

**The relation between parenting stress and adolescents'  
somatisation trajectories: a growth mixture analysis**

<Insert author information>

### **Abstract**

**Objective.** The impact of somatisation in adolescence is substantial. Knowledge on (predictors of) individual-level development of somatisation is necessary to develop tailored treatment. The current study assessed individual-level development of somatisation by means of latent mixed modelling. Parenting stress was included as a predictor of somatisation trajectory membership and within-trajectory variation.

**Methods.** A total of 1499 adolescents and one of their parents (mostly the mother) agreed to participate. Questionnaires were administered when the adolescents were respectively 12-13 (T1), 13-14 (T2), and 14-15 (T3) years old. Adolescents reported on their somatisation, parents on their parenting stress.

**Results.** Four individual somatisation trajectories were found: increased, long-term low, long-term high, and decreased. Higher early parenting stress (T1) significantly predicted less favourable trajectory membership (increased and long-term high). The relation between later parenting stress (T2 and T3) and somatisation depended on trajectory membership. For adolescents in the long-term high and decreased somatisation trajectory, lower T2 and T3 parenting stress was related to higher somatisation, while for adolescents in the long-term low and increased trajectory, higher T2 and T3 parenting stress was related to higher somatisation.

**Conclusions.** The results support a general recommendation to prevent the onset of high levels of parenting stress. In addition, for families in which high levels of parenting stress already exist, clinicians should be aware of natural fluctuations in parenting stress, its associated features (e.g., aspects of overall care, like looking for professional help) and of the consequences this might have for the adolescent.

*Keywords:* adolescents; individual-level; parenting stress; somatisation; trajectories

## **Introduction**

### **Adolescents' somatisation**

About 15 to 25% of all adolescents report recurrent or continuous physical complaints, such as dizziness, headache, or fatigue (Lundqvist, Clench-Aas, Hofoss, & Bartonova, 2006; Perquin et al., 2000; Roth-Isigkeit, Thyen, Raspe, Stöven, & Schmucker, 2004). For the majority of these complaints, no straightforward medical cause can be found, a condition which is frequently referred to as physical functional complaints (PFC; disturbances in physical functioning as opposed to disturbances in body structure). The tendency to experience and report multiple PFC is named somatisation (De Gucht & Fischler, 2002). The impact of PFC and somatisation on the wellbeing and functioning of adolescents is substantial. Not only the complaints themselves but also the often associated restricted school attendance, hobbies and participation in social activities with peers, contribute to this impact (Campo, Comer, Jansen-McWilliams, Gardner, & Kelleher, 2002; Palermo, 2000). Knowledge on the development of PFC and somatisation is necessary in order to develop tailored treatment. Earlier studies revealed that psychological and/or social factors play a major role in the development and progression of PFC/somatisation. However, knowledge on specific contributing features and processes is still in short supply (Garralda, 2010). One of the domains that remain understudied is that of family factors, in particular parenting aspects (Palermo & Chambers, 2005). This study investigates the link between adolescents' somatisation and parenting stress.

### **Somatisation and parenting stress**

Parenting stress is generally conceived as occurring when a parent appraises parenting load higher than the ability to cope with it. Higher parenting stress is related to higher parenting stress-appraisal (i.e., the tendency to appraise parenting situations as stressful), and

to the use of less adaptive coping mechanisms (Abidin, 1992; Lazarus & Folkman, 1984). An association between parenting stress and somatisation can be expected based on the social learning principle of modelling, stating that a person's behaviours are shaped through observation of significant others (Bandura, 1997). Adolescents with parents showing high parenting stress, might be likely to observe (some of) their parents less adaptive stress-appraisal and coping mechanisms. As a result, the adolescents might be more likely to use this less adaptive style in their approach of all kinds of potential stressors, a condition which has been found to be highly related to somatisation (Lovallo, 2005; Walker, Smith, Garber, & Claar, 2006). Few empirical studies have investigated the relation between parenting stress and somatisation. Significant cross-sectional relations were found between parenting stress and adolescents' chronic pain. Eccleston, Crombez, Scotford, Clinch, and Connell (2004) revealed a positive relationship between parenting stress and chronicity of pain in adolescents (11-17 years). Cohen, Vowles, and Eccleston (2010) found that parents of the most disabled chronic pain patients (10- 18 years old) suffered from significantly higher amounts of parenting stress. Rousseau et al. (2013) revealed a significant mean-level longitudinal prediction of higher somatisation by lower parenting stress.

### **Gaps in previous research**

Several questions remain to be answered concerning the relation between somatisation and parenting stress. First, there is a general lack of studies on the link between somatisation and parenting stress. Second, the studies that did investigate the relationship were mainly cross-sectional. Third, longitudinal studies considered only average longitudinal trends, while past research suggests that the development of somatisation cannot be captured by average trends. Dunn, Jordan, Mancl, Drangsholt, and Le Resche (2011) investigated individual patterns of pain development. For three years, every three months, data were collected from a cohort of 11-years-olds on four different kinds of pain. For each kind of pain, comparable

trajectory-types were found. A first type was characterised by consistent low pain frequency. Four other trajectories-types were marked by low onset followed by rather decrease (type two), early increase (type three), late increase (type four) or increase followed by decrease (type five). A last type of trajectory was characterised by consistent high pain (type six). Children with type three or type six trajectories showed the highest levels of distress and somatisation, and the lowest levels of life satisfaction, reflecting the higher vulnerability of children in these groups. A persistent pain trajectory for at least one type of pain was seen in 12% of all children, predominantly females.

Mulvaney, Lambert, Garber, and Walker (2006) investigated individual-level development of functional abdominal pain. Children of 6 to 18 years old with functional abdominal pain were followed for five years at three measurement points. Three types of somatisation trajectories were identified: a long-term risk group (high somatisation scores at all three measurement points), a short-term risk group (high somatisation scores at the first measurement point but decrease at the following ones) and a low-risk group (relatively low initial somatisation scores and decline at the following measurement points). The long-term risk group had the highest baseline means on anxiety, depression, self-worth, and life stress measures. Boys were more likely to be part of the low-risk group.

Stanford, Chambers, Biesanz, and Chen (2008) studied individual-level development of headache, stomach ache and backache. A cohort of 10- to 11-year-olds was followed for eight years with a measurement point every two years. Girls and anxious/depressive adolescents showed higher start- and end- points and steeper slopes on their latent growth curves for the three types of pain.

### **Current study**

The current study investigates individual-level somatisation trajectories and how they are related to parenting stress. Based on the above research<sup>1</sup>, we expect to see at least three somatisation trajectories: low-somatisation, long-term somatisation, and short-term somatisation. Based on the research of Rousseau et al. (2013) it is expected that both worse discrete deviation (e.g., long-term risk group membership) and continuous deviation (e.g., higher intercepts and slopes in all groups) are predicted by higher parenting stress.

Considering that adolescents' gender and emotional symptoms are strongly related to both somatisation and parenting related aspects, these variables will be included as control variables (Barber, 1996; Galambos, Barker, & Almeida, 2003; Garralda, 2010).

## **Methods**

### **Design**

This paper includes data from the JOnG!-adolescents study, a longitudinal research program on development, parenting, behaviour and health in Flemish adolescents (Grietens, Hoppenbrouwers, Desoete, Wiersema, & Van Leeuwen, 2010). Participants were recruited using a conditional random sampling plan. In a first phase (2008), eight Flemish regions were chosen based on socio-economic, urbanisational and provincial diversity. In a second phase (2009), all families living in one of the selected regions, with a child born in 1996, were by post informed about the study and invited to participate. Adolescents and one of their parents (preferably the mother) who agreed to participate completed an informed consent form and subsequently filled out separately a questionnaire. The study included three waves of data collection: the first wave (T1) took place in 2009, the second wave (T2) in 2010, and the third wave (T3) in 2011.

---

<sup>1</sup> Although PFC and somatisation are two different constructs, they are related (Dunn et al., 2011). Because of the limited amount of research on somatisation, research on PFC is used to guide hypotheses.

## Participants

For this cohort, out of 9861 informed families, 1445 parents (14.7%) and 1443 (14.6%) adolescents sent back a questionnaire at T1. For T2 this was respectively 936 (64.8% of T1 respondents) and 889 (61.6% of T1 respondents), for T3, 796 (55.09% of T1 respondents) and 772 (53.50% of T1 respondents). Additional research showed that the socio-economic profile of the T1 responders group matched that of the target population (Flemish families with a child born in 1996) (Guérin et al., 2012). In order to ensure reliable trajectory information, families with more than one missing somatisation score were excluded. The final sample comprised 1026 families. The proportion of participating mothers was 94.5% (T1), 90.5% (T2) and 94.3% (T3). The adolescents' mean age was 12.78 years at T1 ( $SD$  .31), 14.07 at T2 ( $SD$  .28) and 15.53 at T3 ( $SD$  .28). Families with more than one missing somatisation score differed significantly from the others on various demographic variables, except for the child's gender and mothers' paid work (Table I).

< insert Table I >

## Measures

*Somatisation* was assessed by means of the Somatic Complaint List (SCL) (Jellesma, Rieffe, & Terwogt, 2007), filled out by the adolescent. The SCL contained 11 types of physical complaints (e.g., dizziness, tiredness). For every complaint, the adolescent indicated how often he/she suffered from it during the last four weeks, using a 5-point response scale ranging from 1 (almost never) to 5 (quite often). A somatisation-score was obtained by averaging all item-scores. For this study, Cronbach's alphas were .82 (T1), .84 (T2), and .85 (T3).

Three subscales of the Nijmegen Questionnaire regarding Child-rearing Situations (NQCS; Wels & Robbroeckx, 1996) were administered by the parent to assess *parenting stress*: experiencing problems in parenting (e.g., If someone else spends a day with ..., they

will notice how difficult the parenting of ... is), ability to cope with parenting problems (e.g., Of course there is sometimes tension between myself and ... but in general, I can handle the parenting of ...), and child is a burden (e.g., ... causes problems in parenting). A total of 22 items were filled out on a 5-point response-scale (ranging from 'this is definitely not the case' to 'this is definitely true'). For this study, a composite stress-score was used (higher scale scores represent higher parenting stress). Principal component analyses with direct oblimin rotation, including the three scales, indicated unidimensionality. Cronbach's alphas of the separate scales were all higher than .75. Cronbach's alphas of the composite scores were .91 (T1), .92 (T2), and .91 (T3).

The *emotional symptoms* subscale of the strengths and difficulties questionnaire (SDQ; Widenfelt, Goedhart, Treffers, & Goodman, 2003) was used to assess adolescents' perspective on their own psychological functioning. One item was removed because of its overlap with the SCL. The four remaining items (e.g., I worry a lot) were filled out by the adolescent on a 3-point response-scale (1= not true to 3 = completely true). An emotional symptoms score was obtained by averaging all item-scores (higher scale scores represent more emotional symptoms). For this study, Cronbach's alphas were respectively .67 (T1), .80 (T2), and .67 (T3).

## **Procedure**

The study protocol was approved by the Medical Ethics Committees of the universities of Leuven and Ghent. Participants were recruited in 2008 using a conditional random sampling plan. In a first phase, eight Flemish regions were chosen based on socio-economic, urbanisational and provincial diversity (Hermans et al., 2008). In a second phase (2009), all families living in these regions, with a child born in 1996, were by post informed about the study and invited to participate. Adolescents and one of their parents who agreed to be involved completed an informed consent form and subsequently filled out separately a

questionnaire. After one, respectively two years, a second and third questionnaire was sent to those parents and adolescents who consented to participate at T1.

### **Data-analyses**

All analyses were performed using MPLUS software version 7 (Muthén & Muthén, 1998-2012). In order to identify distinct somatisation trajectories, unconditional linear latent class models (including no covariates) were run for one to seven trajectory group solutions, by means of latent class growth analyses. Within-trajectory variances were freed to vary across trajectory groups. The following model fit indices were used to decide on the appropriate number of trajectories: goodness of fit statistics (smallest Bayesian information criteria value or BIC, and a significant bootstrapped likelihood ratio test or BLRT), proportion of adolescents belonging to the different trajectories ( $>.01$ ), classification certainty (entropy, and posterior probabilities  $>.70$ ), and parsimony. In addition to model fit indices, theoretical justification, and interpretability were considered (Jung & Wickrama, 2008; Nylund, Asparouhov, & Muthén, 2007). Concerning interpretability, trajectories were compared to one another regarding somatisation scores ( $>.5 SD$  was interpreted as high;  $<.5 SD$  as low). Next, covariates (parenting stress, adolescents' gender and adolescents' emotional symptoms) were added to the best fitting unconditional model. The conditional latent class model was examined using growth mixture modelling. To ensure a global maximum likelihood solution, each analysis was applied using 5000 random sets of starting values, with the best 500 retained for final optimization. All models were checked using the Mplus OPTSEED function to ensure that local solutions did not bias the results. Subjects were allocated to a cluster based on posterior probability of belonging, a technique which makes it possible to include adolescents with missing data (Jung & Wickrama, 2008; Nylund, Asparouhov, & Muthén, 2007).

### **Results**

## Descriptives

Table II shows descriptive information for all continuous study variables. The variables presented sufficient variability to allow robust testing of hypotheses.

< Insert Table II >

## Unconditional models

Results of the latent class unconditional growth analyses are presented in Table III. Following model fit indices, none of the trajectory solutions could be identified as superior. Comparing the trajectory outlines of the different solutions, it is seen that all trajectories can be categorised into four types: increased, long term low, long term high, and decreased. Based on theory and hypothesis, we expected to observe these types. Because the four trajectory solution was the most parsimonious solution that included all four trajectories types, the four trajectory group solution was withdrawn for further analyses. Compared to models including less trajectories, the four trajectory solution had a smaller BIC (however, the BLRT was not significant). In addition, the four trajectory group solution's entropy, membership proportion, and posterior probabilities were reasonably high. The four trajectories were labelled (1) increased somatisation trajectory (membership proportion .22), (2) long-term low somatisation trajectory (membership proportion .46), (3) long-term high somatisation trajectory (membership proportion .10), and (4) decreased somatisation trajectory (membership proportion .21). Trajectory outlines are shown in figure 1. The long-term high somatisation trajectory showed the highest somatisation scores. For all three measurement points, somatisation scores lay above  $.5 SD$ . The long-term low somatisation trajectory had the lowest somatisation scores. For all three measurement points, somatisation scores lay below  $-.5 SD$ . The increased somatisation trajectory had a medium somatisation score at T1 (between  $-.5 SD$  and  $.5 SD$ ) and high somatisation scores at T2 and T3 ( $> .5 SD$ ). The decreased somatisation trajectory had a high somatisation score at T1 ( $> .5 SD$ ), and a

medium somatisation score at T2 and T3 (between  $-.5$  and  $.5$  *SD*). For all four trajectory group solutions, residual within trajectory variances were significant.

< Insert Table III >

< Insert figure 1 >

### **Conditional models**

Adding covariates did not change trajectory outlines. The BIC improved (BIC = 4950.72 for the conditional model), as well as the entropy (entropy = 0.79 for the conditional model). Results of the multinomial logistic regressions (predicting trajectory membership based on covariates) are shown in Table IV. When comparing long-term low somatisation trajectory membership to increased somatisation trajectory membership, it appeared that adolescents of parents experiencing higher T1 parenting stress were almost two and a half times more likely to have an increased somatisation trajectory. Further, comparing long-term high somatisation trajectory membership to decreased somatisation trajectory membership, showed that adolescents of parents who experienced higher T1 parenting stress were almost three times more likely to have a long-term high somatisation trajectory. Finally, comparing increased somatisation trajectory membership to decreased somatisation trajectory membership, revealed that adolescents of parents who experienced higher T1 parenting stress were almost three and a half times more likely to have an increased somatisation trajectory.

Details on the prediction of within trajectory variance by the covariates are presented in Table V. For adolescents in the increased somatisation trajectory group, higher parenting stress at T2 and T3 was significantly related to higher somatisation at T2 and T3. Further, for adolescents of the long-term high somatisation trajectory group, higher T1 parenting stress was significantly related to higher T1 somatisation. However, higher T2 and T3 parenting stress was significantly related to respectively lower T2 and T3 somatisation. In addition, for adolescents in the decreased somatisation trajectory, higher T2 parenting stress was

significantly related to lower T2 somatisation. For adolescents in the long-term low somatisation trajectory, parenting stress did not predict within trajectory variance.

< Insert Table IV >

< Insert Table V >

### **Discussion**

The impact of somatisation in adolescence is substantial. Not only the physical complaints themselves, but also the associated restricted school attendance, hobbies and participation in social activities with peers, contribute to the impact (Campo et al., 2002; Palermo, 2000). Knowledge on (predictors of) individual-level development of somatisation is necessary to develop costumed treatment. However, past studies have focussed on 'mean-level somatisation development' or 'individual-level somatisation development, assessed in a continuous or discrete way'. The current study addressed knowledge gaps by examining individual-level somatisation trajectories (by means of a combined continuous and discrete approach) and investigating whether parenting stress significantly predicted trajectory membership (discrete approach) and/or within-trajectory variation (continuous approach).

Results revealed the existence of four individual-level somatisation trajectories: increased somatisation trajectory (membership proportion .22), long-term low somatisation trajectory (membership proportion .46), long-term high somatisation trajectory (membership proportion .10), and decreased somatisation trajectory (membership proportion .21). Higher early parenting stress (T1) significantly predicted less favourable trajectory membership: adolescents growing up with parents who reported higher early parenting stress were significantly more likely to have an increased somatisation trajectory than a long-term low somatisation trajectory (almost two and a half times more likely) or than a decreased somatisation trajectory (almost three and a half times more likely). Further, they were almost

three times more likely to have a long-term high somatisation trajectory than a decreased somatisation trajectory.

These last findings may be explained by the modelling theory (Bandura, 1997). Adolescents whose parents show high levels of parenting stress, might observe their parents' less adaptive stress-appraisal and coping mechanisms. As a result, these adolescents may approach potential stressors in a less adaptive way, a condition which has been found to be related to somatisation (Lovallo, 2005; Walker et al., 2006).

In addition, this study revealed that the relation between later parenting stress (T2 and T3) and somatisation depends on the adolescents' somatisation trajectory. For adolescents in the long-term high and decreased somatisation trajectory, lower T2 and T3 parenting stress was related to higher somatisation. In other words, for high somatising children, later decreased parenting stress seems to be a risk factor. This last finding might be explained by factors related to parenting stress. It is for example possible that parenting stress is an aspect of overall care, e.g., parents who report less parenting stress might also be less concerned about their children and for example not seek professional help when needed, or show less parental warmth (Rhee, Holditch-Davis, Miles, & Miles, 2005; Steeger, Gondoli, & Morrissey, 2012). In that case, the link between lower parenting stress and higher somatisation might be mediated by aspects of overall care (e.g., decreased search for professional help, decreased parental warmth). In addition, for adolescents in these less favourable somatisation trajectories, the modelling influence of T2 and T3 increased parenting stress might no longer be relevant on top of earlier high levels of parenting stress (ceiling effect). However, these adolescents might benefit from other factors related to augmented T2 and T3 parenting stress (cf. supra, 'aspects of overall care', like seeking professional help).

For adolescents in the long-term low and increased somatisation trajectory, higher T2 and T3 parenting stress was related to higher somatisation. Since for adolescents in these trajectories increased parenting stress was not preceded by higher T1 parenting stress, also this finding may be explained by the modelling principle.

The results of this study have two important practical implications. First, for those parents of young adolescents (around 12 to 15 years old) who generally experience low amounts of parenting stress, substantial increases in parenting stress have to be prevented. The most effective way to prevent parenting stress to substantially increase is to make sure that parents have somewhere to go for ventilation and for advice concerning techniques to prevent stressors and/or cope with them (Hoagwood et al., 2009). Often, parents will find help in their informal networks, however sometimes additional (professional) resources are needed. It is important to state that this first recommendation does not imply that low amounts of (increase in) parenting stress are worrisome. After all, it is normal that parents experience certain amounts of parenting stress. However, this first recommendation does mean that parents have to be able to ventilate and receive help whenever they feel that it is needed, in order to prevent substantial increases. Second, for those parents of young adolescents (around 12 to 15 years old) who generally experience high levels of parenting stress, not the increase but rather the decrease of parenting stress might be a risk factor.

A first limitation of this study is that the four trajectory solution was withdrawn based on hypotheses and theory and not on model fit indices. Although the indices of the four trajectory solution were satisfactory, they were not superior to those of the other solutions. A second limitation is that the present study does not provide insight into the process linking parenting stress to somatisation, as differences in meaning of parenting stress are not captured by the measurement and not all potential mediating or confounding parameters were included in the study. Future studies might explore the contribution of modelling (e.g., the mediation

of adolescents' stress-appraisal and coping), the contribution of other aspects of overall care (e.g., the mediation of seeking professional help), or the influence of other features like the genetic transmission of affective related problems, adolescent temperament or personality (Deater-Deckard, 1998). A third limitation is that the exclusion of adolescents with missing data might have biased the results, since excluded adolescents differed significantly from included adolescents on multiple demographic variables. It can be hypothesised that this is the reason why other somatisation trajectories, such as a stable high trajectory, were not observed (Garralda, 2010). Further research should focus on the inclusion of adolescents from diverse demographic backgrounds in order to examine this hypothesis.

Future studies should include additional follow-up points in order to further explore individual-level development of somatisation (e.g., including quadratic models). Also, the inclusion of additional measurement points before adolescence will allow for thorough exploration of development, i.e. whether parenting stress predicts somatisation trajectories or somatisation trajectories predict parenting stress.

## References

- Abidin, R. R. (1992). The determinants of parenting behaviour. *Journal of Clinical Child Psychology*, 21(4), 407-412. doi: 10.1207/s15374424jccp2104\_12
- Andruff, H., Carraro, N., Thompson, A., & Caudreau, P. (2009). Latent class growth modelling: A tutorial. *Tutorials in Quantitative Methods for Psychology*, 5(1), 11-24.
- Bandura, A. (1997). *Social learning theory*. New York: General Learning Press.
- Barber, B. K. (1996). Parental psychological control: revisiting a neglected construct. *Child Development*, 67(6), 3296-3319. doi: 10.1111/j.1467-8624.1996.tb01915.x.
- Barkmann, C., Braehler, E., Schulte-Markwort, M., & Richterich, A. (2011). Chronic somatic complaints in adolescents: prevalence, predictive validity of the parent reports, and associations with social class, health status, and psychosocial distress. *Social Psychiatry and Psychiatric Epidemiology*, 46(10):1003-1011. doi: 10.1007/s00127-010-0273-4
- Campo, J. V., Comer, D. M., Jansen-McWilliams, L., Gardner, W., & Kelleher, K. J. (2002). Recurrent pain, emotional distress, and health service use in childhood\* 1. *The Journal of Pediatrics*, 141(1), 76-83. doi: 10.1067/mpd.2002.125491
- Cohen, L. L., Vowles, K. E., Eccleston, C. (2010). Parenting an adolescent with chronic pain: an investigation of how a taxonomy of adolescent functioning relates to parent distress. *Journal of Pediatric Psychology*, 35(7), 748-757. doi:10.1093/jpepsy/jsp103.
- Deater-Deckard, K. (1998). Parenting stress and child adjustment: Some old hypotheses and new questions. *Clinical Psychology: Science and Practice*, 5(3), 314-332. doi: 10.1111/j.1468-2850.1998.tb00152.x.
- De Gucht, V., & Fischler, B. (2002). Somatization: a critical review of conceptual and methodological issues. *Psychosomatics*, 43(1), 1-9. doi: 10.1176/appi.psy.43.1.1
- Dengler-Crish, C. M., Horst, S. N., & Walker, L. S. (2011). Somatic complaints in childhood functional abdominal pain are associated with functional gastrointestinal disorders

in adolescence and adulthood. *Journal of Pediatric Gastroenterologic Nutrition* 52(2), 162-165. doi: 10.1097/MPG.0b013e3181ec1d2e

Dunn, K. M., Jordan, K. P., Mancl, L., Drangsholt, M. T., & Le Resche, L. (2011). Trajectories of pain in adolescents: a prospective cohort study. *Pain*, 152(1), 66-73. doi: 10.1016/j.pain.2010.09.006

Eccleston, C., Crombez, G., Scotford, A., Clinch, J., Connell, H. (2004). Adolescent chronic pain: patterns and predictors of emotional distress in adolescents with chronic pain and their parents. *Pain*, 108(3), 221-229. doi: 10.1016/j.pain.2003.11.008.

Galambos, N. L., Barker, E. T., & Almeida, M. (2003). Parents Do Matter: Trajectories of Change in Externalizing and Internalizing Problems in Early Adolescence. *Child Development*, 74(2), 578-594. doi: 10.1111/1467-8624.7402017

Garralda, M. E. (2010). Unexplained physical functional complaints. *Pediatric Clinics of North America*, 58, 803-813. doi: 10.1016/j.pcl.2011.06.002

Grietens, H., Hoppenbrouwers, K., Desoete, A., Wiersema, J. R., & Van Leeuwen, K. (2010). *JOnG! Theoretische achtergronden, onderzoeksopzet en verloop van het eerste meetmoment (SWVG-rapport)*. Leuven: Steunpunt Welzijn, Volksgezondheid en Gezin.

Guérin, C., Pieters, C. Roelants, M., Van Leeuwen, K., Desoete, A., Wiersema, R. J., & Hoppenbrouwers, K. (2012). *Sociaal-demografisch profiel en gezondheid van 6- en 12-jarige jongeren (cohortes JOnG!) in Vlaanderen (SWVG-rapport)*. Leuven: Steunpunt Welzijn, Volksgezondheid en Gezin.

Haraldstad, K., Sörum, R., Eide, H., Natvig, G. K., & Helseth, S. (2011). Pain in Children and Adolescents: Prevalence, Impact on Daily Life, and Parents' Perception, a School Survey. *Scandinavian Journal of Caring Sciences* 25(1), 27-36. doi: 10.1111/j.1471-712.2010.00785.x

Hermans, K., Demaerschalk, M., Declercq, A., Vanderfaeillie, J., Maes, L., De Maeseneer, J., & Van Audenhove, C. (2008). *Steunpunt Welzijn, Volksgezondheid en Gezin. De selectie van de SWVG-onderzoeksregio's* [Policy Research Centre Welfare, Health and Family. Selection of the research regions (Policy Research Centre Welfare, Health and Family-report)]. Leuven: Steunpunt Welzijn, Volksgezondheid en Gezin.

Hoagwood, K. E., Cavaleri, M. A., Olin, S. S., Burns, B. J., Slaton, E., Gruttadaro, D., & Hughes, R. (2009). Family support in children's mental health: a review and synthesis. *Clinical Child and Family Psychological Review*, 13(1), 1-45. doi: 10.1007/s10567-009-0060-5

Hunfeld, J. A. M., Perquin, C. M. D., Bertina, W., Hazebroek-Kapschreur, A. A. M., van Suijlekom-Smit, L. W. A., Koes, B. W., et al. (2002). Stability of pain parameters and pain-related quality of life in adolescents with persistent pain: a three-year follow-up. *The Clinical Journal of Pain* 18(2), 99-106.

Jellesma, F. C., Rieffe, C., & Terwogt, M. M. (2007). The somatic complaint list: validation of a self-report questionnaire assessing somatic complaints in children. *Journal of Psychosomatic Research*, 63(4), 399-401. doi: 10.1016/j.jpsychores.2007.01.017.

Jung T., & Wickrama K. A. S. (2008). An introduction to latent class growth analysis and growth mixture modelling. *Social and Personality Psychology Compass* 2(1), 302-317. doi: 10.1111/j.1751-9004.2007.00054.x

Lazarus, R. S., & Folkman, S. (1984). *Stress, Appraisal, and Coping*. New York: Springer Publishing Company, Inc.

Lovullo, W. R. (2005). *Stress & health: Biological and Psychological Interactions*. Thousand Oaks: Sage Publications.

Lundqvist, C., Clench-Aas, J., Hofoss, D., & Bartonova, A. (2006). Selfreported headache in schoolchildren: parents underestimate their children's headaches. *Acta Paediatrica*, 95(8), 940–946. doi: 10.1080/08035250600678810

Mulvaney, S., Lambert, E. W., Garber, J., & Walker, L. (2006). Trajectories of symptoms and impairment for pediatric patients with functional abdominal pain: A 5-year longitudinal study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 45(6), 737-744. doi: 10.1097/10.chi.0000214192.57993.06.

Murray, C. J. L., Lopez, A. D., Mathers, C. D., & Stein, C. (2011). The global burden of disease 2000 project: aims, methods and data sources, Available at <http://wwwlive.who.int/healthinfo/paper36.pdf> (accessed 29th of August, 2012).

Muthén, L. K., & Muthén, B. O. (1998-2012). *Mplus User's Guide. Seventh Edition*. Los Angeles: Muthén & Muthén.

Nylund, K. L., Asparouhov, T., & Muthén B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modelling: a monte carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*, 14(4), 535-569. doi: 10.1080/10705510701575396

Palermo, T. M. (2000). Impact of recurrent and chronic pain on child and family daily functioning: a critical review of the literature. *Journal of Developmental and Behavioral Pediatrics*, 21(1), 58-69. doi: 0196-206X/00/2101-0058

Palermo, T. M., Chambers, C. T. (2005). Parent and family factors in pediatric chronic pain and disability: an integrative approach. *Pain*, 119(1), 1-4. doi: 10.1016/j.pain.2005.10.027.

Perquin, C. W., Hazebroek-Kampschreur, A. A. J. M., Hunfeld, J. A. M., Bohnen, A. M., van Suijlekom-Smit, L. W. A., Passchier, J., & van der Wouden, J. C. (2000). Pain in

children and adolescents: a common experience. *Pain*, 87(1), 51-58. doi: 10.1016/S0304-3959(00)00269-4

Rhee, H., Holditch-Davis, D., Miles, F., & Miles, M. (2005). Patterns of physical symptoms and relationships with psychosocial factors in adolescents. *Psychosomatic Medicine*, 67(6), 1006-1012. doi: 10.1097/01.psy.0000188404.02876.8b.

Roth-Isigkeit, A., Thyen, U., Raspe, H. H., Stoven, H., & Schmucker, P. (2004). Reports of pain among German children and adolescents: an epidemiological study. *Acta Paediatrica*, 93(2), 258–263. doi: 10.1111/j.1651-2227.2004.tb00717.x

Rousseau, S., Grietens, H., Vanderfaellie, J., Hoppenbrouwers, K., Wiersema, J. R., & Van Leeuwen, K. (2013). Parenting stress and dimensions of parenting behaviour: cross-sectional and longitudinal links with adolescents' somatisation. *International Journal of Psychiatry in Medicine*, 46(3), 243-270. doi: 10.2190/PM.46.3.b

Stanford, E. A., Chambers, C. T., Biesanz, J. C., & Chen, E. (2008). The frequency, trajectories and predictors of adolescent recurrent pain: a population-based approach. *Pain*, 138(1), 11-21. doi: 10.1016/j.pain.2007.10.032

Steeger, C. M., Gondoli, D. M., & Morrissey R. A. (2012). Maternal avoidant coping mediates the effect of parenting stress on depressive symptoms during early adolescence. *Journal of Child and Family Studies*, 22(7), 952-961. doi: 10.1007/s10826-012-9657-2

Walker, L. S., Guite, J. W., Duke, M., Barnard, J. A., & Greene, J. W. (1998). Recurrent abdominal pain: a potential precursor of irritable bowel syndrome in adolescents and young adults. *The Journal of Pediatrics*, 132, 1010. doi: 10.1016/S0022-3476(98)70400-7

Walker, L. S., Smith, C. A., Garber, J., & Claar, R. L. (2006). Appraisal and coping with daily stressors by pediatric patients with chronic abdominal pain. *Journal of Pediatric Psychology* 32(2), 206-216. doi: 10.1093/jpepsy/jsj124

Wels, P. M. A., & Robbroeckx, L. M. H. (1996). NVOS. *Nijmeegse Vragenlijst voor de Opvoedingssituatie* [Nijmeegse Family Situation Questionnaire]. Lisse, Swets & Zeitlinger.

Widenfelt, B. M., Goedhart, A. W., Treffers, P. D. A., & Goodman, R. (2003). Dutch version of the strengths and difficulties questionnaire (SDQ). *European Child & Adolescent Psychiatry, 12*(6), 281-289. doi 10.1007/s00787-003-0341-3

Table I

*Demographic Characteristics of Families with Complete and Incomplete Data*

| Demographics <sup>I</sup>              | Maximum 1<br>somatisationscore missing<br>(n = 1026)<br>Valid % | More than 1<br>somatisationscore missing<br>(n = 476)<br>Valid % | $\chi^2$ |
|--|---|--|----------|
|  |   |  | 3.91     |
| <i>Gender child (n = 1496)</i>         |   |  |          |
| Male                                   | 43.7  | 49.1   |          |
| <i>Origine (n = 1436)<sup>II</sup></i> |   |  |          |
| Belgian                                | 91.9  | 85.0   | 19.31a   |
| WHO A                                  | 3.9   | 5.1  |          |
| WHO B-D                                | 4.2   | 9.9  |          |
| <i>Mothers' occupation (n = 1412)</i>  |   |  |          |
| Paid work                              | 83.9  | 80.6   | 2.38     |
| <i>Fathers' occupation (n = 1272)</i>  |   |  |          |
| Paid work                              | 95.6  | 91.0   | 10.32a   |
| <i>Mothers' education (n = 1407)</i>   |   |  |          |
| Bachelor/master                        | 62.7  | 44.2   | 50.40a   |
| Highschool                             | 28.3  | 36.3   |          |
| <i>Fathers' education (n = 1252)</i>   |   |  |          |
| Bachelor/master                        | 49.6  | 39.8   | 13.99a   |
| Highschool                             | 37.9  | 40.7   |          |
| <i>Family structure (n = 1418)</i>     |   |  |          |
| Two-parent                             | 81.9  | 69.7   | 25.76a   |
| Newly-formed                           | 7.7   | 12.9   |          |
| Single-parent                          | 10.5  | 17.4   |          |
| <i>Family income (n = 1165)</i>        |   |  |          |
| < 1500 €                               | 4.5   | 9.7  | 21.31a   |
| 1500 – 3000 €                          | 39.2  | 46.6   |          |
| > 3000 €                               | 56.3  | 43.7   |          |

<sup>c</sup>  $p < .05$ ; <sup>b</sup>  $p < .01$ ; <sup>a</sup>  $p < .001$ ; <sup>I</sup> based on T1 parent-questionnaires; <sup>II</sup> based on country of birth and nationality of the parents, as defined by the World Health Organization (Murray, Lopez, Mathers, & Stein, 2011): WHO-A country = a country other than Belgium, with high prosperity and low health-risks; WHO B-D country = a country other than Belgium, with low prosperity and high health-risks

Table II

*Descriptives of the Continuous Study Variables*

|                                       | Min | Max | M(SD)     | Correlations     |                  |                  |                  |                  |                  |                  |                  |  |  |
|---------------------------------------|-----|-----|-----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|--|--|
|                                       |     |     |           | 1                | 2                | 3                | 4                | 5                | 6                | 7                | 8                |  |  |
| 1. T1 Adolescent's somatisation       | 0   | 5   | 1.66(.51) |                  |                  |                  |                  |                  |                  |                  |                  |  |  |
| 2. T2 Adolescent's somatisation       | 0   | 5   | 1.60(.54) | .51 <sup>a</sup> |                  |                  |                  |                  |                  |                  |                  |  |  |
| 3. T3 Adolescent's somatisation       | 0   | 5   | 1.85(.62) | .42 <sup>a</sup> | .54 <sup>a</sup> |                  |                  |                  |                  |                  |                  |  |  |
| 4. T1 Parenting stress                | 0   | 5   | 1.62(.52) | .21 <sup>a</sup> | .15 <sup>a</sup> | .09 <sup>c</sup> |                  |                  |                  |                  |                  |  |  |
| 5. T2 Parenting stress                | 0   | 5   | 1.59(.52) | .17 <sup>a</sup> | .16 <sup>a</sup> | .07              | .74 <sup>a</sup> |                  |                  |                  |                  |  |  |
| 6. T3 Parenting stress                | 0   | 5   | 1.56(.52) | .13 <sup>a</sup> | .13 <sup>b</sup> | .11 <sup>b</sup> | .63 <sup>a</sup> | .69 <sup>a</sup> |                  |                  |                  |  |  |
| 7. T1 Adolescent's emotional symptoms | 0   | 3   | 1.54(.45) | .44 <sup>a</sup> | .31 <sup>a</sup> | .26 <sup>a</sup> | .16 <sup>a</sup> | .18 <sup>a</sup> | .14 <sup>a</sup> |                  |                  |  |  |
| 8. T2 Adolescent's emotional symptoms | 0   | 3   | 1.52(.45) | .34 <sup>a</sup> | .46 <sup>a</sup> | .32 <sup>a</sup> | .12 <sup>b</sup> | .16 <sup>a</sup> | .13 <sup>b</sup> | .57 <sup>a</sup> |                  |  |  |
| 9. T3 Adolescent's emotional symptoms | 0   | 3   | 1.56(.47) | .26 <sup>a</sup> | .35 <sup>a</sup> | .47 <sup>a</sup> | .03              | .09 <sup>c</sup> | .05              | .43 <sup>a</sup> | .58 <sup>a</sup> |  |  |

<sup>c</sup>  $p < .05$ ; <sup>b</sup>  $p < .01$ ; <sup>a</sup>  $p < .001$ ; T1 = Time 1; T2 = Time 2; T3 = Time 3



Table IV

Prediction of Somatisation Trajectory Membership (Intergroup Differences)

|                                    | COMPARISON GROUP =<br>LONG-TERM LOW<br>SOMATISATION TRAJECTORY |             |   |             |  |              | COMPARISON GROUP =<br>LONG-TERM HIGH<br>SOMATISATION TRAJECTORY |             |   |             | COMPARISON GROUP =<br>INCREASED<br>SOMATISATION TRAJECTORY |             |
|------------------------------------|--|-------------|---|-------------|--|--------------|---|-------------|---|-------------|--|-------------|
|                                    | Increased<br>somatisation<br>trajectory                        |             | Decreased<br>somatisation<br>trajectory |             | Long-term high<br>somatisation<br>trajectory |              | Increased<br>somatisation<br>trajectory                         |             | Decreased<br>somatisation<br>trajectory |             | Decreased<br>somatisation<br>trajectory                    |             |
|                                    | Exp(b)   | CI          | Exp(b)                                  | CI          | Exp(b)                                       | CI           | Exp(b)  | CI          | Exp(b)                                  | CI          | Exp(b)   | CI          |
|                                    |  |             |   |             |  |              |   |             |   |             |  |             |
| T1 Parenting stress                | 2.33 <sup>c</sup>  | (1.14-4.76) | 2.64                                    | (0.37-1.54) | 0.76   | (0.96-07.23) | 0.88  | (0.32-2.41) | 0.29 <sup>c</sup>                       | (0.10-0.80) | 0.33 <sup>b</sup>  | (0.15-0.71) |
| T2 Parenting stress                | 0.52   | (0.24-1.10) | 0.47                                    | (0.54-2.19) | 1.09   | (0.16-01.33) | 1.10  | (0.39-3.15) | 2.33                                    | (0.82-6.59) | 2.11   | (0.94-4.71) |
| T3 Parenting stress                | 1.11   | (0.57-2.14) | 1.40                                    | (0.90-3.09) | 1.67   | (0.56-03.46) | 0.79  | (0.32-1.97) | 1.19                                    | (0.49-2.94) | 1.51   | (0.75-3.01) |
| T1 Adolescent's emotional symptoms | 1.56   | (0.81-3.02) | 7.95 <sup>a</sup>                       | (3.04-0.85) | 5.74 <sup>a</sup>                            | (3.33-19.01) | 0.20 <sup>a</sup>   | (0.08-0.46) | 0.72                                    | (0.31-1.67) | 3.68 <sup>a</sup>  | (1.88-7.23) |
| T2 Adolescent's emotional symptoms | 1.63   | (0.84-3.17) | 2.23                                    | (0.73-2.91) | 1.45   | (0.88-05.63) | 0.73  | (0.30-1.82) | 0.65                                    | (0.26-1.64) | 0.89   | (0.44-1.83) |
| T3 Adolescent's emotional symptoms | 4.52 <sup>a</sup>  | (2.48-8.23) | 3.05                                    | (0.64-2.33) | 1.22 <sup>c</sup>                            | (1.29-07.21) | 1.48  | (0.65-3.41) | 0.40 <sup>c</sup>                       | (0.17-0.95) | 0.27 <sup>a</sup>  | (0.14-0.52) |
| Gender (=male)                     | 0.46 <sup>b</sup>  | (0.28-0.76) | 0.62                                    | (0.58-1.53) | 0.94   | (0.28-01.36) | 0.75  | (0.33-1.69) | 1.51                                    | (0.68-3.39) | 2.03 <sup>c</sup>  | (1.15-3.59) |

a =  $p < .001$ ; b =  $p > .01$ ; c =  $p > .05$

Table V

*Prediction of Within Trajectory Variance (Intragroup Differences)*

|                                    | INCREASED               |                   |                   | LONG-TERM HIGH          |                    |                    | LONG-TERM LOW           |                   |                   | DECREASED               |                    |                   |       |      |                   |      |
|------------------------------------|-------------------------|-------------------|-------------------|-------------------------|--------------------|--------------------|-------------------------|-------------------|-------------------|-------------------------|--------------------|-------------------|-------|------|-------------------|------|
|                                    | SOMATISATION TRAJECTORY |                   |                   | SOMATISATION TRAJECTORY |                    |                    | SOMATISATION TRAJECTORY |                   |                   | SOMATISATION TRAJECTORY |                    |                   |       |      |                   |      |
| <b>Predictor = continuous</b>      | <i>M</i> scl T1         | <i>M</i> scl T2   | <i>M</i> scl T3   | <i>M</i> scl T1         | <i>M</i> scl T2    | <i>M</i> scl T3    | <i>M</i> scl T1         | <i>M</i> scl T2   | <i>M</i> scl T3   | <i>M</i> scl T1         | <i>M</i> scl T2    | <i>M</i> scl T3   |       |      |                   |      |
| T1 Parenting stress                | 0.16                    | 0.12              |                   | 1.38 <sup>a</sup>       | 0.25               |                    | 0.02                    | 0.04              |                   | -0.23                   | 0.21               |                   |       |      |                   |      |
| T1 Adolescent's emotional symptoms | 0.48 <sup>a</sup>       | 0.10              |                   | 0.17                    | 0.16               |                    | 0.26 <sup>a</sup>       | 0.05              |                   | 1.16 <sup>a</sup>       | 0.25               |                   |       |      |                   |      |
| T2 Parenting stress                |                         | 0.48 <sup>c</sup> | 0.19              |                         | -1.66 <sup>a</sup> | 0.40               |                         | 0.08              | 0.04              |                         | -0.51 <sup>a</sup> | 0.10              |       |      |                   |      |
| T2 Adolescent's emotional symptoms |                         | 0.47 <sup>a</sup> | 0.11              |                         | -0.92 <sup>c</sup> | 0.45               |                         | 0.23 <sup>a</sup> | 0.04              |                         | 1.25 <sup>a</sup>  | 0.11              |       |      |                   |      |
| T3 Parenting stress                |                         |                   | 0.28 <sup>b</sup> | 0.10                    |                    | -0.73 <sup>c</sup> | 0.29                    |                   | 0.04              | 0.03                    |                    | -0.04             | 0.20  |      |                   |      |
| T3 Adolescent's emotional symptoms |                         |                   | 0.44 <sup>a</sup> | 0.10                    |                    | 0.60               | 0.32                    |                   | 0.28 <sup>a</sup> | 0.03                    |                    | 0.46 <sup>a</sup> | 0.13  |      |                   |      |
| <b>Predictor = categorical</b>     | Intercept               |                   | Slope             |                         | Intercept          |                    | Slope                   |                   | Intercept         |                         | Slope              |                   |       |      |                   |      |
| Gender (=male)                     | -0.33                   | 0.24              | 0.05              | 0.16                    | 2.34 <sup>a</sup>  | 0.49               | -1.85 <sup>a</sup>      | 0.32              | 0.07              | 0.08                    | 0.02               | 0.04              | -0.47 | 0.39 | 0.78 <sup>c</sup> | 0.32 |

Reported values are  $B(SE)$ ;  $M$  = mean; scl = somatic complaints list; T1 = time 1, T2 = time 2, T3 = time 3; a =  $p < .001$ ; b =  $p > .01$ ; c =  $p > .05$

*Figure 1.* Trajectories of the 4-class Solution: Estimated Model

