
participants were the independent variables. Results showed a significant main effect of amount of alcohol for both the male profile ($F(3, 368) = 86.65, p < .001, \eta_p^2 = .414$) and female profile ($F(3, 368) = 60.14, p < .001, \eta_p^2 = .329$). The interaction with sex of the participants, on the other hand, was nonsignificant in both profile sets ($F_{\text{Male profile}}(3, 368) = 1.73, p = .161, \eta_p^2 = .014$; $F_{\text{Female profile}}(3, 368) = 0.91, p = .438, \eta_p^2 = .007$). Follow-up Tukey post-hoc analyses (see Figure 2) showed that a man’s perceived level of sexual unrestrictedness rose as the amount of alcoholic beverages increased, up to six alcoholic beverages (all $ps < .001$). However, a young man drinking nine alcoholic beverages was not perceived significantly different compared to a man drinking six alcoholic beverages ($p = .675$). Similar results were found in the female profile, as a young woman was perceived as being more short-term oriented in her mating strategy when drinking a higher amount of alcohol (all $ps < .001$). Yet here, drinking six alcoholic beverages did not affect a woman’s perceived level of sexual unrestrictedness significantly different than drinking four alcoholic beverages ($p = .104$).

![Figure 2: Perceived level of sexual unrestrictedness as a function of amount of alcohol](image_url)
In addition, in the male profile, there was also a significant main effect for sex of the participants – although the effect size was rather small – \( (F(1, 368) = 7.28, p = .007, \eta_p^2 = .019) \). Without taking into account the number of alcoholic drinks, a young man was perceived as being more sexually unrestricted by the female participants \( (M = 4.42, SD = 1.47) \), compared to the male participants \( (M = 4.03, SD = 1.33) \). No significant main effect of sex was present for the female profile \( (F(1, 368) = 0.002, p = .964, \eta_p^2 < .001) \).

4.3. The attractiveness of heavy episodic drinking

A two-way mixed ANOVA was conducted for each profile to investigate if consuming a high amount of alcoholic drinks increases young adults’ short-term attractiveness, while harming the long-term attractiveness \( (H2) \). The within-subjects factor ‘attractiveness’ consisted of the variables short-term attractiveness and long-term attractiveness, with amount of alcoholic drinks as between-subjects factor. As only the opposite sex rated the short-term and long-term attractiveness, sex was not included as an additional between-subjects factor.

In the male profile, results showed a significant main effect of the within-subjects factor attractiveness \( (F(1, 197) = 4.12, p = .037, \eta_p^2 = .022) \), as well as a significant main effect of the amount of alcoholic drinks \( (F(3, 197) = 9.17, p < .001, \eta_p^2 = .123) \). Also the interaction between attractiveness and the amount of alcoholic drinks was significant \( (F(3, 197) = 17.10, p < .001, \eta_p^2 = .207) \).

Generally, when not taking into account the amount of alcoholic drinks, the short-term attractiveness \( (M = 3.82, SD = 1.50) \) was slightly higher than the long-term attractiveness \( (M = 3.57, SD = 1.68) \). Furthermore, when not differentiating between short-term and long-term attractiveness, drinking three alcoholic beverages \( (M = 4.25, SD = 1.06) \) was found the most attractive, being significantly more attractive than drinking six alcoholic beverages \( (M = 3.50, SD = 1.27, p = .014) \) as well as nine alcoholic beverages \( (M = 2.99, SD = 1.35, p < .001) \). Not drinking any alcohol \( (M = 4.01, SD = 1.47) \) did not differ significantly
from drinking three ($p = .785$) or six alcoholic drinks ($p = .188$), but was considered more attractive than drinking nine alcoholic beverages ($p = .001$). No significant differences were found for drinking six or nine alcoholic beverages ($p = .192$).

Simple effects analyses of the interaction effect (see Figure 3), via the SPSS syntax (Field, 2013), showed that a young man drinking six alcoholic beverages ($p < .001$) or nine alcoholic beverages ($p < .001$) was considered more attractive as a short-term mating partner compared to a long-term mating partner. A non-drinker, on the other hand, was more desirable as a long-term mating partner ($p < .001$). When drinking three alcoholic beverages, the short-term and long-term desirability did not differ significantly ($p = .703$).

Additional simple effects analyses confirmed that drinking high amounts of alcohol clearly harmed a young man’s long-term attractiveness. As can be seen in Figure 3, the long-term desirability of a young man did not differ significantly when drinking 3 alcoholic beverages or no alcohol ($p = .367$). However, drinking six or nine alcoholic beverages did lower a man’s attractiveness as a long-term mating partner, compared to not drinking or drinking ‘only’ three alcoholic beverages ($ps < .001$). Drinking nine alcoholic drinks even lowered a man’s long-term attractiveness slightly more than drinking six alcoholic drinks ($p = .077$). However, heavy episodic drinking (both nine and six alcoholic drinks) did not significantly affect a man’s short-term attractiveness compared to not drinking ($ps ≥ .171$). Drinking three alcoholic beverages, on the other hand, did enhance a young man’s short-term attractiveness compared to not drinking ($p = .011$) or drinking nine alcoholic drinks ($p = .004$), yet did not significantly differ from drinking 6 alcoholic beverages ($p = .200$). Also, there was a marginally nonsignificant difference between drinking 6 alcoholic beverages and consuming nine alcoholic beverages ($p = .091$).
For the female profile, there was a significant main effect of the within-subjects factor attractiveness ($F(1, 169) = 4.29, p = .040, \eta_p^2 = .025$), as well as the between-subjects factor amount of alcoholic beverages ($F(3, 169) = 4.04, p = .008, \eta_p^2 = .067$). Also the interaction between attractiveness and the amount of alcoholic beverages was significant ($F(3, 169) = 9.17, p < .001, \eta_p^2 = .140$).

When not taking into account the alcohol quantity, the short-term attractiveness ($M = 4.53, SD = 1.41$) of the female profile was somewhat higher than the long-term attractiveness ($M = 4.29, SD = 1.52$). Additionally, when making no distinction between short-term and long-term attractiveness, pairwise comparisons indicated that drinking two alcoholic beverages ($M = 4.82, SD = 1.27$) was considered more attractive than drinking no alcohol ($M = 4.01, SD = 1.14, p = .005$). No other significant differences were present, not for drinking four alcoholic beverages ($M = 4.01, SD = 1.14, ps \geq .145$), nor six alcoholic beverages ($M = 4.29, SD = 1.03, ps \geq .158$).
Similar to the male profile, simple effects analyses of the interaction effect (Figure 4) confirmed that drinking four alcoholic beverages \( (p = .010) \), as well as six alcoholic drinks \( (p < .001) \) was considered more desirable in a short-term mating partner than in a long-term mating partner. On the other hand, drinking no alcohol was preferred in a long-term mating partner \( (p = .004) \). No significant differences were present for drinking two alcoholic beverages \( (p = .718) \).

Additional pairwise comparisons further clarified that drinking alcohol enhanced a young woman’s attractiveness as a short-term mating partner compared to not drinking any alcohol, independent of the amount of alcoholic beverages \( (ps < .001) \). As can be seen in Figure 4, the short-term attractiveness when drinking two, four or six alcoholic beverages did not significantly differ \( (ps \geq .882) \). Consuming six alcoholic drinks, on the other hand, did lower a woman’s long-term desirability, compared to not drinking \( (p = .064) \) or drinking two alcoholic beverages \( (p = .003) \). A young woman consuming four alcoholic drinks was also considered slightly less attractive as a long-term mating partner compared to drinking two alcoholic drinks \( (p = .072) \). However, the long-term attractiveness of a woman drinking no alcohol on a night out did not significantly differ from a woman drinking two alcoholic beverages \( (p = .214) \) or four alcoholic beverages \( (p = .572) \). There was also no significant difference in a young woman’s long-term attractiveness depending on whether she drank four or six alcoholic beverages \( (p = .189) \).
4.4. The perceived physical qualities as a function of alcohol quantity

Two three-way mixed ANOVAs (one for the male profile, one for the female profile) were conducted to investigate if heavy episodic drinking signals specific physical qualities. Disease resistance, stature, physical prowess and physical attractiveness functioned as the variables in the within-subjects factor ‘physical qualities’. The amount of alcohol and sex of the participants were the between-subjects factors.

As the assumption of sphericity was violated for the male profiles (Mauchly’s test \( p = .005, \ \eta_{\text{Greenhouse-Geiser}} = .972 \)), a Huynd-Feld correction was opted for (Field, 2013). The results showed a significant interaction between the physical qualities and the amount of alcoholic drinks \((F(9, 1100.61) = 5.50, \ p < .001, \ \eta_p^2 = .043)\), but no significant three-way interaction between the physical qualities factor, amount of alcoholic drinks and sex of the participants \((F(9, 1100.61) = 1.22, \ p = .282, \ \eta_p^2 = .010)\). Also the main effect of amount of alcohol \((F(3, 367) = 1.20, \ p = .308, \ \eta_p^2 = .010)\) was nonsignificant, as well as the interaction
between sex of the participants and amount of alcohol \( F(3, 367) = 0.55, p = .648, \eta^2_p = .004 \).

However, Levene’s test indicated that there was also a violation of the assumption of homogeneity of variance for all four variables \( (ps \leq .042) \). Although analyses of variance are quite robust for violations of homogeneity of variance in the case of a balanced design (Field, 2013), separate one-way independent univariate analyses of variance were preferred as follow-up analyses. Consequently, the correcting F-ratio Welch could be used, as well as Games-Howell post-hoc tests, in the case of significant Levene’s tests (Field, 2013). Results of the robust Welch test showed a significant main effect for the variables disease resistance \( F(3, 204.16) = 6.10, p = .001 \), stature \( F(3, 204.68) = 3.84, p = .011 \) and physical attractiveness \( F(3, 202.88) = 3.19, p = .022 \), with no significant effect for physical prowess \( F(3, 203.41) = 0.12, p = .947 \).

As can be seen in Figure 5, Games-Howell post-hoc tests indicated that a young man drinking nine alcoholic beverages was perceived as being less disease resistant compared to when he consumed three \( (p = .007) \) or zero \( (p < .001) \) alcoholic beverages. Also a young man drinking six alcoholic beverages was perceived as being slightly less disease resistant compared a non-drinker \( (p = .086) \). All other alcohol quantities did not affect the level of perceived disease resistance \( (ps \geq .118) \). Similarly, a young man drinking nine alcoholic beverages was rated as significantly less physically attractive than a man drinking three alcoholic beverages \( (p = .011) \), and slightly less physically attractive than a young man drinking six \( (p = .066) \) or no alcoholic drinks \( (p = .078) \). The other amounts of alcoholic drinks did not affect a man’s physical attractiveness \( (ps \geq .888) \). Furthermore, consuming a high amount of alcoholic drinks also marginally affected the expected stature. When drinking nine or six alcoholic beverages, a young man was rated as somewhat taller compared to a young man drinking three \( (p_{9 \text{ drinks}} = .066, p_{6 \text{ drinks}} = .076) \) or no alcoholic beverages \( (p_{9 \text{ drinks}} = .086, p_{6 \text{ drinks}} = .097) \), with no significant difference between three and zero alcoholic drinks.

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Finally, the amount of alcoholic drinks did not affect how physically strong the participants perceived a young man to be ($p_s \geq .930$).

![Figure 5](image)

**Figure 5: Perceived male physical qualities as a function of amount of alcohol**

Also in the female profile, Mauchly’s test of Sphericity was significant ($p = .001$, $\varepsilon_{\text{Greenhouse-Geiser}} = .961$), leading to a Huynh-Feldt correction (Field, 2013). Similar to the male profile, results showed a significant interaction between the within-subjects factor physical qualities and the amount of alcoholic drinks ($F(8.89, 1087.38) = 2.37$, $p = .012$, $\eta_p^2 = .019$), yet no significant three-way interaction with sex of the participants ($F(8.89, 1087.38) = 0.60$, $p = .797$, $\eta_p^2 = .005$). In addition, there was also no significant main effect of the amount of alcohol ($F(3, 367) = 1.46$, $p = .226$, $\eta_p^2 = .012$), nor a significant interaction between amount of alcohol and sex of the participants ($F(3, 367) = 0.83$, $p = .480$, $\eta_p^2 = .007$).

Similar to the male profile, four univariate independent ANOVAs with amount of drinks as independent variables and the four physical qualities as (separate) dependent variables were conducted as follow-up analyses. Results showed no significant effect from amount of alcoholic drinks on the perceived physical prowess ($F(3, 372) = 0.99$, $p = .396$, $\eta_p^2 = .008$) or physical attractiveness ($F(3, 371) = 1.36$, $p = .255$, $\eta_p^2 = .011$). The quantity of
alcoholic beverages did affect the perceived disease resistance ($F_{Welch}(3, 205.83) = 4.51, p = .004$) and the expected tallness $F(3, 372) = 2.92, p = .034, \eta^2_p = .023$).

Games-Howell post-hoc analyses further clarified (see Figure 6) that a young woman drinking no alcohol was expected to be more disease resistant, compared to a young woman drinking six alcoholic beverages ($p = .053$). Similarly, drinking two alcoholic beverages also led to the impression of being more disease resistant, compared to when drinking four ($p = .077$) or six alcoholic drinks ($p = .008$). The perceived disease resistance of a young woman drinking no alcohol or two glasses did not significantly differ ($p = .988$), as well as a young woman drinking four and six alcoholic beverages ($p = .768$). In addition, Tukey post-hoc testing showed that a young woman drinking four alcoholic beverages was perceived as significantly taller compared to a young woman drinking no alcohol ($p = .042$). No other significant differences in perceived stature were present between the alcohol quantities ($ps \geq .123$).

![Figure 6: Perceived female physical qualities as a function of amount of alcohol](image-url)
4.5. **The Perceived Mental Characteristics as a Function of Alcohol Quantity**

Similar to the physical qualities, two three-way mixed ANOVAs were conducted (one for the male profile, one for the female profile) to investigate if consuming a higher amount of alcoholic drinks signals specific mental qualities in both young men and young women. The mental characteristics adventurousness, braveness, risk-proneness and level of confidence formed the within-subjects factor ‘mental qualities’ whereas amount of alcoholic drinks and sex of the participants were used as between-subjects factor. As the assumption of sphericity was violated for both the male and female profile (Mauchly’s test $ps < .001$, $\varepsilon_{\text{Greenhouse-Geiser}} \geq .895$), a Huynh-Feldt correction was used for both profiles (Field, 2013).

In the male profile, results showed a significant interaction effect between the mental qualities and the amount of alcoholic drinks ($F(8.28, 1100.61) = 16.66, p < .001, \eta_p^2 = .121$). The three-way interaction between mental qualities, amount of alcoholic drinks and sex of the participants was highly nonsignificant ($F(8.28, 1100.61) = 0.37, p = .943, \eta_p^2 = .003$). Additionally, there was also a significant main effect of amount of alcoholic drinks ($F(3,363) = 35.66, p < .001, \eta_p^2 = .228$) and a non-significant interaction between alcohol quantity and sex ($F(3,363) = 1.50, p = .214, \eta_p^2 = .012$). As can be seen in Figure 7, follow-up pairwise comparisons of the significant main effect of alcohol quantity showed that drinking a higher amount of alcohol significantly increased the perceived mental qualities ($ps \leq .001$). However, there were no significant differences between a young man drinking six or nine alcoholic beverages ($p = .194$).
To follow-up on the significant interaction effect between the mental qualities and the amount of alcohol, four univariate ANOVAs were conducted (one for each mental characteristic). Perceived adventurousness, courageousness, risk-proneness and confidence served as the dependent variables, with the amount of alcohol as independent variable. When the assumption of homogeneity of variance was violated, Welch F-test was used, in addition to Games-Howell post-hoc tests.

Results showed a significant effect from the amount of alcoholic drinks on the perceived level of adventurousness ($F(3,372) = 41.64, p < .001, \eta^2_p = .251$), courageousness ($F_{Welch}(3,203.05) = 8.60, p < .001$), risk-proneness ($F(3,371) = 47.57, p < .001, \eta^2_p = .278$), as well as the extent to which a young man was perceived to be confident ($F_{Welch}(3,202.19) = 3.18, p = .025$). Furthermore, as can be seen in Figure 8, post-hoc analyses revealed that the more a young man consumed alcohol, the more he was considered adventurous ($ps < .001$). However, the perceived level of adventurousness did not differ when drinking six or nine alcoholic beverages ($p = 941$). A similar trend was present for risk-proneness. The higher the amount of alcoholic beverages, the more a young man was perceived as being a risk-
taker ($p < .001$), with no significant differences between six or nine alcoholic beverages ($p = .580$). Furthermore, a young man drinking no alcohol was considered less courageous compared to a young man drinking six ($p < .001$) or nine ($p < .001$) alcoholic drinks. Also a young man drinking three alcoholic beverages was assessed as being less daring compared to a young man drinking six alcoholic drinks ($p = .053$). Again, the courageousness of young males drinking six or nine glasses of alcohol was not perceived as significantly different ($p = 1.00$), as well as a young man drinking no alcohol or three glasses ($p = .101$). Finally, perceived confidence did not differ significantly when drinking zero, three or six glasses of alcohol ($ps \geq .650$). However, a young man was rated as less confident when drinking nine alcoholic drinks, compared to drinking six glasses ($p = .015$), with no significant differences compared to three ($p = .105$) or zero ($p = .136$) glasses of alcohol.

Figure 8: Perceived male adventurousness, courageousness, risk-proneness and confidence as a function of amount of alcohol

Also for the female profile, there was a significant interaction between the within-subjects factor mental qualities and the amount of alcoholic drinks ($F(8.6, 1052.03) = 19.64$, $p < .001$, $\eta^2_p = .138$), but no significant three-way interaction with sex of the participants
Additionally, the tests of the between-subjects effects showed a significant main effect of the amount of alcoholic drinks \( (F(3,368) = 54.03, p < .001, \eta_p^2 = .306) \) and a slightly nonsignificant interaction between sex of the participants and the alcohol quantity \( (F(3,368) = 2.56, p = .055, \eta_p^2 = .020) \).

![Graph showing mental qualities by amount of alcohol](image)

**Figure 9: Perceived female mental qualities as a function of amount of alcohol**

As displayed in Figure 9, pairwise comparisons of the significant main effect of alcohol quantity confirmed that also in the female profile, a higher amount of alcoholic drinks increased the perceived mental qualities \( (ps < .001) \). Again, there were no significant differences in perception between four and six alcoholic drinks \( (p = .386) \). Subsequently, four univariate ANOVAs were conducted with the four mental qualities as (separate) dependent variables and alcohol quantity as independent variables. As the assumption of equality of variances was not met for the dependent variables adventurousness, courageousness and confidence, the Welch F-ratio and Games-Howell post-hoc tests were reported for these variables.
More specifically, results showed a significant effect from amount of alcohol on perceived adventurousness ($F_{Welch} (3,203.71) = 62.94, p < .001$), courageousness ($F_{Welch} (3,205.68) = 14.17, p < .001$), risk-taking tendencies ($F(3,372) = 73.05, p < .001, \eta_p^2 = .371$). However, there was no significant effect from amount of alcohol on the perceived level of confidence ($F_{Welch} (3,204.57) = 2.32, p = .077$). Furthermore, post-hoc analyses (see Figure 10) confirmed that a young woman drinking more alcoholic beverages was perceived as being more adventurous ($ps < .001$). Only the perception of a young woman drinking four or six alcoholic beverages did not differ significantly ($p = .673$). A similar linear trend was present for the extent to which a young woman was perceived as brave. A young woman drinking four or six glasses of alcohol was perceived as being more courageous than a young woman drinking two glasses of alcohol ($ps \leq .020$) or no alcohol ($ps < .001$). Additionally, a young woman drinking two alcoholic drinks was perceived as being somewhat more brave than a young woman drinking no alcohol at all ($p = .084$). No significant difference were found when drinking four or six glasses of alcohol ($p = .574$). Finally, as the amount of alcohol increased, also the perceived risk-taking tendencies rose ($ps < .001$). Again, there were no significant differences between a young woman drinking four alcoholic beverages and six alcoholic beverages ($p = .411$).
5. **General Discussion**

5.1. **Discussion**

Previous studies showed that drinking high amounts of alcohol may function as a short-term mating signaling strategy among young adults. However, the perception of heavy episodic drinkers remained unclear. Therefore, this paper investigated if drinking high amounts of alcohol in a limited period of time functioned as a short-term mating cue (Hypothesis 1), while affecting young adults’ short-term and long-term attractiveness (Hypothesis 2). In addition, we also investigated if heavy episodic drinking signals specific physical and/or mental qualities in both young men and young women (Research Question 1). To answer these hypotheses and research question, an online experimental study was conducted, in which participants assessed male and female young adults based on...
behavioral profiles. These behavioral profiles differed in the amount of alcoholic drinks a young adult consumed in two hours’ time.

Confirming hypothesis 1, heavy episodic drinking appeared to function as a cue of a short-term oriented mating strategy. More specifically, the more alcoholic beverages a young adult consumed, the more short-term oriented his/her mating orientation was perceived to be. However, the perceived level of sexual unrestrictedness was unaffected when drinking more than the binge drinking cut-off, i.e. six alcoholic drinks for men and four alcoholic drinks for women in two hours’ time. Accordingly, a young man drinking nine alcoholic beverages was not perceived as being more sexually unrestricted compared to a young man consuming six alcoholic drinks. A young woman drinking four or six alcoholic drinks was also perceived in a similar manner. These findings correspond with studies showing that men perceive women who drink alcohol as being sexually available (Garcia & Kushnier, 1987; Koukounas, Djokic, & Miller, 2014; Lindgren, Parkhill, George, & Hendershot, 2008; Parks & Scheidt, 2000). Yet, according to the error management theory (Haselton, 2007; Haselton & Buss, 2000) and literature on sexual assault (Abbey, 2002; Abbey, Mcauslan, & Ross, 1998; Abbey, Zawacki, Buck, Clinton, & McAuslan, 2004) men often overestimate women’s sexual intent, whereas women underestimate men’s commitment (Haselton, 2003). However, in this study, there were no interaction effects with sex of the participants, indicating that both male and female participants assessed young adults’ level of sexual unrestrictedness in a similar manner.

In addition, and corresponding with hypothesis 2, results also indicated that both male and female binge drinking was perceived as more attractive in a short-term sexual partner than in a long-term romantic partner, whereas not drinking was found more attractive in a long-term mating partner. Moderate drinking was considered equally attractive in a short-term and long-term mating partner. Furthermore, binge drinking clearly harmed a young man’s long-term attractiveness compared to not drinking or moderate drinking, and was perceived similar in short-term attractiveness as a not drinking.
In women, on the other hand, drinking alcohol enhanced a woman’s desirability as a short-term mating partner, independent of the amount of alcohol. Yet, very heavy episodic drinking, in which a woman consumed six alcoholic drinks, also harmed a woman’s long-term attractiveness compared to drinking no alcohol at all or only drinking two alcoholic beverages. These findings correspond with recent findings on the attractiveness of risky drinking patterns (Vincke, 2016a, 2016b) showing that frequent drinking only brings attractiveness benefits in a short-term mating context. Also research on risk-taking behavior indicated that risky behavior only increased individuals’ short-term attractiveness but not their long-term attractiveness, unless it concerned moderate risk-taking (Bassett & Moss, 2004; Farthing, 2007; Kelly & Dunbar, 2001; Sylwester & Pawłowski, 2011).

Furthermore, the experiment clearly showed that heavy episodic drinking signals specific mental qualities in both young men and young women, more so than specific physical qualities. More specifically, all scores on the physical qualities were centered around the neutral score 4, with only small differences between the four behavioral profiles (as could be derived from the nonsignificant main effect of the amount of alcoholic drinks). For instance, young adults drinking a higher amount of alcoholic drinks were expected to be less disease resistant. Possibly, the participants envisioned an intoxicated young adult when answering this question. Male and female heavy drinkers were also perceived to be slightly taller. This finding corresponds with the crazy bastard hypothesis, in which risk-prone men and women are perceived to be taller (Fessler, Holbrook, et al., 2014; Fessler, Tiokhin, et al., 2014).

The perceived mental qualities, on the other hand, clearly increased as both young men and young women consumed more alcohol. Remarkably, drinking more than the defined binge drinking level (six beverages in men, four in women) also did not bring additional benefits. As a consequence, heavy episodic drinkers were perceived to be more adventurous, more brave and more risk-prone. However, the perceived confidence level of a young adult was not affected by the amount of alcoholic drinks. Only a young man drinking
nine alcoholic drinks was perceived as less confident compared to when he would ‘only’
drink six beverages. Apparently, this gives the impression to peers that he went over the
top because of insecurity reasons. This is also found in research showing that individuals
with coping motives are associated with heavy drinking (Gallupe, 2014; Hasking, Lyvers, &
Carlopio, 2011; Kuntsche, Knibbe, Gmel, & Engels, 2005), characterized by personality
characteristics such as neuroticism and anxiety (Kuntsche, Fischer, & Gmel, 2008; Kuntsche,
Knibbe, Gmel, & Engels, 2006).

Together these findings indicate that heavy episodic drinking could function as an
honest signal of risk-proneness. According to the handicap principle (Zahavi, 1975; Zahavi
& Zahavi, 1997) and costly signaling theory (Bird & Smith, 2005; Smith & Bird, 2000),
physical risk-taking could serve as an honest signal of a specific quality, if physically risky
behavior is relatively less costly for high quality individuals than for individuals low in the
signaled quality. Applied to heavy episodic drinking, this would mean that individuals who
are not risk-prone find it harder to engage in binge drinking, as they are not willing to incur
the risks (sickness, coma, accidents, injuries etc.). Research suggests that this is actually the
case (Zuckerman & Kuhlman, 2000).

Moreover, as risk-proneness is a valuable trait for intrasexual competition, status and
reputation in young men (Ellis et al., 2012; Fessler, Tiokhin, et al., 2014; Wilson & Daly,
1985), these findings suggest that the signaling value of male binge drinking is linked to
reputation and social status. This is also found in research on drinking games, stating that
drinking games are considered venues in which young men can compete with peers to
impress women (Hone & McCullough, 2015; Hone, Carter, & McCullough, 2013). Moreover,
other research showed that high-status men drink more alcohol compared to group
members lower in the status hierarchy (Dumas, Wells, Flynn, Lange, & Graham, 2014),
whereas men who engage in frequent binge drinking or exceed peers’ alcohol consumption
during a heavy drinking occasion are perceived as being higher in social status (Dumas,
Graham, Bernards, & Wells, 2014). As women search dominant, adventurous and daring
men as short-term mating partners (Geher et al., 2013; Kruger et al., 2003), this might explain why male heavy episodic drinking is off interest to young women in short-term mating situations.

However, as intrasexual competitive ability is not a preferred quality in women (Buss, 2012; Li, Bailey, Kenrick, & Linsenmeier, 2002; Li & Kenrick, 2006), it seems unlikely that female heavy episodic drinking is linked to dominance and status. A more plausible explanation would be that alcohol consumption is known to affect women’s risk-taking behavior, including sexually risky behavior (e.g. Fielder et al., 2013; Grello et al., 2006; Labrie et al., 2014; Parks, Miller, Lorrain, & Zetes-zanatta, 1998; Parks, Hsieh, Collins, & Levonyan-Radloff, 2011; Testa et al., 2006; Zawacki, 2011). Consequently, heavy episodic drinking, leading to the perception of being adventurous, brave and risk-prone, might be used as a cue of sexual availability and intent. Other research already confirmed that recklessness in women is used by men as a cue indicating sexual exploitability (Goetz et al., 2012). Moreover, as women are more susceptible to the intoxicating effects of alcohol due to physiological differences, and given that alcohol impairs sexual inhibitions (Health Promotion Agency, 2015), this could explain why both moderate and heavy episodic drinking enhance a woman’s short-term attractiveness.

The reasoning that both men and women engage in physical risk-taking to signal risk-proneness and enhance their reputations is also found in the crazy bastard hypothesis (Fessler, Holbrook, et al., 2014; Fessler, Tiokhin, et al., 2014). However, according to this theory, risk-taking tendencies also function as an indicator of individuals’ formidability. These findings are only partially replicated as men engaging in binge drinking were perceived as slightly taller compared to moderate drinkers and non-drinkers, but not stronger. Also in women, only a woman drinking four alcoholic drinks was perceived as taller than a non-drinker. Possibly, these findings could be explained as the behavioral profiles did not mention the physical consequences of young adults’ drinking behavior. When drinking high amounts of alcohol, the functioning of the brain is impaired, affecting
a person’s coordination, speech and balance, sometimes leading to sickness, blackouts and even coma (NIAAA, 2015; WHO, 2014). However, the impairing effects of alcohol depend on several factors, including a person’s immune system (Afshar et al., 2015). Also the body type affects individuals’ reaction to alcohol and the actual alcohol level in their blood. For instance, the more muscular a person, the more alcohol is absorbed, leading to fewer intoxicating symptoms (Health Promotion Agency, 2015; Kuhn, Swartzwelder, & Wilson, 2008). Consequently, including additional information about the impairing effects of alcohol (the level of drunkenness, sickness etc.) when drinking six or nine alcoholic drinks might also affect the perceived physical qualities. This reasoning corresponds with the costly signaling theory stating that the cost of a signal needs to be quality-dependent in order for a behavior to function as an honest signal of a specific quality. Because of this quality-dependent cost, the signaling behaving is more harmful for individuals low in the signaled quality than individuals’ high in the displayed quality. This way the cost distinguishes which individuals possess the quality, and which individuals cannot afford the cost (Bliege Bird et al., 2001; Donath, 2011; Zahavi, 1975).

5.2. Future research and limitations

Although this paper expands the knowledge on the sexual signaling dimension of heavy episodic drinking, there are some limitations to this study. First of all, the behavioral profiles did not mention the physical consequences when drinking a certain amount of alcoholic drinks (e.g. intoxication, sickness). In addition, as some physical characteristics measured in this study can be considered male fitness indicators (i.e. strength, stature), future research would also benefit from including more female fitness indicators (i.e. youthfulness and fertility).

Additionally, also the number of mental characteristics was rather limited and focused on risk-proneness. After all, if male heavy episodic drinking is related to showing off intrasexual competitive abilities, it might also signal other characteristics, including
aggression and dominance. However, as research indicated that alcohol is also used by young adults for social bonding, group acceptance and maintaining friendships (Bancroft, Zimpfer, Murray, & Karels, 2014; de Visser, Wheeler, Abraham, & Smith, 2013; Niland, Lyons, Goodwin, & Hutton, 2013; Seaman & Ikegwuonu, 2010), alcohol use might also function as a social signal, in addition to being a sexual signal. Consequently, future research could investigate if alcohol consumption also signals social qualities (e.g. friendly, social, reliable, caring), taking into account the individuals’ drinking behavior and the drinking behavior of the peers. Moreover, also the inhibiting effects of alcohol might increase the perception of alcohol drinkers as being pleasant, relaxed and fun-loving. However, as these relaxing effects are mainly present when individuals are mildly intoxicated (HPA, 2015; NIAAA, 2015), future research could investigate if these positive perceptions diminish when engaging in heavy episodic drinking.

Furthermore, we choose to use standard alcoholic drinks in the behavioral profiles to avoid potential influences of the kind of beverage on perceived characteristics and attractiveness (f.e. masculine vs feminine drinks; de Visser & McDonnell, 2012; de Visser & Smith, 2007; Lyons et al., 2006; Rolfe et al., 2009). Nonetheless, future research taking into account the variety of alcoholic beverages might be fruitful.

Additionally, this research did also not control for potentially moderating effects (with the exception of sex of the participants). However, as research indicated that alcohol abstainers perceive drinkers and heavy drinkers differently from alcohol users (e.g. Gerrard et al., 2002; van Lettow, de Vries, Burdorf, Norman, & van Empelen, 2013), future research could also take into account participant’s alcohol consumption.
5.3. **CONCLUSION**

This paper shows that young adults who engage in heavy episodic drinking are perceived as more adventurous, brave and risk-prone. Moreover, heavy episodic drinking also functions as a short-term mating cue, while bringing some short-term attractiveness advantages. These findings contribute to research on the functioning of alcohol as a sexual signaling strategy, and research on drinking motivations in general. Given the prevalence and harmfulness of young adult binge drinking, these findings are also of interest to social marketing professionals and organizations focusing on youth alcohol (ab)use.
6. REFERENCES


CHAPTER 7

CONSPICUOUS ALCOHOL CONSUMPTION.

EXPENSIVE DRINKING AS SIGNALING BEHAVIOR
Research on conspicuous consumption clearly indicated that showy spending behavior functions as a money and status cue, as well as a cue of a short-term oriented mating strategy in young men and young women. Moreover, men also appear to use conspicuous consumption as a strategic short-term mating signaling system. As drinking behavior also has a financial aspect due to the price of alcohol, this paper investigated if consuming alcohol in an expensive manner could also function as a short-term mating cue and signal in young adults, displaying their status, resources and sexual unrestrictedness. A first exploratory experiment (N = 138), showed that young men and young women drinking an expensive alcoholic beverage were perceived as having higher social status and more money, as well as being single and more sexually unrestricted. Moreover, when drinking expensive beverages, young adults were preferred as short-term mating partners. A second experiment (N = 253) confirmed that a costly drink functions as a cue of status and resources, via the perceived expensiveness of the drink. Young men were also perceived as less loyal, whereas women gave the impression of being more flirty. Finally, a third experiment (N = 231) showed that young men and young women were willing to spend a higher amount of money on alcohol in a short-term mating context than in a long-term mating context. Remarkably, young adults did not prefer a more expensive first drink in a short-term mating context. Together, these results indicate that expensive drinking behavior could function as a short-term mating signal in both young men and women, yet more research remains necessary.
1. **INTRODUCTION**

Alcohol consumption is widespread. Even though a significant number of youngsters already use alcohol during adolescence (Hibell et al., 2012; Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014), both the prevalence and intensity of drinking behavior rises substantially in young adulthood (Center for Behavioral Health Statistics and Quality, 2015; Johnston, Bachman, & Schulenberg, 2012; Substance Abuse and Mental Health Services Administration, 2014). Given the harmful effects of heavy episodic drinking (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2010; WHO, 2014) and chronic heavy drinking (Rehm, 2011; World Health Organization, 2014), much research has attempted to shed light on the underlying drinking motives of young adults.

Much of this motivational research focuses on functional (e.g. conformity or social motives) or hedonic drinking motivations (e.g. enhancement or coping motives) (e.g. Cooper, Frone, Russel, & Mudar, 1995; Cooper, 1994; Cox & Klinger, 1988; Diep, Tan, Knibbe, & Vries, 2016; Grant, Stewart, O’Connor, Blackwell, & Conrod, 2007; Kuntsche et al., 2014; Kuntsche, Knibbe, Gmel, & Engels, 2005, 2006; Wardell, Ramchandani, & Hendershot, 2016; White, Anderson, Ray, & Mun, 2016). However, other research suggests that drinking behavior also has an important signaling dimension (e.g. de Visser, Wheeler, Abraham, & Smith, 2013; Martin & Leary, 2001; O’Grady, 2013; O’Grady, Harman, Gleason, & Wilson, 2012). According to signaling theory, signals are perceivable actions that intend to indicate a difficult to observe trait or quality, with the intention of affecting the receiver’s beliefs and/or behavior in ways that are beneficial for the signaler. Cues, on the other hand, are features that are used by receivers to infer a hidden state or quality. However, when cues are intentionally used by a sender to serve as communication, these cues become signals (Donath, 2011; Maynard Smith & Harper, 2003).
According to recent research on the signaling dimension of young adult alcohol use, heavy episodic drinking functions as a short-term mating signaling strategy, due to the physical riskiness of drinking high volumes of alcohol (Vincke, 2016a, 2016b, 2017). However, next to the physical aspects (e.g. the amount of alcohol), drinking behavior also has a financial aspect that might affect the signaling function of alcohol. Indeed, as alcoholic beverages differ in price, young adults can choose to drink expensive drinks (e.g. champagne) or more cheaper drinks (e.g. beer) in the presence of potential mating partners. Consequently, this paper wishes to explore if the financial cost of alcohol could affect the functioning of drinking behavior as a mating cue and mating signal. With this paper, we aim to expand knowledge on the signaling dimension of alcohol, and to contribute to research on drinking motivations.

1.1. Mating strategies

Due to their high investment in offspring (including pregnancy and nursing of children) and their more limited reproductive life span, poor mating decisions have large, negative consequences for women. Therefore, women often follow a sexually restricted, long-term oriented mating strategy, searching a reliable partner for a committed relationship. Accordingly, women tend to be rather choosy in selecting a partner. Men’s reproductive success, on the other hand, benefits from being sexually involved with a large(r) number of women, as men can limit their parental investment to the begetting of children. Consequently, men are often more sexually unrestricted and short-term oriented in their mating orientation, being less choosy in their sexual engagements (Buss, 2012; Trivers, 1972).

However, depending on environmental circumstances (e.g. uncertainty, harshness) and personal characteristics (e.g. attractiveness), both sexes can benefit from following other mating strategies, leading to sexually unrestricted women and sexually restricted men (Buss & Schmitt, 1993; Gangestad & Simpson, 2000). In addition, depending on the mating strategy that is being followed, different traits and qualities are
preferred in a partner (Buss, 2007; Li & Kenrick, 2006). Therefore, both sexes engage in conspicuous signaling behavior, displaying qualities corresponding with the other sex’ mating preferences and sexual strategy (Geary, 2006; Miller, 2009).

1.2. **Male conspicuous displaying**

Possessing resources is an important feature of a man’s attractiveness, both as a long-term mating partner and as a short-term mating partner. When following a long-term oriented mating strategy, women search for a man who is able and willing to invest in her and her potential future children. Accordingly, she prefers ambitious men with (financial) resources – or the prospect of – and a high social status. However, she also searches for a man who is stable and dependable (Buss & Schmitt, 1993; Buss, 1989; Buss, 2007; Li et al., 2002). In short-term mating contexts, on the other hand, women prioritize immediate resources, in which they prefer men who are willing to spend money on them, in the form of gifts and an extravagant lifestyle (Buss & Schmitt, 1993; Greiling & Buss, 2000). This pattern of showy spending, in which expensive goods are purchased to signal status and wealth, is labeled conspicuous consumption (Sundie et al., 2011; Truong & McColl, 2011; Veblen, 1899).

Corresponding with these preferences, men reported feeling more ambitious in the presence of attractive women, or even mere female cues (e.g. pictures). They also placed more value on wealth and social status (Roney, 2003). Similarly, the presence of an attractive woman increased young men’s attention to and recall of status products (Janssens et al., 2011). Men in a mating mindset were also more willing to spend money, yet only on highly visible luxuries and not on privately consumed necessities (Griskevicius et al., 2007). Additional studies clarified that conspicuous spending behavior in mating situations is especially engaged in by young men following a short-term mating strategy, and is triggered by short-term mating contexts (Sundie et al., 2011). This was confirmed by research showing that men’s spending behavior is related to higher mating intentions and mating success (Kruger, 2008), while men with a high income are more sexually active
compared to men with a low income (Hopcroft, 2006). Similarly, men engage in financial risk-taking behavior when they are motivated to increase their desirability as a mating partner, due to mating competition (Chan, 2015).

In addition, status products, such as an expensive car, clearly enhanced men’s physical attractiveness (Dunn & Searle, 2010; Guéguen & Lamy, 2012), while also increasing men’s testosterone levels (Saad & Vongas, 2009). Men in a high status attire also received more attention than men wearing low status clothing (Dewall & Maner, 2008). Research differentiating between short-term and long-term attractiveness further clarified that conspicuously spending money in a wasteful manner increased a man’s desirability, but only as a short-term mating partner (Sundie et al., 2011). This was also confirmed in risk-taking literature, as financial risk takers were considered more attractive than financial risk avoiders, but only for short-term mating (Sylwester & Pawlowski, 2011). Research not differentiating between short-term and long-term mating desirability found no attractiveness benefit of financial risk-taking (Farthing, 2005; Wilke, Hutchinson, Todd, & Kruger, 2006). Finally, both men (Hennighausen, Hudders, Lange, & Fink, 2016) and women (Sundie et al., 2011) perceived men who engage in conspicuous spending behavior as being more sexually unrestricted in their mating orientation.

1.3. FEMALE CONSPICUOUS DISPLAYING

Contrary to women, men place a greater premium on youth and beauty in potential short-term and long-term partners, as these traits signal fertility and health. However, social status and ability to acquire resources are of less importance to men in both mating contexts (Buss, 2012; Li et al., 2002; Li & Kenrick, 2006). Corresponding with these preferences, research showed that romantic motives do not trigger women into conspicuous spending behavior (Griskevicius et al., 2007; Sundie et al., 2011), not even in women with a sexually unrestricted mating strategy (Sundie et al., 2011). Similarly, research found no relation between women’s mating efforts and number of sexual partners, and their spending behavior (Kruger, 2008). Furthermore, unlike physically
attractive women, high status women also did not receive preferential attention from men (Dewall & Maner, 2008).

These findings suggest that displaying status and resources does not function as an intersexual mating signaling strategy in women (Sundie et al., 2011). Yet, recent research demonstrated that women do engage in conspicuous consumption in a mating context when intrasexual competition is present. More specifically, research found that women in a committed relationship use luxury consumption as a mate guarding tactic. By showing that their partner is still willing to invest, women attempt to deter potential mate poachers (Wang & Griskevicius, 2014). Moreover, also single women have an increased preference for luxuries when competing with other women for the attention of an attractive man, but only when the luxuries are attractiveness enhancing (Hudders, De Backer, Fisher, & Vyncke, 2014). Accordingly, in an intrasexual competitive situation, single women seem to use luxury consumption as a self-promotion strategy to increase their odds of reproductive success (Hudders et al., 2014). Corresponding with these results, a study showed that fertile women near their ovulation become more sensitive to their relative standing, compared to the status of other women (Durante, Griskevicius, Cantú, & Simpson, 2014).

Consuming status products, such as an expensive car or a luxurious apartment, also did not enhance women’s attractiveness (Dunn & Hill, 2014; Dunn & Searle, 2010), not as a long-term mating partner, nor as a short-term mating partner (Sundie et al., 2011). It did, however, affect women’s perception of other women. When buying expensive luxury products, young women were perceived by other women as being ambitious and having a higher status, but they were also assessed as more youthful, attractive, sexy and flirty. Similarly, men perceived a woman owing a conspicuous car as slightly more sexually unrestricted compared to a woman owning a regular car (Sundie et al., 2011). Research even indicated that materialistic men interpreted women’s high-status spending behavior as a signal of requiring high (financial) standards in prospective mates (Lens, 2012).
1.4. **Current Research**

For men, the above research indicates that consuming expensive products in a conspicuous manner functions as a short-term mating signal. First of all, short-term mating motivations increase young men’s willingness to engage in showy spending behavior. Moreover, this behavior operates as a short-term mating cue, while enhancing young men’s attractiveness as a short-term mating partner. For women, findings suggest that expensive, highly visible luxury consumption only functions as a cue of women’s sexual unrestrictedness, as well as a cue of their status, resources and high financial standards. As short-term mating motivations do not trigger female conspicuous consumption, and given that conspicuous consumption does not increase women’s desirability as a sexual partner, showy spending behavior does not seem to function as a short-term mating signaling strategy in women. It might, on the other hand, function as an intrasexual competition signaling strategy.

As alcoholic beverages differ in price, young adults can choose to drink expensive alcoholic beverages (e.g. champagne, cocktails, etc.) or cheaper alcoholic drinks (e.g. beer). In addition, young adults can spend large amounts of money on drinking behavior, by drinking expensive drinks, but also by treating a potential partner. Given that drinking alcohol in a bar is a highly visible activity, we believe that expensive drinking behavior might function as a short-term mating cue in both young men and young women because of its financial cost. Moreover, as men actively use conspicuous consumption as a short-term mating signaling strategy, we also expect young men, but not young women, to use expensive drinking behavior as a short-term mating signal.

More specifically, we predict that drinking an expensive alcoholic beverage will function as a cue of resources and social status compared to drinking a less expensive alcoholic drink, in both young men and young women (Hypothesis 1). Furthermore, male and female young adults will be perceived as more sexually unrestricted (Hypothesis 2) and single (Hypothesis 3) when drinking an expensive alcoholic beverage, compared to
drinking a cheaper alcoholic beverage. Also, young men drinking an expensive alcoholic drink will have a higher short-term attractiveness compared to peers drinking an alcoholic beverage lower in price. However, an expensive drink will not enhance women’s short-term attractiveness (Hypothesis 4). Finally, we expect expensive alcoholic drinks to function as a cue indicating status, resources and sexual willingness because of the high financial cost of the drink. Accordingly, we predict that participants’ perceptions of status, resources and level of sexual unrestrictedness will be positively mediated by the perceived expensiveness of the consumed alcoholic drinks (Hypothesis 5).

In addition, as research indicates that men but not women use expensive behavior as a short-term mating signaling strategy, we believe that only young men will use expensive drinking behavior as a signal in short-term mating contexts. Consequently, we expect that a short-term mating context will increase young men’s preference for consuming expensive drinks compared to a long-term mating context. However, a short-term mating situation will not affect women’s preference for consuming expensive alcoholic beverages (Hypothesis 6). Similarly, we believe that a short-term mating context will trigger young men into spending a higher amount of money on alcohol compared to a long-term mating context, but will not increase women’s spending behavior (Hypothesis 7). Finally, we hypothesize that the preferred expensiveness of alcoholic beverages, as well as the amount of money young men are willing to spend on alcohol will be mediated by the extent to which young men are motivated to pursue a short-term mating relationship. As there are no indications that women use showy spending behavior as a strategic short-term mating signal, we do not expect this mediating effect in women’s expensive drinking behavior (Hypothesis 8).
2. **STUDY 1**

2.1. **DESIGN AND PARTICIPANTS**

To explore if expensive alcoholic beverages function as a short-term mating cue, and as a cue of status and resources, a forced choice study with a between-subjects design was conducted. Participants either saw a young man or a young woman drinking two alcoholic beverages similar in alcohol content, but different in price. Participants were asked to indicate which of the two people (the person with the more expensive drink, or the same person with the less expensive drink) fitted best with a specific characteristic or trait. In total, 138 participants between 18 and 27 years old took part in the experiment, \((M = 21.25, \ SD = 1.84)\), of which 71 men (51.4%) and 67 women (48.6%).

2.2. **MATERIALS**

**Visual displays.** To investigate if expensive drinks function as a cue indicating status, resources and a short-term mating orientation,, two visual display sets were created. The first set showed two male displays, whereas the second set showed two female displays. Each visual display consisted of a profile picture (from head to chest) with an alcoholic beverages posited next to the picture, at the right side. To avoid all confusion, the name of the alcoholic beverage was added just above the glass (cf. appendix). For both the male and female displays, one visual display showed a glass of red wine, the other visual display showed a glass of champagne.

**Choice of beverage.** Alcoholic beverages differ in both alcohol content and price. In theory, bars serve standard alcoholic drinks, with varying volume depending on the alcohol concentration, to ensure that all alcoholic drinks have the same amount of pure alcohol. However, in reality, a standard drink is often different from normal serving sizes. Moreover, within each type of beverage (e.g. beer, wine, spirits) there is considerable variability in alcohol content (NIAAA, 2015). Therefore, we chose to compare red wine
and champagne, as both beverages have a similar alcohol content of (about) 12%, yet differ substantially in price.

For instance, a comparative study of eight different bars and restaurants in the city center of Ghent, Belgium showed that the price of a glass of red wine ranges from 3.5 to 6 EUR (with the exception of exclusive wines), whereas customers pay 8 to 12 EUR for a glass of champagne. This price difference is also found in Belgian supermarkets: a bottle of champagne (75cl) ranges from 13 EUR (e.g. Comptesse De Gramont, brut) to 60 EUR (e.g. Piper Heidsieck, brut magnum). A bottle of red wine (75cl), on the other hand, can be bought for 2.8 EUR (e.g. Bordeaux 2013), yet prices over 15 EUR are rather scarce (e.g. Chateau Cap de Mourlin 2012) (e.g. Colruyt, www.colruyt.collectandgo.be; Delhaize, www.http://shop.delhaize.be).

2.3. MEASURES AND PROCEDURE

To verify that expensive beverages are used by young adults as cues of certain qualities and traits, participants were asked to assess two visual displays (either male or female) on a series of characteristics. An introductory text clarified the question, explaining that the participants would view two pictures showing the same person but with a different beverage. They were asked to imagine seeing those people in a bar, alone, drinking the beverages depicted on the right side of the display. Subsequently, participants were instructed to indicate to which of the two pictures (i.e. beverages), the characteristic fitted best. The position of the two beverages was randomized, ensuring that wine and champagne were alternately on the left side of the screen.

Subsequently, the actual question appeared (Which of the two fits best with the following characteristics?), showing the two visual displays with a list of characteristics: (a) has social status and prestige (b) owns money (c) is single (d) is in a relationship. The four characteristics were presented in a random order. In addition, a timer in the left corner of the screen indicated that participants had 20 seconds to fill in the questions.
seconds/characteristic). After 20 seconds, the online experiment automatically advanced to the next page.

The following page showed the same two visual displays (either male or female), yet showed three statements concerning a person’s sexual strategy. More specifically, the three attitudinal items of the Revised Sociosexual Inventory Orientation scale (SOI-R, Penke & Asendorpf, 2008) were shown (e.g. *Sex without love is OK*). Participants were asked the following: ‘*Which of the two persons fits best with the following statements. Assume that the persons in the picture would be making the statement*’. As only the third statement of the SOI-R was long-term mating oriented, results of this statement were recoded to ensure that confirmation with all three statements signaled sexual unrestrictedness. On this page, participants had 30 seconds to fill in the question (10 seconds/statement). Again participants were automatically directed to the following page after 30 seconds.

Subsequently, opposite-sex participants were asked to indicate who they would chose for either (a) a one-night stand or short-term affair or (b) a long-term, romantic relationship. Participants had 10 seconds to fill in the attractiveness questions (5 seconds/question). On a final page, respondents indicated their sex and age.

### 2.4. Statistical Analyses

To analyze if both men and women perceived a person drinking an expensive alcoholic beverage differently compared to one who is drinking a beverage similar in alcohol content but less expensive, Chi² was used with a continuity correction. In addition, to ensure that the proportion of participants who chose the person with the expensive beverage for a specific trait differed significantly from the proportion that preferred the version with the less costly beverage, a percentage test was conducted. This percentage test verified that the proportions significantly deviated from a 50/50 ratio. A percentage test was also used to analyze the preferred short-term and long-term mating partner.
Similar statistical analyses were conducted in other experiments using a forced choice design (Vyncke, 2011).

2.5. Results

Results (cf. Table 1) clearly showed that both a young man and a young woman drinking champagne were perceived as having more resources and a higher social status compared to a person drinking a glass of wine. Moreover, when drinking an expensive alcoholic beverage, young adults were also perceived to be single and short-term oriented in their sexuality, more so than when they were drinking a glass of wine. As can be seen in Table 2, this perception of male and female drinkers did not significantly differ depending on the sex of the participants, as there were no significant Continuity Correction Chi²’s.

Table 1: Perceived characteristics as a function of the expensiveness of the drink

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>% Champagne</th>
<th>% Wine</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male drinker</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>64.7</td>
<td>35.3</td>
<td>*</td>
</tr>
<tr>
<td>Resources</td>
<td>71.4</td>
<td>28.6</td>
<td>*</td>
</tr>
<tr>
<td>Single</td>
<td>76.9</td>
<td>23.1</td>
<td>*</td>
</tr>
<tr>
<td>Relationship</td>
<td>16.9</td>
<td>83.1</td>
<td>*</td>
</tr>
<tr>
<td>ST-mating 1</td>
<td>83.1</td>
<td>16.9</td>
<td>*</td>
</tr>
<tr>
<td>ST-mating 2</td>
<td>82.4</td>
<td>17.6</td>
<td>*</td>
</tr>
<tr>
<td>ST-mating 3</td>
<td>89.9</td>
<td>10.1</td>
<td>*</td>
</tr>
<tr>
<td>Female drinker</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>81.3</td>
<td>18.8</td>
<td>*</td>
</tr>
<tr>
<td>Resources</td>
<td>82.2</td>
<td>17.2</td>
<td>*</td>
</tr>
<tr>
<td>Single</td>
<td>76.6</td>
<td>23.4</td>
<td>*</td>
</tr>
<tr>
<td>Relationship</td>
<td>17.5</td>
<td>82.5</td>
<td>*</td>
</tr>
<tr>
<td>ST-mating 1</td>
<td>85.3</td>
<td>14.7</td>
<td>*</td>
</tr>
<tr>
<td>ST-mating 2</td>
<td>91.3</td>
<td>8.7</td>
<td>*</td>
</tr>
<tr>
<td>ST-mating 3</td>
<td>82.4</td>
<td>17.6</td>
<td>*</td>
</tr>
</tbody>
</table>
Table 2: Male and female perceptions of characteristics as a function of expensiveness of the drink

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sex</th>
<th>% Champagne</th>
<th>% Wijn</th>
<th>Chi²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male drinker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>Men</td>
<td>62.2</td>
<td>37.8</td>
<td>χ²(1, N = 68) = 0.05, p = .822.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>67.7</td>
<td>32.3</td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td>Men</td>
<td>80</td>
<td>20</td>
<td>χ²(1, N = 63) = 1.97, p = .161.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>60.7</td>
<td>39.3</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>Men</td>
<td>83.3</td>
<td>16.7</td>
<td>χ²(1, N = 65) = 1.15, p = .284.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>69</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Relationship</td>
<td>Men</td>
<td>16.7</td>
<td>83.3</td>
<td>χ²(1, N = 65) = 0.00, p = 1.00.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>17.2</td>
<td>82.8</td>
<td></td>
</tr>
<tr>
<td>ST-mating 1</td>
<td>Men</td>
<td>80.6</td>
<td>86.2</td>
<td>χ²(1, N = 65) = 0.07, p = .786.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>19.4</td>
<td>13.8</td>
<td></td>
</tr>
<tr>
<td>ST-mating 2</td>
<td>Men</td>
<td>81.6</td>
<td>83.3</td>
<td>χ²(1, N = 68) = 0.00, p = 1.00.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>18.4</td>
<td>16.7</td>
<td></td>
</tr>
<tr>
<td>ST-mating 3</td>
<td>Men</td>
<td>89.5</td>
<td>90.3</td>
<td>χ²(1, N = 69) = 0.00, p = 1.00.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>10.5</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female drinker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>Men</td>
<td>77.4</td>
<td>22.6</td>
<td>χ²(1, N = 64) = 0.19, p = .660.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>84.4</td>
<td>15.2</td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td>Men</td>
<td>77.4</td>
<td>87.9</td>
<td>χ²(1, N = 64) = 0.60, p = .437.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>22.6</td>
<td>12.1</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>Men</td>
<td>73.3</td>
<td>79.4</td>
<td>χ²(1, N = 64) = 0.08, p = .782.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>26.7</td>
<td>20.6</td>
<td></td>
</tr>
<tr>
<td>Relationship</td>
<td>Men</td>
<td>24.1</td>
<td>11.8</td>
<td>χ²(1, N = 63) = 0.92, p = .339.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>75.9</td>
<td>88.2</td>
<td></td>
</tr>
<tr>
<td>ST-mating 1</td>
<td>Men</td>
<td>81.8</td>
<td>88.6</td>
<td>χ²(1, N = 68) = 0.20, p = .658.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>18.2</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>ST-mating 2</td>
<td>Men</td>
<td>87.9</td>
<td>94.4</td>
<td>χ²(1, N = 69) = 0.29, p = .590.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>12.1</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>ST-mating 3</td>
<td>Men</td>
<td>78.8</td>
<td>85.7</td>
<td>χ²(1, N = 68) = 0.19, p = .667.</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>21.2</td>
<td>14.3</td>
<td></td>
</tr>
</tbody>
</table>
Moreover, as shown in Table 3, young men preferred a young woman drinking champagne as a short-term mating partner, whereas a young woman drinking wine was preferred as a long-term mating partner. Similarly, women found the champagne drinking man more attractive for a short-term affaire or one-night stand, but preferred the wine drinker as a steady partner in a romantic relationship.

Table 3: Attractiveness as a function of expensiveness of the drink

<table>
<thead>
<tr>
<th>Attractiveness</th>
<th>% Champagne</th>
<th>% Wine</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male drinker</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST-relation</td>
<td>85.2</td>
<td>14.8</td>
<td>*</td>
</tr>
<tr>
<td>LT-relation</td>
<td>10.3</td>
<td>89.7</td>
<td>*</td>
</tr>
<tr>
<td>Female drinker</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST-relation</td>
<td>86.7</td>
<td>13.3</td>
<td>*</td>
</tr>
<tr>
<td>LT-relation</td>
<td>19.4</td>
<td>80.6</td>
<td>*</td>
</tr>
</tbody>
</table>

2.6. DISCUSSION

This first experiment confirmed that drinking expensive alcoholic beverages affects young adults’ perception of the drinking person. Confirming the hypotheses, young adults consuming an expensive alcoholic beverage were perceived as having status and resources, being single and having a short-term oriented mating orientation. In line with these results, drinking champagne was also preferred in a short-term mating partner, but not in a long-term mating partner. However, as this exploratory experiment was limited to a forced choice design, this study could not verify that champagne functioned as a cue for resources and status, as well as a cue of an unrestricted sexuality in both young men and women because of its higher price. Moreover, although wine and champagne have an equal alcohol content but differ in price, no study verified that young adults actually perceive champagne as more expensive in price, yet similar in alcohol
content. Therefore, a second study was conducted, also focusing on young adults' perception.

3. STUDY 2

3.1. DESIGN AND PARTICIPANTS

A 2 (sex participants) x 4 (cheap drink man, expensive drink man, cheap drink woman, expensive drink woman) between-subjects experimental design was used to verify that the functioning of expensive alcoholic beverages as a status and resources cue, and as a short-term mating cue is positively mediated by the expensiveness of the alcoholic consumption. Similar to study 1, visual display sets were used, showing either a young woman or a young man with an expensive or cheaper alcoholic beverage. However, contrary to the first study, participants were asked to assess one visual display on several 7-point scales. A total sample of 253 heterosexual young adults took part in the online experiment, aged between 18 and 27 years old (M = 21.05, SD = 1.63). Only five participants indicated never drinking any alcohol.

3.2. MATERIALS

The four visual displays of study 1 were reused in this second study. In both the male and female visual display set, one display showed a profile picture of a young adult with a glass of red wine, whereas a second display showed the same person with a glass of champagne.

3.3. MEASURES AND PROCEDURE

When opening the link to the online experiment, a short introduction explained that participants would assess one person on a number of characteristics. Participants were told that they were about to view a picture consisting of a person and an alcoholic
beverage and they were instructed to imagine seeing this person in a bar, drinking the alcoholic beverage on the display. This display would be visible for four seconds, after which a short list of characteristics would appear. This time constraint was added to stimulate respondents to answer spontaneously, based on their first impression.

After viewing the visual display, participants were asked how they would assess the person in the display on the following characteristics: (a) has social status, prestige (b) owns money, is financially successful (c) is flirty (d) is faithful in a relationship. Contrary to the first experiment, young adults’ mating strategy was measured by means of two characteristics inherent to having either a short-term mating orientation (flirtiness) or a long-term mating orientation (faithfulness). A second question asked the participants how they perceived the expensiveness and alcohol content of the drink in the visual display. All answers were given on a 7-point Likert scale, ranging from 1 (very low) to 7 (very high). Finally, participants were asked to fill in their sex and age and to indicate if they sometimes consumed alcohol.

3.4. RESULTS

As we were interested in how young men and young women are perceived when drinking expensive alcoholic beverages, we preferred to conduct the analyses on the male profiles and female profiles separately.

3.4.1. MANIPULATION CHECK

To start, two three-way mixed ANOVAs were conducted, to verify that young adults perceive champagne as more expensive than wine, but equal in alcohol content. Perceived alcohol content and perceived expensiveness formed the within-subjects factor ‘beverage perception’, with alcoholic beverage (wine vs champagne) and sex of the participants as between-subjects factors.
As expected, results showed a significant interaction effect between the beverage perception and the kind of alcoholic beverage, both in the male profiles ($F(1, 97) = 21.26$, $p < .001$, $\eta^2_p = .180$) and the female profiles ($F(1, 97) = 18.35$, $p < .001$, $\eta^2_p = .159$). No significant three-way interactions with sex of the participants were present, not in the male profiles ($F(2, 97) = 2.02$, $p = .159$, $\eta^2_p = .020$), nor in the female profiles ($F(2, 97) = 0.10$, $p = .748$, $\eta^2_p = .001$). Follow-up simple effects analyses via the SPSS syntax (Field, 2013) confirmed that in the male profiles, champagne ($M = 3.57$, $SD = 1.50$) and red wine ($M = 3.72$, $SD = 1.43$) did not differ in their perceived alcohol content ($p = .631$). However, champagne ($M = 5.55$, $SD = 1.19$) was perceived as more expensive compared to red wine ($M = 4.34$, $SD = 1.52$; $p < .001$). Similarly, also in the female study, the alcohol content of champagne ($M = 3.43$, $SD = 1.03$) and red wine ($M = 3.27$, $SD = 0.98$) was not perceived significantly different ($p = .258$), whereas champagne ($M = 4.72$, $SD = 1.15$) was perceived to be significantly more costly than wine ($M = 3.67$, $SD = 1.02$; $p < .001$).

3.4.2. Expensive drinks as a resources and social status cue

To verify that also in this second experiment both a young man and a young woman drinking champagne were perceived as having a higher social status and more money, two three-way mixed ANOVAs were conducted (one for the male profiles, one for the female profiles). Perceived level of social status and amount of money functioned as the variables of the within-subjects factor ‘perceived resources’. Sex of the participants and kind of alcoholic beverage (red wine vs. champagne) served as independent variables.

For the male profiles, results showed no significant interaction effect between perceived resources and the alcoholic beverage ($F(1, 122) = 0.48$, $p = .492$, $\eta^2_p = .004$), nor a three-way interaction between perceived resources, kind of alcoholic beverage and sex of the participants ($F(1, 122) = 0.40$, $p = .530$, $\eta^2_p = .003$). A significant main effect of kind of beverage, on the other hand, was present ($F(1, 122) = 12.88$, $p < .001$, $\eta^2_p = .095$). Accordingly, perceived resources where higher when drinking champagne ($M = 5.32$, $SE = .17$) compared to when drinking wine ($M = 4.47$, $SE = .17$).
Also for the female profiles, both the two-way interaction between perceived resources and alcoholic beverage \((F(1, 123) = 2.44, p = .121, \eta^2_p = .019)\) and the three way interaction with sex of the participants \((F(1, 123) = 2.29, p = .132, \eta^2_p = .018)\) was nonsignificant. However, the main effect of kind of beverage on perceived resources was significant \((F(1, 123) = 8.46, p = .004, \eta^2_p = .064)\). Similar to male drinking behavior, perceived resources were higher when a young woman drank champagne \((M = 4.29, SE = .12)\) than when she consumed a glass of red wine \((M = 3.81, SE = .12)\).

Follow-up separate independent t-tests confirmed that, for both the male profiles and female profiles, there was a significant main effect of choice of beverage for social status \((t_{male}(119.99) = -2.64, p = .009, r = .23; t_{female}(125) = -2.10, p = .038, r = .18)\), as well as having a lot of money \((t_{male}(124) = -3.76, p < .001, r = .32; t_{female}(125) = -3.83, p < .001, r = .32)\). As can be seen in Figure 1, a young man and a young woman were perceived as having a higher social status and possessing more money when drinking champagne, compared to when drinking wine.

![Figure 1: Perceived resources depending on the expensiveness of the drink](image)
3.4.3. Expensive Drinks as a Short-term Mating Cue

Additionally, two three-way mixed ANOVAs were conducted (one for the male profiles, one for the female profiles), to analyze if young adults who drink champagne were perceived as more flirty but less faithful compared to when drinking wine. Perceived flirtiness and faithfulness formed the within-subjects factor ‘perceived sexuality’, while alcoholic beverage and sex of the participant were the between-subjects factors.

For both a young man \(F(1, 122) = 6.20, p = .014, \eta^2_p = .048\) and a young woman \(F(1, 123) = 5.36, p = .022, \eta^2_p = .042\), results showed a significant interaction between the perceived sexuality and the alcoholic beverage. No significant three-way interaction with sex of the participants was present in the male profiles \(F(1, 122) = 0.003, p = .960, \eta^2_p < .001\), nor in the female profiles \(F(1, 123) = 0.88, p = .350, \eta^2_p = .007\).

Follow-up analyses further clarified that the perceived flirtiness of a young man drinking champagne \((M = 4.42, SD = 1.77)\) did not significantly differ from a young man drinking wine \((M = 4.10, SD = 1.58; p = .263)\), yet a young man drinking champagne \((M = 3.91, SD = 1.56)\) was perceived as significantly less faithful compared to when he was drinking a glass of red wine \((M = 4.68, SD = 1.40; p = .005)\). A young woman, on the other hand, was perceived as more flirty when drinking a glass of champagne \((M = 3.48, SD = 1.12)\) than when drinking a glass of wine \((M = 3.06, SD = 1.17; p = .043)\). However, there were no significant differences in women’s perceived faithfulness when drinking a glass of champagne \((M = 4.25, SD = 0.97)\) or a glass of wine \((M = 4.40, SD = 0.88; p = .180)\).

3.4.4. The Mediating Impact of Perceived Expensiveness

Finally, we also verified that champagne functions as a cue of status, money and sexual unrestrictedness because of its expensiveness. Therefore, six mediation analyses (three for the male profiles, three for the female profiles) were conducted, using model 4 of the PROCESS macro of Hayes (Hayes, 2013; http://www.afhayes.com). Additionally, six
moderated mediations were conducted (model 14), to investigate if the mediating effect of perceived expensiveness on status, resources and unrestricted sexuality perception is moderated by the sex of the participants. Bias-corrected bootstrapping (with 5000 bootstrap samples) was used to generate 95% confidence intervals around the indirect effects of perceived expensiveness of the beverage on (1) the perceived level of social status and (2) on the perceived amount of money and (3) perceived faithfulness (men) vs. flirtiness (women). Mediation occurs when the confidence intervals exclude zero. The perceived level of social status, the perceived amount of money and the perceived level of faithfulness / flirtiness were used as separate outcome variables, with alcoholic beverages as independent variable. When using model 14, sex functioned as moderator V.

For both a young man and a young woman, results (see Table 4) showed a significant positive indirect effect of drinking a glass of champagne on the perceived social status, via the perceived expensiveness of the drink. These findings indicate that when drinking champagne compared to wine, the perceived expensiveness rises, leading to a higher perceived status. A similar positive mediating effect was found for the perceived level of money of a young woman drinking champagne. However, for men, the mediating impact of perceived expensiveness of the beverage on perceived level of money and resources was moderated by the sex of the participants. Conditional indirect effects at both values of the moderator sex showed that only among male participants, there was a positive mediation through perceived expensiveness of the drink ($ab = .483$, $SE = .191$, 95% LLCI = .164, 95% ULCI = .921). No mediation was present among the female participants ($ab = -.062$, $SE = .174$, 95% LLCI: = -.419, 95% ULCI = .272). Additionally, there were also no significant mediating effects of perceived expensiveness of the alcoholic beverages on the perceived level of faithfulness and flirtiness.
Table 4: The mediating impact of perceived expensiveness

<table>
<thead>
<tr>
<th>Mediator (x moderator)</th>
<th>Perception of young men</th>
<th>a*b</th>
<th>SE</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived expensiveness beverage (Model 4)</td>
<td>Social status*</td>
<td>.322</td>
<td>.148</td>
<td>.082</td>
<td>.692</td>
</tr>
<tr>
<td></td>
<td>Money/resources</td>
<td>.225</td>
<td>.149</td>
<td>-.037</td>
<td>.558</td>
</tr>
<tr>
<td></td>
<td>Faithfulness</td>
<td>.024</td>
<td>.148</td>
<td>-.275</td>
<td>.305</td>
</tr>
<tr>
<td>Perceived expensiveness beverage x sex (Model 14)</td>
<td>Social status*</td>
<td>-.145</td>
<td>.245</td>
<td>-.644</td>
<td>.328</td>
</tr>
<tr>
<td></td>
<td>Money/resources*</td>
<td>-.545</td>
<td>.238</td>
<td>-.109</td>
<td>-.129</td>
</tr>
<tr>
<td></td>
<td>Faithfulness</td>
<td>-.051</td>
<td>.266</td>
<td>-.577</td>
<td>.490</td>
</tr>
<tr>
<td>Perceived expensiveness beverage (Model 4)</td>
<td>Social status*</td>
<td>.285</td>
<td>.112</td>
<td>.091</td>
<td>.540</td>
</tr>
<tr>
<td></td>
<td>Money/resources*</td>
<td>.372</td>
<td>.125</td>
<td>.167</td>
<td>.648</td>
</tr>
<tr>
<td></td>
<td>Faithfulness</td>
<td>.116</td>
<td>.107</td>
<td>-.082</td>
<td>.341</td>
</tr>
<tr>
<td>Perceived expensiveness beverage x sex (Model 14)</td>
<td>Social status</td>
<td>.046</td>
<td>.181</td>
<td>-.253</td>
<td>.452</td>
</tr>
<tr>
<td></td>
<td>Money/resources</td>
<td>-.066</td>
<td>.158</td>
<td>-.410</td>
<td>.227</td>
</tr>
<tr>
<td></td>
<td>Flirtiness</td>
<td>-.000</td>
<td>.199</td>
<td>-.396</td>
<td>.395</td>
</tr>
</tbody>
</table>

*= significant indirect effect
a*b = indirect effect of X on Y through M;
LLCI = lower level confidence interval; ULCI = upper level confidence interval

3.5. DISCUSSION

The second experiment confirmed that even without a forced choice design, drinking an expensive drink clearly functioned as a cue indicating young adults’ status and resources, through the cost of the beverage. Additionally, here too, expensive beverages displayed information about youngsters’ mating orientation, perceiving men drinking champagne as less faithful in relationships, and women drinking champagne as more flirty. However, to function as a short-term mating signaling strategy, young adults must engage in expensive drinking behavior in short-term mating contexts. To our knowledge, no study empirically investigated whether this is actually the case. Therefore, a third experimental study tested whether short-term mating intentions increase young adults’ spending on alcohol.
4. STUDY 3

4.1. DESIGN AND PARTICIPANTS

A third experiment was conducted to study if short-term mating intentions trigger expensive drinking behavior in young adults. Therefore, a 2 (sex) x 2 (priming conditions: short-term mating vs long term mating) between-subjects experimental design was used. The priming methodology consisted of a guided visualization task, in which participants read a scenario followed by empathy questions to help visualize the described scenario and to stimulate them into empathizing with the scenario. This priming methodology is based on previous research on signaling behavior, using priming to elicit mating related motivations (Vincke, 2017; Wang & Griskevicius, 2014). Moreover, previous studies also showed that a priming method can be used to elicit both short-term and long-term mating motivations in young adults (Greitemeyer et al., 2013; Sundie et al., 2011; Vincke, 2017).

As the study concerned expensive alcohol consumption, only young adults who drink alcohol took part in the experiment. Moreover, also the data of 14 participants who indicated preferring nonalcoholic drinks in the described mating conditions were not taken into account (five participants in the short-term mating condition, nine participants in the long-term mating condition). Additionally, due to the heterosexual perspective in the scenarios of the two mating priming conditions, participants with a homosexual orientation were omitted from the sample, as well as participants who did not complete the visualization task. Consequently, our final sample consisted of 217 young adults between the age of 18 and 27 years old ($M = 21.22$, $SD = 1.48$), of which 68.7% women and 31.3% men. In Belgium, the legal drinking age is 18 for distilled spirits and 16 for all other alcoholic beverages, making all participants legal alcohol consumers (www.health.belgium.be).
4.2. MATERIALS

**Priming methodology.** The experiment used two priming conditions (1) short-term mating, (2) long-term mating. Participants were randomly assigned to one of the two conditions. In each of the two priming conditions, participants read a short story of circa 300 words, consisting of four parts. Each part was followed by a question, to stimulate participants into empathizing with the scenario. The first question assessed how an attractive short-term or long-term mating partner would be (e.g. *Describe who would interest you for a short-term sexual adventure. How does he/she look like?*). Additionally, participants were also instructed to keep this person in mind when reading the scenario. The following questions asked the participants to write down (briefly) how they would feel in that particular moment, as described in the scenario.

In the **short-term mating condition**, the scenario started with instructing the participants to image being single, and highly interested in short-term sexual adventures and casual relationships. Then, the scenario described how on a Friday evening, the main character makes eye contact with an attractive man/woman in a bar. They approach each other and start talking. He/she tells the main character that he/she is travelling through Europe and will be leaving the country soon. The main character feels really attracted to this person, and hopes that they will do more than just talking.

In the **long-term mating condition**, on the other hand, participants were instructed to envision that they are single, but only interested in a committed, long-term romantic relationship with that one special person. Then, the scenario described how on a Friday evening, in a bar, the main character recognizes an attractive man/woman he/she knows from the past, and for whom he/she used to have romantic feelings. The main character approaches this person, and they have a very pleasant conversation. The main character feels a strong connection with this person, and hopes to spend more time together.
Manipulation check. To ensure that the visualization task elicited the right feelings, participants were asked to indicate which emotions they felt after reading the scenario. A list of 5 emotions was presented: (a) sexual arousal, (b) desire, (c) romantic feelings, (d) amorousness, (e) enthusiasm. Additionally, a second question assessed to what extent the scenario elicited the following motivations: (f) making an attractive impression, (g) pursuit of a short term relationship, (h) pursuit of a long term relationship, (i) enjoying yourself, having fun. The order of the emotions and motivations was randomized. Answers were given on a 5-point Likert scale ranging from 1 (Not at all) to 5 (Very much).

Alcohol measures. Subsequently, two questions assessed the expensiveness of participants’ drinking behavior. A first question assessed participants’ price preference, by asking which drink they would order on that Friday evening, as described in the priming scenario. More specifically, participants were asked to indicate the price of the drink he/she would order on a 7-point scale, ranging from 2 to 14 EURO. In addition, also the total amount of money spent was assessed, by asking the maximum amount of money participants’ would spend on alcohol, in a period of two hours’ time. Participants could give a number between 0 and 120 EUR.

However, to verify that this amount of money is not limited to the cost of the purchased beverages, an additional question assessed the maximum amount of alcoholic beverages that young adults would be willing to drink in two hours’ time, on the Friday evening as described in the priming scenario. Participants were instructed to give a number between 0 and 20. Subsequently, a new variable was computed, multiplying the amount of drinks with the cost of the preferred alcoholic beverage.

Finally, to ensure that only alcohol drinkers took part in the experiments, participants were asked to indicate if they sometimes consumed alcohol.
**Sexual strategy.** To measure participants’ mating orientation, the three attitudinal items of the Revised Sociosexual Orientation Inventory scale (Penke & Asendorpf, 2008) were used (cf. Study 1). Accordingly, participants were asked to indicate their level of sexual unrestrictedness on three statements (e.g. *Sex without love is OK*.), followed by a 7-point Likert scale ranging from 1 (*I completely disagree*) to 7 (*I completely agree*). The SOI-R had sufficient internal consistency ($\alpha = .73$), in which a higher score indicated a more unrestricted sexuality.

4.3. **PROCEDURE**

Participants agreeing to take part in the experiment were randomly assigned to one of the two priming conditions. First, participants were asked about their sex, age, sexual orientation and drinking behavior. This was followed by the SOI-R. Subsequently, participants read the priming scenario with visualization questions, and filled in the manipulation check, followed by the measures of alcohol consumption.

4.4. **RESULTS**

4.4.1. **MANIPULATION CHECK**

To verify that the visualization task elicited the right emotions, a three-way mixed ANOVA was conducted. The five emotions functioned as the within-subjects factor ‘emotions’, whereas sex of the participants and priming version (ST mating vs. LT mating) served as independent factors. Given the violation of the assumption of sphericity ($p < .001$; $\varepsilon_{\text{Greenhouse-Geisser}} = .81$), the Huynh-Feldt correction was used. Results showed a significant interaction between the within-subjects factor ‘emotions’ and priming version ($F(3.32, 707.23) = 29.18, p < .001, \eta_p^2 = .120$), whereas the three-way interaction between emotions, priming version and sex of the participants was nonsignificant ($F(3.32, 707.23) = 1.58, p = .187, \eta_p^2 = .007$). Follow-up pairwise comparisons (see Figure 2) through the SPSS syntax (Field, 2013) confirmed that sexual arousal was significantly higher in the
short-term mating condition ($p = .002$), whereas romantic feelings ($p < .001$) and amorousness ($p < .001$) were significantly higher in the long-term mating condition. The level of desire did not differ significantly between the two mating primes ($p = .967$), as well as the level of experienced enthusiasm ($p = .795$).

A similar three-way mixed ANOVA was conducted to verify that the two priming conditions elicited the right motivations, using the four motivations as within-subjects factor, with sex and priming version as between-subjects variables. Due to a significant Mauchly’s test of sphericity ($p < .001$, $\varepsilon_{\text{Greenhouse-Geisser}} = .85$), the Huynh-Feldt correction was opted for. Here also, results showed a significant two-way interaction between the motivations and priming version ($F(2.61, 555.80) = 16.55$, $p < .001$, $\eta_p^2 = .072$), yet a nonsignificant three-way interaction with the variable sex ($F(2.61, 555.80) = 2.47$, $p = .070$, $\eta_p^2 = .011$). As expected (see Figure 2), simple effects analyses of the main effect indicated that participants in both mating conditions were equally motivated to make an attractive impression ($p = .345$) and enjoy themselves ($p = .414$). However, young adults were more motivated to pursue a short-term relationship in the short-term mating condition ($p < .001$), and more motivated to pursue a long-term relationship in the long-term mating condition ($p = .022$).
4.4.2. The impact of short-term mating on the price of the preferred drink

To investigate if short-term mating intentions affect the price of the preferred drink, a three-way interaction moderation analysis was conducted, using model 3 of the PROCESS procedure of Hayes (Hayes, 2013; http://www.afhayes.com). Corresponding to similar research on short-term mating signaling behavior (Sundie et al., 2011; Vincke, 2017), participants’ mating orientation (SOI-R) and sex were included as moderating variables. The price of the first drink functioned as the outcome variable Y, mating condition as independent variable X. Sex of the participants (M) and their sociosexual orientation (W) functioned as moderators. Results showed no significant three-way
interaction between mating condition, sex and mating orientation on the price of the preferred drink ($B = .28$, $SE = .22$, $t(208) = 1.26$, $p = .209$).

Additionally, a two-way univariate ANOVA was conducted, with priming version and sex of the participants as between-subjects factors and price of the preferred drink as dependent variable. However, results also showed no significant main effect of priming version on the price of the preferred drink ($F(1, 213) = 0.44, p = .508, \eta^2_p = .002$), as well as no significant priming x sex interaction ($F(1, 213) = 0.57, p = .453, \eta^2_p = .003$). Both in the short-term mating condition ($M = 2.18$, $SD = 0.93$, $Mdn = 2$) and in the long-term mating condition ($M = 2.14$, $SD = 0.98$, $Mdn = 2$), young adults preferred to order a drink of approximately 4 EUROs.

4.4.3. The impact of short-term mating on the amount of money spent

Again, model 3 of the PROCESS macro was used for a three-way interaction between priming version (X), sex (M) and mating orientation (W) of the participants on the amount of money young adults were willing to spend on alcohol (Y). However, results found no significant three-way interaction ($B = 3.12$, $SE = 2.58$, $t(208) = 1.21$, $p = .229$). A following two-way univariate ANOVA with sex and priming version as between-subjects factors also did not find a significant two-way interaction effect ($F(1, 213) = 2.54, p = .113, \eta^2_p = .012$), yet did find a significant main effect of the mating condition on the spending behavior of young adults ($F(1, 213) = 10.48, p = .001, \eta^2_p = .047$). Accordingly, young adults were willing to spend more money in a short-term mating situation ($M = 21.38$, $SD = 15.18$) than in a long-term mating situation ($M = 16.48$, $SD = 7.18$).

However, as participants could fill in an amount between 0 and 120 EUR, and given that a number of participants in the short-term mating condition was willing to spend high amounts of money, there were large differences in variances between the two conditions (Levene’s test of equality of variances: $p < .001$). Therefore, as an additional verification of the significant main effect of mating condition on the amount of money participants were willing to spend, a univariate ANOVA was conducted, using the Brown-Forsythe test.
Brown-Forsythe can be considered an alternative F-ratio, that is robust when the homogeneity of variance is violated (Field, 2013). This was followed by two separate univariate ANOVAs for men and women – also using the Brown-Forsythe F-ratio – by means of a split file on sex. Results confirmed the two-way ANOVA, showing a significant effect of the mating condition on the amount of money young adults were willing to spend on a night out ($F(1, 156.41) = 9.34, p = .003$). In addition, as can be seen in Figure 3, both young men ($F(1, 45.92) = 4.41, p = .041$) and young women ($F(1, 142.47) = 5.40, p = .022$) indicated spending significantly more in a short-term mating situation compared to a long-term situation.

![Figure 3: The amount of money spent depending on the mating condition.](image)

To ensure that the higher amount of money spent on alcohol is not limited to the actual cost of drinking a larger amount of alcoholic beverages, an additional three-way mixed ANOVA was conducted. The within-subjects factor ‘spending’ consisted of the new variable calculating the actual cost of the amount of beverages young adults were willing to consume (cf. measures), and the maximum amount of money participants were willing...
to spend on alcohol. Priming version and sex of the participants were the two between-subjects factors. Results showed a slightly nonsignificant interaction between the spending variable and the priming version \( F(1, 212) = 2.91, p = .090, \eta_p^2 = .014 \), and a highly nonsignificant three-way interaction with sex of the participants \( F(1, 212) = 0.034, p = .853, \eta_p^2 < .001 \). Simple effects analyses clarified that in both the short-term mating condition and long-term mating condition, the amount young adults were willing to spend in two hours’ time was significantly higher than the actual cost of the alcoholic beverages \( (ps < .001) \). However, the difference between the two amounts was higher in the short-term mating condition \( (M_{\text{difference}} = 5.29, p < .001) \), than the long-term mating condition \( (M_{\text{difference}} = 2.77, p = .065) \).

4.4.4. The mediating impact of short-term mating motivations on alcohol spending

To confirm that the effect of a short-term mating prime on alcohol spending is positively mediated by the extent to which young adults are motivated to pursue a short-term relationship, model 4 of the PROCESS procedure of Hayes was used. As the mating condition only affected the amount of money young adults were willing to spend, and not the expensiveness of a preferred drink, only one mediation analysis was conducted. To test the proposed underlying process, we used bias-corrected bootstrapping to generate a 95% confidence interval around the indirect effect of short-term mating motivations, where mediation occurs if the confidence interval excludes zero (Hayes, 2013). Amount of money that participants were willing to spend was used as outcome variable \( (Y) \), priming version as independent variable \( (X) \) and the desire to pursue a short-term relationship as mediator \( (M) \). Confirming hypothesis 7, results showed a highly significant positive indirect effect of the mating prime on alcohol spending, via their motivation to engage in a short-term relationship \( (ab = 1.421, SE = .797; 95\% \text{ LLCI} = .062, 95\% \text{ ULCI} = 3.193) \). As predicted, a short-term mating condition increased the motivation to pursue a short-term relationship, which made participants more willing to spend a larger sum of money on drinking behavior.
Additionally, by means of model 14 of the PROCESS macro (Hayes, 2013), we tested if the mediating effect of short-term mating motivations on alcohol spending was moderated by the sex of the participants. The analysis (5000 bootstraps; 95% bias-corrected confidence intervals) revealed no significant moderated mediation ($ab = -.400, SE = 1.886$, $95\%\ LLCI = -4.236$, $95\%\ ULCI = 3.253$). Accordingly, for both young men and young women, a short-term mating context increased the willingness to spend money on drinking behavior, via the desire to pursue a casual, short-term relationship.

4.5. DISCUSSION

The results of the priming study showed that a short-term mating context did not lead to a higher preference for an expensive alcoholic drink. However, both young men and young women were willing to spend more money in a short-term mating occasion, compared to a long-term mating occasion. Moreover, this willingness to spend a higher amount of money in a short-term mating situation was positively mediated by young adults’ motivation to pursue a casual, sexual relationship. Moreover, additional analyses suggested that this higher amount of money is not solely the result of buying a higher number of alcoholic beverages, yet more research remains necessary.

5. GENERAL DISCUSSION

5.1. DISCUSSION

Research on conspicuous consumption indicated that showy spending behavior is used by men as a short-term mating signaling strategy, displaying their status as well as a more sexually unrestricted mating orientation. Moreover, studies showed that for women expensive consumption functions as a cue of an unrestricted sexuality, while displaying information on their resources and status. As drinking alcohol also has a financial aspect – with e.g. some alcoholic beverages being much more expensive than
others – this paper investigated if expensive alcohol consumption affects young adults’ perception of peers’ resources (H1), relationship status (H2), mating orientation (H3) and sexual attractiveness (H4), and whether this is linked to the perceived expensiveness of the drink (H5). Moreover, we also empirically investigated if short-term mating motivations increase young adults’ expensive drinking behavior (H6 – H8). To answer these hypotheses, three studies were conducted.

A first experiment used a forced choice design to explore if a young adult was perceived differently when drinking an expensive alcoholic beverage (champagne) compared to drinking a less expensive beverage, yet similar in alcohol content and volume (wine). Results confirmed the first four hypotheses, clearly showing that both a young man and a young woman drinking champagne were perceived as having a higher social status, possessing more money, being single and having a more sexually unrestricted mating orientation. In addition, young adults drinking champagne were also preferred as a short-term mating partner.

A second study, using a different experimental design, confirmed the results of the first study, showing that drinking champagne increased the perceived social status and financial resources, compared to drinking wine, via the perceived expensiveness of the drink. Accordingly, the more expensive participants perceived a glass of champagne to be, the higher participants assessed a person’s social status and financial successfulness when drinking champagne instead of wine. However, although women also perceived champagne as higher in cost than wine, this positive mediation was not present among female participants when assessing the financial resources of a young man. Apparently, drinking champagne functioned as a cue of men’s financial successfulness, independent of how expensive the luxury drink was perceived to be.

Furthermore, when drinking champagne, men gave the impression of being less faithful in relationships, whereas women were perceived as more flirty. These results correspond with the studies of Sundie et al. (2011) and Hudders et al. (2014) showing that
both young men and young women who consume expensive, high-status products were perceived as having an unrestricted sexual strategy. Also, no significant mediation of perceived expensiveness of the alcoholic drink was present, indicating that the perceived level of sexual willingness (through faithfulness vs. flirtiness) did not rise if the perceived expensiveness of champagne increased. However, the manipulation check did confirm that young adults perceived drinking champagne as more expensive than drinking wine.

In summary, the results clearly showed that consuming expensive drinks functions as a cue of status and resources. In addition, the first two studies also confirmed that expensive drinking behavior, through beverage choice, functions as a cue indicating an unrestricted sexuality. However, to operate as a short-term signaling strategy, individuals must also engage in expensive drinking in short-term mating contexts. Therefore, the third experimental study investigated if short-term mating increased the participants’ spending behavior on alcohol. Unexpectedly, results showed that the mating context, either short-term or long-term, did not affect the expensiveness of the preferred alcoholic beverage of both young men and young women. In both situations, men and women preferred a drink of circa 4 EUROs. However, as the mean age of the sample was 21 years old, many of the participants were students with a limited income. Accordingly, for men, buying a drink of 4 EURO might be considered relatively expensive given that a beer costs between 2 EURO and 2.5 EURO in Belgium. Consequently, these findings could also indicate that men prefer expensive drinks in both a short-term and long-term mating context. As women search for cues of resources in both long-term and short-term mating partners (although showy spending is preferred more in a short-term sexual partner; Buss, 2012), a drink that is more expensive than an ‘ordinary’ beer might function as a suitable signal for resources in both sexually restricted and unrestricted men.

For women, the fact that there were no differences in the expensiveness of the preferred first drink corresponds with hypothesis 5. Moreover, a preferred drink of approximately 4 Euros also corresponds with the fact that wine is the most consumed alcoholic drink in female college students in Belgium (Rosiers et al., 2014), costing
between 3.5 EUR and 5 EUR for a glass. However, it is also possible that the limited budget of a young adult sample might have withheld women from engaging in additional signaling by ordering a more expensive drink. After all, study 3 indicated that women were willing to increase their spending behavior in a short-term mating situation.

Indeed, both sexes were willing to spend a larger amount of money when (imagining) interacting with an attractive potential short-term mating partner than a potential long-term romantic partner. Moreover, the more young adults were motivated to pursue a casual, sexual encounter, the more money they were willing to spend. However, as young adults are also stimulated to drink more alcoholic drinks in short-term mating contexts (Vincke, 2017), additional analyses verified whether the sexually short-term oriented participants’ higher spending behavior was not only the result of drinking – and paying – a higher amount of alcoholic beverages. Indeed, these follow-up analyses confirmed that the amount of money young adults’ were willing to spend in two hours’ time was not solely the financial cost that participants would have paid for their drinks. This was the case in both the long-term mating and short-term mating condition, yet the difference between the actual cost and the amount of money young adults were willing to spend was remarkably larger in the short-term mating condition. Possibly, these findings suggest a higher willingness to spend money on the potential opposite sex partner, for instance by offering drinks. However, more research is necessary to clarify why young adults are willing to spend a higher sum of money when pursuing a short-term mating partner compared to a long-term mating partner.

Moreover, women’s higher spending in a short-term mating context does contradict hypothesis 6, as well as existing literature showing no link between female conspicuous consumption and following a short-term mating strategy (Kruger, 2008; Sundie et al., 2011). Possibly, previous research might have focused too much on ‘male’ conspicuous status consumption to find a link between female short-term mating and spending behavior. Also the study of Hudders et al. (2014) indicates that there might be some kind of ‘female’ conspicuous consumption, as women in an intrasexual competitive
mating situation engaged in conspicuous consumption, but only when it concerned attractiveness enhancing products. Furthermore, other research showed that fertile women, near their ovulation period, paid more attention to status products (Lens, Driesmans, Pandelaere, & Janssens, 2012). Although the article explained these findings as a heightened interest for male status cues (even in the absence of men), these results could also indicate that short-term mating oriented women are interested in displaying more status themselves, perceiving status products as a means for reproduction. Indeed, research on the ovulatory shift hypothesis showed that women near ovulation become more sexually unrestricted in their mating behavior (Gangestad, Thornhill, & Garver-Apgar, 2010; Gildersleeve, Haselton, & Fales, 2014). Research also shows that certain men pay attention to women’s status consumption in a mating context, as materialistic men interpret women’s conspicuous consumption as a signal of requiring high financial standards in prospective partners (Lens, 2012).

5.2. Future Research and Limitations

Although findings in this paper suggest that expensive drinking behavior can function as a short-term mating signaling strategy in both young men and women, more research is necessary to confirm these results. After all, even though expensive beverages function as a cue of resources, status and a short-term mating orientation, no preferences for expensive drinks were found in primed short-term mating contexts. Future research should verify that these findings are not due to the young adult sample. As the mean age of the sample is 21 years old, many participants will be college and university students without a steady income. Consequently, future research should take into account the income of the participants. Moreover, in the first two experiments, expensive and non-expensive alcoholic drinks were limited to champagne and wine. These choices have been made because of the similar alcohol content, yet there is a wide array of alcoholic beverages that young adults drink when going out. Accordingly, future research could focus on identifying which other alcoholic beverages function as relevant mating cues.
Furthermore, this research only assessed the general amount of money young adults were willing to spend on alcohol, without gathering information on what this amount consists of. Also the additional analyses, calculating the financial cost of the amount of alcoholic drinks, were only a rough measure, as it only took into account the cost of the first drink. Future research should address this limitation, to find out if young adults are willing to pay more for expensive drinks, to treat potential partners etc. Moreover, as the results in this paper suggest that expensive drinking behavior might also function as a short-term mating signaling strategy in women, additional studies could look into the possibility of female conspicuous consumption in general as a short-term signaling strategy.

In addition, as all individuals have different mating orientations, using a priming scenarios to activate short-term and long-term mating motivations could also be a limitation to this paper. However, this priming methodology is based on previous research, in which extensive pretesting has been conducted to ensure that the two mating conditions elicited the appropriate emotions and motivations (Vincke, 2017). This was also confirmed in two manipulation checks, within the actual experiment. In addition, we also took into account the actual sociosexual orientation of the participants in the statistical analyses, yet no moderating impact was found.

Finally, these studies focused on the functioning of expensive drinking behavior as a short-term mating cue and signal. However, as this paper clearly showed that expensive alcohol use functions as a status cue, future research could also investigate the signaling function of expensive drinking behavior in male intrasexual competition. Moreover, as individuals can also spend money on treating acquaintances and friends, expensive alcohol consumption can even function as a signaling strategy in social bonding and friendship contexts. Consequently, by focusing on expensive drinks, this paper only explored the signaling function of expensive drinking behavior. However, much research remains necessary to fully understand the signaling function of expensive drinking behavior.
5.3. **CONCLUSION**

Based on literature on conspicuous consumption, this paper explores if expensive drinking behavior could function as a signaling strategy in young adults. The results show that expensive alcoholic drinks function as a cue of status and money, via the perceived expensiveness. Moreover, drinking an expensive beverage displays sexual willingness, and even enhances young adults’ attractiveness as a short-term mating partner. In addition, results showed no difference in the expensiveness of the preferred first drink depending on the mating context. However, young adults were willing to spend a larger amount of money in a short-term mating situations. Consequently, expensive drinking behavior could be used by both young men and women as a signal of both their resources and status, as well as their short-term sexual orientation, as parts of a short-term mating strategy. This paper contributes to research on the signaling dimension of alcohol consumption, as well as research on conspicuous consumption. Moreover, as this paper focuses on motivations to engage in drinking behavior, results might be of interest to social marketing professions and institutions targeting youth alcohol use.
6. REFERENCES


Vincke, E. (2017). Drinking High Amounts of Alcohol as a Short-Term Mating Strategy: The


7. APPENDIX

Exemple visual displays

Red wine

Champagne
CHAPTER 8

GENERAL DISCUSSION.

CONTRIBUTIONS, LIMITATIONS AND FUTURE RESEARCH.
CHAPTER 8: GENERAL DISCUSSION. CONTRIBUTIONS, LIMITATIONS AND FUTURE RESEARCH.

1. INTRODUCTION

Dark consumption behavior, such as smoking cigarettes and drinking high amounts of alcohol, can be considered physically risky behavior due to the numerous harmful physical consequences, both in the short term and in the long term. Accordingly, many intervention campaigns – using a classic social marketing approach – have attempted to curtail these deleterious behaviors. Nonetheless, despite the risky nature of these behaviors and regardless of the intervention campaigns, cigarette use and heavy episodic drinking are highly prevalent among young adults. As a consequence, this dissertation aimed to investigate if there is a rationality at a deeper, evolutionary level. Current evolutionary models and theories explaining the evolutionary basis of psychoactive substance (ab)use mainly focused on the hedonic and functional motives of users. However, studies indicate that dark consumption also has a symbolic dimension in several domains. Therefore, this dissertation decided to explore the signaling function of dark consumption.

As signals function as fitness cues, they must capture the interest of the receiver. After all, signals are easily perceivable behaviors and traits that are displayed to affect the receiver’s beliefs or behavior. Consequently, to function as a signal, behaviors must be noticed (Donath, 2011; Guilford & Dawkins, 1991; Maynard Smith & Harper, 2003). Moreover, according to Miller (2009), fitness cues are the only things worth noticing as they reveal information about fitness affordances. Consequently, a first research question wished to verify that dark consumption actually attracts peers’ attention.
RQ1: Does dark consumption attract young adults’ attention?

According to the sexual strategies theory (Buss & Schmitt, 1993) and the strategic pluralism model (Gangestad & Simpson, 2000), both men and women can pursue two mating strategies: either a long-term oriented (sexually restricted) mating strategy, or a short-term oriented (sexually unrestricted) mating strategy (Buss & Schmitt, 1993; Simpson & Gangestad, 1991). Depending on the mating strategy that is being followed, men and women desire different qualities in potential mating partners (e.g. Buss, 2012; Li, Bailey, Kenrick, & Linsenmeier, 2002; Li & Kenrick, 2006). Consequently, to enhance their attractiveness, people display qualities and traits by engaging in sexual signaling behavior that corresponds with these evolved mating preferences.

Research on risk-taking behavior suggested that physically risky behavior functions as a short-term sexual signaling system. Not only do men increase their physical risk-taking behavior in the presence of attractive women, physically risky behavior also enhances men’s short-term attractiveness. Likewise, physical risk-taking is also preferred in female short-term mating partners. As substance use can be considered a form of physical risk-taking, the second (and main) research question wanted to find out if young adults’ dark consumption also functions as a short-term sexual signaling system, because of the risky nature of the behavior.

RQ2: Does dark consumption function as a short-term mating signal?

Finally, substance use contains other aspects than physical riskiness, including a financial aspect due to the purchase cost. As conspicuous consumption functions as a short-term mating cue, as well as a cue of status and resources in both young men and women, the third research question attempted to explore if the expensiveness of dark consumption could be used for sexual signaling purposes.

RQ3: Does the financial cost affect the functioning of dark consumption as a short-term mating signal?
In sum, the main objective of this dissertation was to investigate if dark consumption could function as a sexual signaling strategy for young adults. By answering this question, we wished to contribute to motivational research on young adults’ substance use, as well as research on interpersonal communication by means of consumption behavior. In addition to theoretical contributions, this dissertation also wanted to make a practical contribution by offering new insights to social marketing professionals and institutions targeting youth substance (ab)use.

2. Recapitulation and Theoretical Contributions

Alcohol is widely accepted among young adults in Belgium, with e.g. more than 90% of the Flemish college and university students drinking alcohol (Rosiers et al., 2014). According to the recent Global Drug Survey, 38% of the young men in Belgium engages in risky drinking, as well as 22% of young women, compared to 25% male and 20% female risky drinkers worldwide. As a consequence, young Belgians are fifth in the world in terms of risky alcohol consumption (Winstock, Barratt, Ferris, & Maier, 2017). However, ‘only’ 30% of the Flemish young adult students smoke cigarettes (Rosiers et al., 2014). Other research speaks of 26% smokers in the age category of 20 – 24 years old, with 22% daily smokers (Gisle & Demarest, 2014). Therefore, we decided to focus more on the signaling function of drinking behavior, more so than smoking of cigarettes.

2.1. Chapter 2: Does Dark Consumption Attract Young Adults’ Attention?

2.1.1. Results Dissertation

As our mind functions as a fitness affordance management system, fitness cues are the only things worth paying attention to (Miller, 2009). Accordingly, our attentional mechanisms evolved to select and process only the most relevant information, via our external senses (external attention) and in our memory (internal attention) (Chun,
Golomb, & Turk-Browne, 2010; Kiyonaga & Egner, 2013; Pashler, Johnston, & Ruthruff, 2001). Therefore, chapter 2 investigated if drinking behavior draws young adults’ attention by means of two studies.

To examine if young adults pay visual attention to peers who engage in drinking behavior, a two-part eye tracking study was conducted in which participants viewed a series of visual displays. Results clearly showed that drinking behavior captures young adults’ attention. More specifically, both young men and young women fixated and observed male drinking behavior more than non-symbolic functional behavior. Men’s attention was also clearly drawn to female drinking behavior, whereas women were slightly less interested in the drinking behavior of other women. A second study focused on young adults’ internal attention, using a recall study. This visual recollection study confirmed that also internally, drinking behavior and alcohol products captured young adults’ attention. Both young male and young female drinking behavior was recalled better than non-signaling functional behavior. Also alcoholic beverages were better remembered than purely functional products. Alcoholic drinks were even remember better and faster than non-alcoholic drinks with similar liquid color and shape of glass.

2.1.2. Theoretical implications

The results of the first chapter indicate that drinking behavior could function as a fitness indicator, as it is selected (visual attention) and processed (recall) more than non-signaling functional behavior. Moreover, the fact that alcoholic drinks were better recalled than similar non-alcoholic drinks confirm that drinking behavior and alcoholic beverages are considered relevant fitness cues because of the alcohol content of the beverage. Additionally, the fact that women paid less attention to female drinking behavior could indicate that drinking alcohol does not play a key role in intrasexual competition among women (cf. infra).
2.2. CHAPITERS 3-6: DOES DARK CONSUMPTION FUNCTION AS A SHORT-TERM MATING SIGNAL?

As the first chapter confirmed that dark consumption captures young adults’ attention and therefore could function as a signal, chapters 3 to 6 investigated if dark consumption could operate as a short-term mating signaling system. Both the sender and receiver side were studied.

2.2.1. ALCOHOL USE

2.2.1.1. RESULTS DISSERTATION

As a first step in establishing a connection between drinking high amounts of alcohol and following a short-term mating strategy, chapters 3 to 5 questioned young adults’ drinking behavior and mating orientation. These survey studies showed a clear link between drinking alcohol in general and being more sexually unrestricted, in both young men and women. Also, male and female young adults who engaged in binge drinking were more short-term oriented in their mating strategy compared to peers who never engaged in binge drinking. Additional correlation measures even showed that young adults’ level of sexual unrestrictedness rose as the amount of drinking behavior and binge drinking increased.

However, verifying the link between young adults’ short-term mating orientation and heavy drinking behavior did not suffice to state that this dark consumption functions as short-term mating signal. After all, signaling theory states that signals are engaged in with the intention of affecting the receivers’ beliefs and/or behavior. Therefore, chapter 5 investigated if short-term mating motivations increased young adults’ drinking behavior, by means of a priming study. To ensure that the priming elicited the right motivations, a guided visualization technique was used, in addition to two elaborate pretests and a manipulation check in the actual experiment. Results showed that young men and young women in a short-term mating situation, in which they imagined interacting with an attractive person on a night out, were willing to drink a larger amount
of alcoholic drinks compared to young adults in a long-term mating situation. Mediation analyses confirmed that this higher drinking behavior was triggered by a higher desire to pursue a short-term sexual relationship. Additionally, the mating context also affected young adults’ perception of the number of alcoholic drinks that they perceived as a high amount in both male and female drinking. In particular, young adults in a short-term mating context perceived a larger amount of drinks as heavy compared to peers in a long-term mating context.

Furthermore, as signals are displayed to affect the receivers’ beliefs and behaviors in ways that benefit the signaler, chapters 3, 4 and 6 investigated how drinking behavior affected young adults’ perception using a factorial survey methodology. More specifically, chapter 3 showed that a young man drinking alcohol frequently was perceived by young women as being more sexually unrestricted compared to both an occasional drinker and a nondrinker. Additionally, chapter 4 added that a woman drinking alcohol, either occasionally or frequently, was perceived by young men as being more short-term oriented in her mating strategy compared to a non-drinker. Finally, chapter 6 indicated that even the number of alcoholic drinks that is consumed on a specific occasion affected the perceived mating orientation. Up to the binge drinking cut-off (six alcoholic drinks for men / four alcoholic drinks for women in two hours’ time, in Belgium), a young adult drinking a higher quantity of alcoholic beverages was perceived as more sexually unrestricted compared to a young adult drinking a lower amount of alcoholic beverages. However, the mating orientation of a young man consuming nine alcoholic drinks was not perceived differently than a young man drinking six alcoholic beverages. Similarly, the perceived level of sexual unrestrictedness did not differ between a young woman drinking four or six alcoholic beverages. Chapter 6 also confirmed that young men and young women did not perceive their drinking peers differently.

In addition, chapters 3, 4 and 6 also investigated how the short-term and long-term attractiveness of young adults was affected by their own drinking behavior, taking into account both the drinking frequency and the amount of alcoholic drinks. Chapter 3
confirmed that drinking frequently increased a young man’s desirability as a short-term mating partner compared to not drinking, yet lowered his attractiveness as a long-term mating partner. Occasional drinking, on the other hand, enhanced a man’s short-term and long-term attractiveness compared to both not drinking and drinking heavily. Similarly, chapter 4 illustrated that frequent drinking was found more attractive in women than not drinking for short-term mating, while these short-term attractiveness benefits faded in a long-term mating context. Additionally, also in women, an occasional drinker was found most attractive as a partner in both short-term sexual relationships and long-term romantic relationships. Furthermore, in men, drinking alcohol (both occasionally and frequently) was found more desirable in a short-term mating partner than in a long-term mating partner, whereas not drinking was found equally desirable. In women, on the other hand, moderate drinking was found most suitable in a long-term romantic partner, whereas frequent drinking was preferred more in a short-term mating partner. Again, the attractiveness of not drinking did not differ between a short-term and long-term mating context.

As many short-term mating relationships are initiated based on short interactions with potential opposite-sex mating partners, chapter 6 also verified the attractiveness of heavy drinking on a night out. These results confirmed that engaging in heavy episodic drinking (6 drinks for men / 4 drinks for women) or even very heavy episodic drinking (9 drinks for men / 6 drinks for women) was considered more attractive in a short-term sexual partner than a long-term romantic partner, in both men and women. Not drinking, on the other hand, was preferred in a long-term relationship partner, whereas moderate drinking (3 drinks for men / 2 drinks for women) was perceived equally attractive in both a short-term or long-term mating context. In addition, (very) heavy episodic drinking (both 6 and 9 alcoholic drinks) lowered a man’s desirability as a long-term mating partner compared to a man who did not drink any alcohol, but did not affect a man’s short-term attractiveness. Moderate drinking, on the other hand, did enhance a man’s short-term desirability compared to not drinking and very heavy episodic drinking. In women,
drinking alcohol enhanced the short-term sexual attractiveness, independent of the amount of alcohol. Additionally, very heavy episodic drinking harmed a woman’s attractiveness as a long-term relationship partner when comparing to a woman who did not or only moderately drink on a night out.

In sum, these findings show that the level of drinking behavior young adults engage in affects how these young adults are perceived by peers. However, the question remains why. Based on research on physical risk-taking behavior, chapters 3 and 4 explored whether drinking behavior affected young adults’ perception because of its risky nature. On the one hand, results confirmed that frequent drinking is considered physically risky behavior, as it increased the perceived overall behavioral unhealthiness and riskiness of young adults’ behavior. Additionally, mediation analyses confirmed that frequent male drinking functioned as a cue of an unrestricted sexuality via the higher perceived riskiness. Similarly, mediation analyses showed a positive mediating effect of the perceived behavioral unhealthiness and riskiness on the functioning of female frequent drinking as a short-term mating cue.

Mediation analyses on the attractiveness ratings pointed in the same direction, but were less conclusive. As expected, the perceived behavioral unhealthiness and riskiness negatively affected young men’s long-term attractiveness. Yet, the perceived harmfulness of drinking behavior did not mediate a man’s short-term attractiveness as a function of the drinking frequency. In women, on the other hand, the short-term attractiveness ratings when drinking alcohol were clearly linked to a higher perceived riskiness. However, also a woman’s long-term attractiveness was positively mediated by the behavioral riskiness. This finding corresponds with the high attractiveness ratings of occasional drinking in a long-term mating partner, as well as the fact that frequent drinking is considered equally attractive compared to not drinking in a romantic, long-term relationship partner.
Furthermore, as researchers suggested that physical risk-taking and alcohol use could signal both physical qualities and mental qualities, chapter 6 explored if this was also the case for heavy episodic drinking behavior. Results clearly showed that heavy episodic drinking in young adults signaled mental qualities related to risk-proneness, more so than physical qualities. More specifically, young men and women were perceived to be more adventurous, more brave and a higher risk-taker when drinking a higher amount of alcoholic drinks. However, drinking more than the defined binge drinking level (6 drinks for men / 4 drinks for women) did not increase the perceived mental qualities. Drinking also did not increase young adults’ perceived level of confidence. On the contrary, a young man drinking nine alcoholic drinks was even perceived as less self-confident compared to a young man drinking six beverages. Remarkably, when drinking a higher amount of alcoholic drinks, both young men and women were perceived as less disease resistant, while young men were also perceived as less physically attractive. Male and female binge drinkers were perceived as slightly taller compared to peers consuming less alcohol.

2.2.1.2. THEORETICAL IMPLICATIONS

Together, these results indicate that drinking high amounts of alcohol could function as a short-term mating signaling strategy in both young men and women. Not only do young adults increase their drinking behavior when pursuing a short-term sexual relationship, drinking high amounts of alcohol also functions as a cue of an unrestricted sexuality, while bringing some short-term attractiveness benefits. Moreover, drinking high amounts of alcohol appears to function as a short-term mating signal because of its risky nature. In both young men and young women, a higher drinking frequency operates as a cue of a short-term mating strategy through the higher behavioral riskiness. Moreover, drinking higher amounts of alcohol clearly signals qualities related to risk-proneness, including bravery and adventurousness.

As a consequence, risky drinking behavior appears to function as a short-term mating signaling strategy in both young men and young women for different reasons.
Mental qualities such as risk-proneness, bravery and courage are traits that are especially valuable in male intrasexual competitions, to increase a man’s position in the dominance hierarchy and enhance his reputation and social status (Daly & Wilson, 2001; Ellis et al., 2012). Accordingly, research indicates that men who frequently engage in binge drinking behavior or men who drink more alcohol on heavy drinking occasions compared to the other attendees are perceived to have a higher social status (Dumas, Graham, Bernard, & Wells, 2014). Similarly, in heavy drinking groups, high status men will drink more alcohol than men lower in status (Dumas, Wells, Flynn, Lange, & Graham, 2014). Moreover, research on drinking games confirms that especially sexually unrestricted men use risky drinking to compete with each other to impress women, being driven by sexual motivations, competitive motivations and motivations to display their fortitude (Hone & McCullough, 2015; Hone, Carter, & McCullough, 2013). As women search for cues of genetic quality in a short-term mating, including social dominance (Geher, Kaufmann, & Fisher, 2013), this could explain why heavy drinkers are preferred as short-term mating partners.

Because of their higher parental investment in children, the harmful consequences of engaging in risky behavior lead to higher reproductive costs in women (Campbell, 2004). As a consequence, adventurousness, courage and risk-proneness are less of an asset in female intrasexual competition. Accordingly, women generally prefer to compete indirectly by advertising qualities valued by men, and by derogating rivals through gossip (Buss, 2012; De Backer, 2005; Fisher & Cox, 2011; Fisher, Cox, & Gordon, 2009). However, as sexually unrestricted men search for cues of sexual willingness in potential sexual partners, women could use alcohol to indicate that they are open to risk-taking behavior, including sexual risk-taking. Indeed, research indicates that drinking behavior increases women’s sexual receptivity (Lannutti & Camero, 2007; Parks, Hequembourg, & Dearing, 2008; Testa, Vanzile-Tamsen, Livingston, & Buddie, 2006; Zawacki, 2011) and often precedes sexual encounters and hook-ups (Fielder, Walsh, Carey, & Carey, 2013; Grello, Welsh, & Harper, 2006; Labrie, Hummer, Ghaidarov, Lac, & Kenney, 2014). Consequently,
female drinking behavior could function as a signal of intent, more so than a signal of quality. A similar reasoning, proposed by Sylwester and Pawlowski (2011), is that women use signaling strategies analogous to men to indicate they are also sexually unrestricted. As drinking is still considered masculine behavior (de Visser & McDonnell, 2012; de Visser & Smith, 2007; Lyons, Dalton, & Hoy, 2006) and used by men as a sexual signal, women could use drinking behavior to signal that they have a more ‘masculine’ sexual strategy. Research confirms that women who engage in drinking behavior are indeed perceived to be more masculine (Day, Gough, & McFadden, 2007; Jackson & Tinkler, 2007; Rolfe, Orford, & Dalton, 2009).

Furthermore, results of chapter 6 suggest that heavy episodic drinking might function as a costly signal. According to the crazy bastard hypothesis (Fessler, Holbrook, Tiokhin, & Snyder, 2014; Fessler, Tiokhin, Holbrook, Gervais, & Snyder, 2014), voluntary nonviolent physical risk-taking functions as an index of risk-proneness, as only risk-prone individuals engage in voluntary risky behavior. However, as individuals who are less risk-prone can also behave in a risky manner, including drinking high amounts of alcohol, it appears that costly signaling theory is more applicable to explain the functioning of heavy episodic drinking as a signal of risk-proneness. Costly signals have a quality-dependent cost, meaning that individuals low in signaled quality suffer more from engaging in costly behavior (Bliege Bird, Smith, & Bird, 2001; Donath, 2011; Zahavi & Zahavi, 1997). Applied to heavy episodic drinking, this would mean that individuals who are not risk-prone would suffer more from engaging in binge drinking compared to risk-prone individuals, as they are less willing to bear the potential harmful consequences linked to risky drinking behavior.

On the other hand, this dissertation found no indication that heavy episodic drinking would signal physical qualities related to disease resistance and physical prowess. These findings correspond with the study of Borkowska and Pawloski (2014) who investigated if a higher drinking frequency is linked with indicators of genetic quality. As the authors found no relationship between bodily symmetry and substance use
frequency, they concluded that substance use does not reflect genetic quality. However, nor the study of Borkowska and Pawlowski (2014), nor our study did take into account that a cost needs to be quality dependent to function as an honest signal. As the impairing effects of heavy episodic drinking depend on factors such as the muscularity of a man and the functioning of the immune system (Afshar et al., 2015; Health Promotion Agency, 2015; Kuhn, Swartzwelder, & Wilson, 2008), adding if a young adult can ‘hold his liquor’ might affect the perceived phenotypic and genetic quality (cf. Limitations and Future research).

2.2.2. Cigarette Use

2.2.2.1. Results dissertation

Although this dissertation mainly focused on the signaling function of alcohol use, chapters 3 and 4 also explored if cigarette use could operate as a short-term sexual signaling strategy in young adults. First of all, survey studies confirmed that male and female smokers are more sexually unrestricted than non-smokers. However, contrary to drinking behavior, a heavier smoking behavior did not correlate with a higher level of sexual unrestrictedness. In addition, chapters 3 and 4 showed that young male and female adults who engaged in smoking behavior were perceived as being more sexually unrestricted than non-smokers, irrespective of their smoking frequency.

Furthermore, smoking behavior seemed to bring some short-term mating attractiveness benefits, but to a lesser extent than drinking behavior. For instance, frequent smoking was only considered slightly less attractive in a potential short-term mating partner compared to not smoking or smoking occasionally, but clearly harmed a young man’s desirability as a long-term mating partner. Occasional smoking, on the other hand, was considered as attractive as not smoking in both a short-term and long-term mating partner. In women, frequent smoking harmed a woman’s short-term and long-term mating attractiveness. However, whereas occasional smoking was considered equally attractive as not smoking in a short-term mating partner, occasional smoking
lowered a young woman’s attractiveness as a partner for a romantic, committed relationship. Also, the attractiveness of a male non-smoker did not differ depending on the mating context, while both occasional and frequent male smokers were considered more attractive as a short-term sexual partner than a long-term romantic partner. Corresponding with the lower standards of men in a short-term mating partner, women were always considered more attractive as a mating partner in short-term sexual relationships, more so than long-term romantic relationships, independent if they did not smoke, smoked occasionally or even frequently.

Additionally, results confirmed that also smoking behavior was perceived as physically risky, as young adults’ overall behavior was considered more unhealthy and risky when the individuals smoked. Moreover, corresponding with the alcohol results, mediation analyses confirmed that smoking behavior functioned as a short-term mating cue because of the unhealthy and risky nature of the behavior. Also young men’s long-term attractiveness ratings were negatively mediated by the perceived behavioral unhealthiness, indicating that a higher smoking frequency lowered a young man’s desirability as a potential relationship partner, due to an increase in perceived behavioral unhealthiness.

2.2.2.2. THEORETICAL IMPLICATIONS

Together, these results suggest that smoking cigarettes might also function as a short-term mating signaling system in both young men and young women, yet more research is necessary. Indeed, although smoking clearly functioned as a short-term mating cue, the attractiveness benefits of cigarette use were limited to not harming young adults’ sexual attractiveness. On the one hand, this could be a consequence of the more negative discourse on smoking (e.g. the warning on every package of cigarettes sold in Belgium) leading to more negative cultural norms on smoking behavior compared to drinking behavior. This smoking culture might affect the suitability of smoking behavior as a sexual signal. On the other hand, it could also be a consequence of typical short-term physical consequences of smoking behavior, as cigarette use causes a typical ‘smokers breath’,
stains teeth and skin, and causes erectile dysfunctions in men. These are all physical consequences that might counteract potential attractiveness benefits in casual sexual encounters.

Moreover, although chapter 3 and 4 showed a clear link between smoking and having an unrestricted sexuality, no study empirically investigated whether smoking behavior is used by sexually unrestricted young adults as a mating signal. However, recent research suggests that this might be the case, as pictures of attractive women triggered male smokers into increasing their smoking behavior (Chiou, Wu, & Cheng, 2015). In addition, Dewitte (2011) confirmed that smoking could function as an honest signal of physical qualities, as the physical cost of smoking is quality-dependent. Consequently, adolescents with low dispositional health suffered more from the harmful effects of smoking compared to individuals high in genetic quality. These findings contradict the research of Borkowska and Pawloski (2014) stating that substance use does not reflect genetic quality in its users, but this study only searched for a correlation between smoking and indicators of genetic quality. Finally, the study of Dewitte (2011) also showed that in the absence of other indices of health (e.g. an active lifestyle), a person’s smoking status is used as a health cue. However, given the harmful nature of smoking behavior, it is likely that smoking also functions as a cue of mental qualities related to risk-proneness, in addition to the physical health qualities.

2.2.3. Alternative explanations

According to life history theory, humans fall along a fast-to-slow life history continuum, ranging from early reproduction and a focus on mating effort (fast life history strategy) to delayed reproduction with a focus on somatic and parental effort (slow life history strategy) (Ellis, Figueredo, Brumbach, & Schlomer, 2009; Kaplan & Gangestad, 2005). Which life history strategy is being followed depends on an interplay of life history variables, including genetic quality, sex, life stage and environmental factors, and can be considered an adaptive behavioral strategy to maximize fitness. Accordingly, men more
often follow a fast life history strategy, as well as young adults in a mating life stage and individuals living in harsh and unstable (early and current) environments. However, life history strategies show a high plasticity, taking into account environmental cues and triggers (Figueredo et al., 2005).

When following a fast life history strategy, individuals follow a more short-term oriented behavioral and mating strategy, focusing on short-term gains at the expense of long-term costs. As a consequence, these individuals develop a cluster of traits, including rebelliousness, risk-proneness and impulsivity. This led some researchers to suggest that risky behavior, including risky drinking and smoking, can be considered a mere byproduct of a fast life history strategy, reflecting a tendency towards mating effort over somatic and parental effort (Gerald & Dee Higley, 2002; Richardson et al., 2016; Richardson, Chen, Dai, Hardesty, & Swoboda, 2014; Richardson & Hardesty, 2012). However, other life history theorists add that individuals have psychological mechanisms that increase costly mating tactics in the case of mating opportunities or high intrasexual competition. Accordingly, individuals engage in conspicuous behavior that enhances courtship or individuals’ intrasexual competitive abilities at the expense of health (Ellis et al., 2012; Tybur, Bryan, & Hooper, 2012). This corresponds with risk-taking literature showing that young males’ risk-taking in mating situations is attuned to women’s evolved mating preferences, in which physical risk-taking seems to function as a short-term mating signaling strategy. Consequently, the finding that risky drinking behavior also functions as a short-term signaling system can also be explained from a life history framework.

Other researchers state that substance use is linked to mating effort and mating success because it affects the functioning of the brain. For instance, due to inhibiting effects on the prefrontal cortex, substances increase disinhibiting behavior, leading to the discounting of future costs for immediate benefits. Accordingly, it makes individuals more brave to approach a potential mate, while making risky sex more appealing (Abernathy, Chandler, & Woodward, 2010; Koob & Volkow, 2010; Richardson et al., 2017). However, research showed that the effects of alcohol on individuals’ behavior depends on the social
context, suggesting that alcohol has symbolic properties in addition to biochemical and pharmacological effects (The Social Issues Research Centre, 1998). For instance, research showed that young adults who consumed a moderate dose of alcohol engaged in more riskier behavioral decision making compared to young adults who consumed non-alcoholic drinks, but only when the decision occurred in a group context. Moreover, also young adults who believed that they drank alcohol, but instead received a non-alcoholic placebo drink, made riskier behavior choices in a social context (Sayette et al., 2012).

2.3. CHAPTER 7: DOES THE FINANCIAL COST AFFECT THE FUNCTIONING OF DARK CONSUMPTION AS A SHORT-TERM MATING SIGNAL?

2.3.1. RESULTS DISSERTATION

In addition to the physical riskiness of heavy (episodic) drinking, alcohol consumption contains other aspects, including a financial cost. Therefore, chapter 7 explored if the expensiveness of alcohol consumption also affected the functioning of drinking behavior as a sexual signal. By means of two studies, we investigated if an expensive drink functions as a short-term mating cue, as well as a cue of resources and status. A forced choice experiment using visual displays confirmed that young men and young women drinking an expensive alcoholic beverage (champagne) were perceived as having more resources, having a higher social status, being single and following a short-term oriented mating strategy, more so than a young adult drinking a cheaper beverage with a similar alcohol content (wine). Moreover, the young adult drinking the expensive beverage was preferred as a short-term mating partner, whereas the young adult drinking the less expensive drink was considered most attractive as a long-term mating partner. A second experiment, using a different experimental design, confirmed that an expensive beverage choice functioned as a cue of status and resources in both young men and women through the perceived financial cost of the drink. Only women’s perception of men’s resources as a function of a more expensive beverage choice was not mediated by the perceived expensiveness. Additionally, a young man drinking champagne was also
perceived as less loyal, whereas a young woman drinking champagne was considered as more flirty.

As expensive beverage choice appeared to function as a short-term mating cue, an additional priming study investigated if short-term mating motivations increase expensive drinking behavior. This experiment showed that young adults in a short-term mating context, in which they had a conversation with a person they found very attractive, did not prefer a more expensive first drink compared to young adults in a long-term mating situation. More specifically, in both mating contexts, young men and women preferred a drink of circa 4 EUROs. However, both young men and women were willing to spend a higher amount of money in a short-term mating context. Mediation analyses confirmed that the higher the motivation to pursue a short-term sexual relationship, the higher the sum they were willing to spend. Moreover, additional analyses also showed that this monetary sum was higher than the mere financial cost of drinking a higher amount of alcoholic beverages.

2.3.2. Theoretical implications

This final chapter illustrates that the signaling function of drinking behavior in mating contexts extends beyond displaying mental qualities related to risk-proneness. Indeed, because of the financial cost of alcohol, expensive drinks function as cues of wealth, status and a short-term mating orientation. Additionally, a higher amount of money spent on alcohol appears to increase young adults’ short-term attractiveness as expensive drinks are preferred in sexual partners. Moreover, the finding that young adults are willing to spend a higher sum of money on a night out when motivated to pursue a short-term relationship rather than a long-term romantic relationship suggests that expensive drinking behavior might actually function as conspicuous consumption behavior, used by individuals as a short-term mating strategy to show-off wealth and status. However, more research is necessary to fully investigate the functioning of expensive alcohol use as a signaling system.
3. LIMITATIONS AND FUTURE RESEARCH

This dissertation can be considered a first attempt to explore the deeply rational signaling function of dark consumption. Consequently, despite the theoretical contributions, future research remains necessary to further the understanding of the complex signaling function of dark consumption and to address the limitations of this dissertation. We will first discuss the limitations and future research suggestions for each research question, followed by more general future research paths.

3.1. LIMITATIONS AND FUTURE RESEARCH FOLLOWING FROM THE EMPIRICAL CHAPTERS

In chapter 2, we verified that both drinking behavior and alcohol cues attract more visual attention and are recalled more than functional behaviors and objects. However, there is an enormous variation in alcoholic drinks and drinking behavior, due to differences in price, volume, alcohol content, amount of alcoholic drinks, brands, social context etc. Future research could explore the impact of these different physical, financial and social drinking aspects on both internal and external attention. Moreover, as the functioning of the perceptual system changes depending on which fundamental goals and evolved psychological mechanisms are active (Kenrick, Neuberg, Griskevicius, Becker, & Schaller, 2010; Neuberg, Kenrick, & Schaller, 2009), future research could also investigate which fundamental goals increase the attention to drinking behavior and alcoholic beverages. As this research only investigated if alcohol captures young adults’ attention, additional research should verify that this is also the case for cigarette use, and potentially other forms of dark consumption.

Chapter 3 to 6 investigated if dark consumption could function as a short-term sexual signaling strategy, by studying both the perceiver side (dark consumption as a fitness cue; chapters 3,4,6) and the signaler side (dark consumption as a signal or fitness indicator; chapters 3,4,5) via experimental research and survey studies. However, as drinking alcohol and smoking cigarettes have a signaling function, substances are (often)
consumed in the presence of others. Additionally, both alcohol and tobacco affect the functioning of the brain. Consequently, because of the experimental and survey methodology, ecological validity can be considered a limitation of this dissertation. Therefore, future research investigating the functioning of dark consumption as a short-term mating signaling strategy in more natural circumstances would be fruitful.

Furthermore, chapters 3 and 4 explored if dark consumption could operate as a short-term mating strategy, using behavioral vignettes varying the frequency of drinking and smoking behavior, without clearly specifying the amount of alcoholic drinks. As this research clearly showed that the behavioral frequency increased the perceived harmfulness of young adults’ behavior, it would be possible that participants interpreted the occasional drinking behavior as moderate drinking, in which the amount of alcohol was rather low, and frequent drinking as heavy drinking consuming high amounts of alcohol in a regular manner. Therefore, it would be beneficial if future research verified that a higher drinking frequency also functioned as a short-term mating cue, when clearly specifying that the number of alcoholic drinks is limited.

Also, this dissertation indicated that dark consumption could function as a short-term mating signaling system, in which short-term mating motivations increase young adults’ drinking behavior. However, to ensure that dark consumption is an actual strategic short-term mating signaling system and no byproduct of discounting of future costs due to biochemical effects, future research should verify that young adults only engage in the risky signaling behavior when their intended audience is present. This reasoning was also used in the studies of Wang and Griskevicius (2014), showing that flaunting luxury is a signaling system used by women to guard their mates. However, women only sought conspicuous luxury items when the products could be seen by her rival.

Additionally, in this dissertation, research on the effectiveness of dark consumption as a short-term sexual signal was limited to investigating the impact of dark consumption on young adults’ short-term and long-term attractiveness. However, mate
preferences do not always correspond with actual mating behavior. Although many studies clearly show a link between consuming alcohol and engaging in sexual encounters and hook-ups (Cooper, 2002, 2006; Grello et al., 2006; Lindgren et al., 2009; Paul, McManus, & Hayes, 2000; Turchik, Garske, Probst, & Irvin, 2010), future research should empirically investigate if consuming substances increases young adults’ short-term mating success. For instance, a variant of the well-known field study of Clark and Hatfield (1989) could be conducted, where a young man or woman addresses potential opposite-sex mating partners with a question implying short-term mating (e.g. Would you come to my apartment tonight?), in which the main characters’ substance use is manipulated. Also Guéguen & Lami (2012) conducted a similar study to investigate the impact of financial resources and status on women’s receptivity to go on a date, showing that women were more likely to give their phone number to young men driving a high-status car.

In the sixth chapter, also the fact that the vignettes did not mention how the alcoholic beverages affected the main character could be considered a limitation of the study. Chapter 6 clearly showed that drinking a higher amount of alcoholic beverages on an occasion indicates mental qualities related to risk-proneness. Yet, individuals engaging in heavy episodic drinking were not perceived as having higher physical qualities. However, according to costly signaling theory, behavior can only function as a costly signal of a certain quality, if the cost of the behavior is higher for individuals low in the signaled quality. Given that drinking high volumes of alcohol in a short period of time weakens the immune system (Afshar et al., 2015), individuals who do not suffer from the intoxicating effects (e.g. who could ‘hold their liquor’) could use their drinking behavior to signal that they have good genes.

Moreover, future research could also study the functioning of dark consumption as a sexual signal in intrasexual competitive situations. As many research indicates that young men use risky behavior for intrasexual competition, and given that dark consumption appears to function as a short-term sexual signaling strategy because of its risky nature, it is highly likely that dark consumption also functions as a male intrasexual
signaling strategy, both in the presence of males only (i.e. indirect intrasexual competition for status), as in mixed social settings in which men compete for direct access to women. This was also found in the study of Hone et al. (2013) showing that men use drinking games as a venue to both display desired characteristics and compete with other males. Also the study of O’Grady, Harman, Gleason, and Wilson (2012) showed that men use alcohol to increase their attractiveness, especially in mixed social settings with both men and women. As women’s intrasexual competition focuses on physical attractiveness, dark consumption seems less relevant for female intrasexual signaling. However, as cues of sexual willingness are a preferred characteristic in female short-term mating partners, it is possible that young women might also engage in heavy episodic drinking in mixed social settings in which multiple women compete for a high-quality sexually unrestricted man. Research already confirmed that women increase their drinking behavior when they feel the desire to make an attractive impression, both when they are alone with a man, as well as in mixed social settings (O’Grady et al., 2012).

The seventh and final empirical chapter’s goal was to illustrate that alcohol has other aspects besides physical riskiness that affect the functioning of alcohol as a mating signal, in this case the financial cost. However, this chapter was very exploratory and needs further research. For instance, the priming experiment only questioned the amount of money young adults would be willing to spend in both a short-term mating context and a long-term mating context, yet it remains unclear whether this higher amount of money entails the cost of more expensive beverages, or also offering drinks to attractive potential mating partners. Moreover, as young adults are often college students without a fixed income, future research would also benefit from investigating if conspicuous alcohol consumption functions more as a short-term mating signaling system in an adult sample.

Finally, this dissertation attempted to explore the sexual signaling function of dark consumption. As a consequence the restricted number of moderators can be considered a limitation. For instance, the studies of this dissertation did not take into account the
drinking and smoking behavior of the participants. Nonetheless, research has shown that the own smoking and drinking behavior affects how peers that use alcohol and tobacco are perceived (Etcheverry & Agnew, 2009; Spijkerman, Larsen, Gibbons, & Engels, 2010; Spijkerman, Van Den Eijnden, & Engels, 2007; van Lettow, de Vries, Burdorf, Norman, & van Empelen, 2013; Zimmermann & Sieverding, 2011). Additionally, as there is great variation in the acceptability of drinking and smoking behavior depending on the community or peer group and on the specific social context (Ahern, Galea, Hubbard, Midanik, & Syme, 2008; Echeverria, Gundersen, Manderski, & Delnevo, 2015; Savic, Room, Mugavin, Pennay, & Livingston, 2016), future research could also control for the impact of social norms on the signaling function of smoking and drinking behavior.

3.2. Future research paths

As indicated before, this dissertation only lifted a corner of the veil of how dark consumption could function as a deeply rational signaling strategy, focusing on sexual signaling. However, we hope that our dissertation will inspire other researchers to further the understanding on the signaling function of harmful consumption. After all, although this dissertation indicates that it is highly likely that dark consumption functions as a short-term mating signaling strategy, other research suggests that both drinking behavior and cigarette smoking also have complementary signaling functions in other domains.

For instance, research shows that alcohol use is linked to social bonding, group acceptance and maintaining friendships in adolescence and young adulthood. Indeed, both male and female young adults mention drinking in the company of peers for being one of the crowd, to feel included and to form closer friendships (Bancroft, Zimpfer, Murray, & Karels, 2014; de Visser, Wheeler, Abraham, & Smith, 2013; Niland, Lyons, Goodwin, & Hutton, 2013; Seaman & Ikegwuonu, 2010). Accordingly, much drinking behavior of adolescents and young adults is affected by direct and indirect peer pressure, by getting offered a drink, by modeling friends and close peers’ behavior and by perceived drinking norms (e.g. Borsari & Carey, 2001, 2003; Kinard & Webster, 2010; Lorant &
Nicaise, 2014; Osgood et al., 2013; Wang, Hipp, Butts, Jose, & Lakon, 2015; Yanovitzky, Stewart, & Lederman, 2006). Research also showed that drinking a moderate dose of alcohol facilitates social bonding in new groups by increasing genuine Duchenne smiling and conversation with others (Kirchner, Sayette, Cohn, Moreland, & Levine, 2006; Sayette et al., 2012). Similarly, young smokers consider smoking behavior to be a social lubricant, as smoking and exchanging cigarettes helps socialize with other smokers and strengthens friendship bonds (Brown, Carpenter, & Sutfin, 2011; Cullen, 2010; Hong, Guo, & Chen, 2015; Miething, Rostila, Edling, & Rydgren, 2016). A large number of studies also showed a strong association between peer-group smoking and young people’s smoking initiation and behavior, as well as a strong influence of best friends’ smoking behavior (Alexander, Piazza, Mekos, & Valente, 2001; Delay, Laursen, Kiuru, Salmela-Aro, & Nurmi, 2013; Ennett et al., 2008; Hoffman, Sussman, Unger, & Valente, 2006; Ragan, 2016; Rostila, Almquist, Östberg, Edling, & Rydgren, 2013; Schofield, Pattison, Hill, & Borland, 2001; Simons-Morton & Farhat, 2010; C. Wang, Hipp, Butts, Jose, & Lakon, 2016).

As social bonding, and the acts of forming and maintaining friendships and coalitions increase individuals’ survival chances, humans evolved psychological mechanisms to increase both group bonding and reciprocal bonding. As a consequence, many (consumption) behaviors are meant to signal group membership, such as wearing a uniform or similar clothing. Other behavior wishes to express reciprocity, including behaving in a generous manner (Buss, 2012; Saad, 2007, 2013). As substance use can be used for both purposes (e.g. offering people a drink or a cigarette, using a specific brand of alcohol or cigarettes), future research investigating how alcohol and cigarettes function as a social signal would be fruitful. This social signaling complements the sexual signaling function of dark consumption.

Additionally, we also stress the importance of cross-cultural research on the signaling function of substance use. In chapters 3 and 4, we suggested that risky drinking behavior brought more attractiveness advantages compared to risky smoking, because alcohol is more socially accepted in Belgium than smoking behavior. However, also other
research refers to the influencing role of cultural norms in drinking behavior, leading to a drinking culture. For instance, according to Grønkjær, Curtis, De Crespigny and Delmar (2011) cultural norms for alcohol use in Denmark lead to acceptance, but also expectance to drink on social occasions. Mäkelä and Mauno (2016) even refer to the indirect pressure among Finnish young adults to drink more alcohol in social settings as a cultural logic, because collective drinking stands for sociability. Other studies focused on variation in drinking cultures, indicating that some countries are more liberal towards alcohol and binge drinking than others (Fjær, Pedersen, von Soest, & Gray, 2016; Kuntsche, Rehm, & Gmel, 2004). Some researchers make a distinction between ‘wet’ and ‘dry’ cultures. Wet cultures refer to the Mediterranean countries of Southern Europe, in which people drink frequently but in a moderate manner. In the dry cultures of Northern and Eastern Europe, people drink less frequently, but more excessively with the intention of becoming intoxicated (Felson, Savolainen, Bjarnason, Anderson, & Zohra, 2011; Room, 2001). Others argue that there are four types of drinking cultures: abstinent societies, constrained ritual drinking, banalized drinking and fiesta drunkenness (Gordon, Heim, & MacAskill, 2012; Room & Mäkelä, 2000). More recent research, on the other hand, stresses that there is an increasing homogenization in drinking cultures because of an Anglo-US zeitgeist (Gordon et al., 2012). In a similar manner, research showed that cultural norms on smoking behavior influences the extent to which individuals engage in smoking behavior (USDHHS, 2012; WHO, 2010) as well as individuals’ quitting intentions (Hosking et al., 2009). Given this high influence of cultural norms, research in different drinking cultures is necessary.

Furthermore, although this dissertation departed from costly signaling theory to investigate the sexual signaling function of substance use, other risky and unhealthy consumption behaviors could be studied from a supernormal stimuli perspective. Supernormal stimuli are exaggerated imitations of fitness cues that can exert a stronger attraction than the real, original cues. These are hard wired preferences discovered by the Dutch Nobel prize Laureate Niko Tinbergen. He found that Oystercatchers birds are
programmed to prefer the largest eggs for brooding since larger eggs are more likely to produce viable chicks. However, when exposed to supernormal stimuli, these stimuli take over the birds’ ingrained survival instincts. Consequently, birds prefer a much larger egg of different bird species over their own eggs, cuckold themselves (Barrett, 2010). Also humans find it hard to resist supernormal stimuli. For instance, in the ancestral environment humans benefited from eating as much fat and sugar as possible due to caloric scarcity. However, as current candy bars and hamburgers contain concentrated sugar, salt and fat, they have become supernormal stimuli that are very hard to say no to (Barrett, 2007). Moreover, as women use cosmetics, diet pills, cosmetic surgery, high heels, sunbathing etc. to enhance their appearance, they attempt to make an extraordinary fitness cue of themselves. Accordingly, these behaviors could also be investigated as forms of supernormal stimuli (Morris, White, Morrison, & Fisher, 2013).

Finally, future research should also study how insights on the signaling function of substance can be translated into effective intervention campaigns and social marketing initiatives.

4. SOCIAL MARKETING IMPLICATIONS

All over the world, excessive drinking and smoking peak during young adulthood (CBHSQ, 2015; Gisle & Demarest, 2014; HSCIC, 2016; Johnston, O’Malley, Bachman, Schulenberg, & Miech, 2015; Rosiers et al., 2014; SAMHSA, 2014). Given the harmful short-term and long-term physical consequences of smoking behavior and heavy drinking behavior, many intervention campaigns attempted to decrease young adults’ dark consumption, using a social marketing approach. Accordingly, these intervention campaigns were often guided by classic theories and models, such as the theory of reasoned action, the health belief model, the stages of change model, the social cognitive theory and the social norms theory. As a consequence, many intervention campaigns attempted to raise awareness of the risks, portraying smokers and binge drinkers as
people at risk, either physically or socially. Other campaigns focused on correcting misperceptions of peers’ smoking and drinking attitudes and behavior (Saad, 2007, 2013; Wolburg, 2006). However, follow-up analyses on the effectiveness of these social marketing campaigns showed mixed results, in which smoking and drinking behavior sometimes even increased when confronted with a social marketing campaign (e.g. DeJong et al., 2009; Fitzpatrick, Martinez, Polidan, & Angelis, 2016; Wechsler et al., 2003; Werch et al., 2000; Wolburg, 2006). The fact that some campaigns have adverse effects or boomerang effects is called the dark side of social marketing campaigns (Pechmann & Slater, 2005).

According to risk models such as the Extended Parallel Process Model (Witte, 1994), this could be explained as individuals can react with denial when confronted with fear appeals, for instance when they do not feel susceptible to the threat, or when they do not feel competent to change their behavior. For instance, smokers may believe that they will quit before they are at risk for the actual long-term health effects (Wolburg, 2006). However, according to evolutionary theorists, some of the adverse social marketing effects might be explained as many intervention campaigns ignore that risk-taking behavior can also be functional behavior that increases individuals’ reproductive fitness. Moreover, by emphasizing the dangers of engaging in risky behavior, they increase the signaling value of risky behaviors. As a consequence, risky behavior even becomes more appealing to some (Ellis et al., 2012; Frankenhuis & Del Giudice, 2012; Kruger, 2011). Subsequently, as this dissertation indicated that dark consumption has a signaling function in the mating domain because of the risks inherent to the behavior, campaigns stressing the harmful consequences of smoking and excessive drinking behavior might actually encourage young adults to use substances as a sexual signal in the presence of opposite-sex others. Corresponding with this reasoning, research showed that young men primed with cues of death were more willing to use psychoactive substances (Hirschberger, Florian, Mikulincer, Goldenberg, & Pyszczynski, 2002). To avoid this unintended boomerang effect, we propose two complementary paths.
First of all, social marketing could attempt to impair the functioning of dark consumption as an attractive short-term mating cue (i.e. message for the receiver) and a suitable short-term signal (i.e. message for the sender of the signal). For instance, social marketing campaigns could address the underlying connotation that dark consumption is adventurous and is linked to valor and risk-proneness. Interventions campaigns could also stress the immediate negative consequences of dark consumption for sexual encounters and hookups, including the bad breath when smoking, or the slurred speech when drinking excessively. In men, heavy alcohol use on one occasion can even affect a men’s sexual performance. Furthermore, also the masculine behavioral connotation of drinking behavior could be addressed, as masculinity is a preferred characteristic in short-term mating partners, and given that women might use drinking behavior as a mating signal because of this masculine association. However, future intervention campaigns should be careful with potential stigmatization of young smokers and drinkers. One the one hand, young adults who’s main motivation to use alcohol and cigarettes is to fit in might respond well to messages stressing reputational risks. Yet, research on risk-taking behavior clearly showed that social risk-takers are found highly attractive as short-term mating partners. Consequently, if dark consumption would be considered nonconventional behavior that is dangerous for one’s reputation, the signaling power of dark consumption as a short-term mating signal rises again.

Secondly, campaigns could promote less harmful behavioral strategies as appropriate short-term sexual signaling strategies. For instance, sports initiatives could promote physically challenging sports, emphasizing the adventurous nature of the activities. Additionally, as women prioritize indicators of good genes in short-term mating partners, including good condition and muscularity, sports initiatives could also emphasize the physical attractiveness benefits of different forms of physical exercise for men. Men, on the other hand, are attracted to cues of sexual availability in short-term mating partners. However, also keeping an open posture and engaging flirty behavior could be used by women as a short-term signaling strategy, as they increase the sexual
attractiveness of women and are perceived by men as a cue of sexual availability (Goetz, Easton, Lewis, & Buss, 2012). Moreover, as chapter 7 illustrated that drinking an expensive drink also functions as an attractive short-term mating cue, future campaigns could address the young adult drinking cultures by focusing on drinking quality instead of drinking quantity.

The above suggestions are only based on the results of this dissertation. However, this dissertation only started to explore the signaling function of dark consumption. And, as chapter 7 indicated, there is more to dark consumption than only the physical riskiness. For instance, the results suggest that dark consumption could also be used as a signal in male intrasexual competitive situations. Moreover, as research indicates that alcohol is also used for social bonding, dark consumption might also have a signaling function in the social domain. Consequently, social marketing campaigns should also take into account the results of future research on the signaling function of dark consumption. As a general rule, we would suggest future interventions to take advantage of our evolved psychological mechanisms (Kruger, 2011).
5. REFERENCES


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