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RESEARCH ARTICLE

Somatisation and functional impairment in adolescents: longitudinal link with mothers' reactions

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Adolescents' somatisation (i.e., the psychological tendency to experience and report multiple physical complaints for which no definite medical cause can be found; SOM) and functional impairment (i.e., all bothersome aftermath of somatisation; FI) were studied in relation to mothers' protection, encouraging/monitoring, and minimisation of physical functional complaints. Besides main effects, interaction effects with other child and parenting characteristics were examined. A total of 990 adolescents and their mothers filled out questionnaires when the adolescents were respectively 12–13 (T1) and 13–14 (T2) years old. At T1, there was a significant relation between mothers' higher amounts of minimisation and adolescents' higher levels of SOM. Further, the link between mothers' higher levels of T1 minimisation and adolescents' higher amounts of T1 FI was significant, but not for adolescents with high levels of depressive mood. Longitudinal analyses revealed that mothers' reactions did not significantly predict adolescents' SOM/FI, nor did adolescents' SOM/FI significantly predict mothers' reactions. Practical implications are discussed.

Keywords: somatisation; functional impairment; protection; encouraging/monitoring; minimisation

Introduction

In the general population, about 15 to 25% of all adolescents report recurrent or continuous physical complaints, such as headaches, abdominal pain or fatigue (Lundqvist, Clench-Aas, Hofoss, & Bartonova, 2006; Perquin et al., 2000; Roth-Isigkeit, Thyen, Raspe, Stoven, & Schmucker, 2004). For the majority of these complaints, no definite medical cause can be found, hence they are often named physical functional complaints (PFC). The (psychological) tendency to experience and report multiple PFC is named somatisation (SOM) (De Gucht & Fischler, 2002). Besides bodily inconveniences, PFC and SOM might affect other areas of functioning, due to for example restricted school attendance or the abandoning of hobbies and social activities. Functional impairment

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(FI) is used as an umbrella term for all bothersome aftermath of PFC/SOM (Campo, Comer, Jansen-McWilliams, Gardner, & Kelleher, 2002; Palermo, 2000). Earlier studies revealed that in the development and progression of PFC/SOM and FI, psychological and/or social factors play a major role, however, knowledge on specific contributing features and processes is still in short supply (Eminson, 2007; Garralda, 2010). One of the domains that remain understudied is that of family factors (Palermo & Chambers, 2005).

The relation between adolescents' PFC/SOM and family factors can be theoretically modelled by operant conditioning mechanisms. In this light, (verbal and nonverbal expressions of) PFC are believed to be susceptible to feedback (such as reinforcement, punishment, or ignoring reactions) from important others (Fordyce, 1978). On the one hand, reinforcement will strengthen PFC and thereby increase the likelihood of re-occurrence. Reinforcement can be positive (adolescents' PFC will increase as a result of positive consequences, such as parents' attention) or negative (adolescents' PFC will increase as a result of the omission of negative affairs, e.g., parents' permission to avoid undesirable activities). On the other hand, in theory, the prevalence of PFC will decrease when followed by negative reactions (e.g., minimising reactions, such as parents telling their children that they are exaggerating or ignoring them). Reactions on PFC are also likely to show a link with adolescents' FI. PFC reinforcement (e.g., permission to avoid undesirable activities; reduced frequency of stressful interactions) might stimulate FI by approving it, while negative reactions will in theory have the opposite effect. In addition, reinforcement of desired behaviours (FI preventing behaviours, such as sustainment of activity in spite of pain), should decrease FI. Although researchers agree on the fact that learning principles play a role in the determination of PFC/SOM and FI, they disagree on the aetiological importance of it, with opinions ranging from extreme, for example denying the importance of other aetiological factors or conceptualizing them as internal operants (Jahanshahi, 1986; Novy, Nelson, Francis, & Turk, 1995; Rachlin & Philips, 1985), to more moderate such as acknowledging the bio-psychosocial perspective (Fordyce, 1978).

In research on PFC, SOM and FI, this operant learning model has been predominantly used to assess the link between adults' outcome and their spouses' reactions. More recently, the knowledge that parents' rewards and punishments play a crucial role in the development of children's behaviour has inspired researchers to assess the link between parental reactions and children's PFC, SOM and FI. So far, empirical research with children focused on rewarding parental reactions. Researchers found that solicitous or protective reactions (e.g., giving privileges or releasing from chores or responsibilities) were related to various outcome measures, such as higher levels of SOM (Walker, Claar, & Garber, 2002), higher levels of FI (Claar, Simons, & Logan, 2008; Langer, Romano, Levy, Walker, & Whitehead, 2009; Peterson & Palermo, 2004; Walker, Garber, & Greene, 1993), or higher frequency or severity of single PFC (Walker et al., 1993). However, some studies did not find this link (Jellesma, Rieffe, & Terwogt, 2008; Merlijn, Hunfeld, & van der Wouden, 2003; Wendland, Jackson, & Stokes, 2010). Further, only a limited amount of studies investigated moderating factors. Studies that did include moderating features indicated that the association between specific parenting behaviour and SOM/FI may be stronger for girls and children with higher levels of overall emotional distress (Claar et al., 2008; Peterson & Palermo, 2004; Walker et al., 2006).

Research in adults suggested that besides the rewarding of PFC, other dimensions of specific responses might be related to PFC/SOM and FI. More specific, the validity of the dimensions 'distraction' and 'punishing' was revealed (Kerns, Turk, & Rudy, 1985; Riley, Zawacki, Robinson, & Geisser, 1999). Distraction seemed to be related to better health, while punishing was associated to

worse health (Bergstrom, Bodin, Jensen, Linton, & Nygren, 2001; Turk & Rudy, 1988; Turk & Rudy, 1990). More recently, also with regard to adolescents' PFC, a broader range of reactions is studied. Walker et al. (2006) identified the relevance of encouraging/monitoring behaviours (related to distraction, cf. supra) or in other words the combination of encouraging the adolescent to stay engaged in everyday activities, and monitoring the complaints without giving further attention to them. In addition, Walker et al. (2006) demonstrated the importance of minimising responses (related to punishing, cf. supra), or in other words the act of discounting and criticising adolescents' complaints. Encouraging/monitoring seems to be protective (Walker et al., 2006), however Claar et al. (2008) did not find significant results. Minimising was found to be related to less adaptive outcome (Claar et al., 2008). Although in the above studies it is frequently stated that operant mechanisms explain the associations, the authors do not further elaborate on which specific operant mechanisms are at stake. We believe that the protective role of encouraging/distracting might be related to the reinforcement of desired behaviour, which will indirectly lead to the decrease of undesired behaviours. Monitoring may relate to a neutral approach to the complaints, providing no positive or negative consequences, and therefore not leading to an increase or reduction of the complaints. That minimising (~ ignoring undesired behaviour) is related to higher levels of SOM/FI is in contradiction to the assumptions of the operant learning theory as outlined above. Therefore, other mechanisms might be at stake, such as the stress theory. It is possible that adolescents' stress following an unpleasant parental reaction (minimisation) explains the link with somatisation/functional impairment (Lovallo, 2005).

Based on the above, four key challenges for further research on the link between parental reactions on PFC and adolescent's PFC/SOM and FI can be identified. First, previous research about parents' reactions on adolescents' PFC has focused on protective reactions (Jellesma et al., 2008; Langer et al., 2009; Merlijn et al., 2003; Peterson & Palermo, 2004; Wendland et al., 2010). Other reactions, such as the above described encouraging/monitoring and minimisation aspects are understudied.

Second, since findings concerning the relation between parental reactions and adolescents' SOM/FI are inconsistent, additional research on this topic is needed. As indicated by earlier studies, it is important to include possible moderating child characteristics, such as emotional distress and gender (Claar et al., 2008; Peterson & Palermo, 2004; Walker et al., 2006). But also other moderators can be investigated. Parenting research suggests a difference between specific and general parenting practices: whereas specific parenting practices might differ upon the area of child development (e.g., a parent can be more controlling towards a child's sports achievement than towards a child's academic achievement), general parenting practices picture broader parenting behaviour across areas of child development (e.g., how controlling is the parent in general, beyond the specific areas of child development?). Usually, general parenting practices are grouped into three relatively independent parenting dimensions: warmth/support (the amount in which a parent shows parenting practices of warmth, acceptance and understanding), behavioural control (the extent to which a parent shows parenting practices through which the child's behaviour is directly controlled, e.g., punishment), and psychological control (the amount in which a parent shows parenting practices through which the child's emotions and cognitions are controlled, e.g., guilt induction) (Barber 1996; Galambos, Barker, & Almeida, 2003). Scholars have suggested that the effect of specific parenting practices, such as parents' reactions on PFC, has to be considered in the light of their interaction with these higher order general parenting dimensions (Cummings, Davies,

& Campbell, 2000). Although we are not aware of empirical research or theoretical elaboration on the relation between specific and general parenting dimensions, previous studies showed that the impact of certain general parenting dimensions can alternate the impact of other parenting dimensions. Higher levels of parental warmth may for example buffer the negative impact of psychological control (Barber, Bean, & Erickson, 2002; Gray & Steinberg, 1999; Pettit & Laird, 2002). In contrast, one may assume that parents who combine high levels of parental warmth and high levels of psychological control are experienced as intrusive, which is associated with less adaptive child development (Barber & Buehler, 1996). Or, these parents may be experienced as inconsistent, which is likewise related to less adaptive child development (Punamäki, Qouta, & El-Sarraj, 2001). In addition to a significant psychological control by warmth interaction, previous studies showed moderation between other parenting dimensions (e.g., Galambos et al., 2003). The above findings allow us to make hypotheses on how general parenting dimensions may moderate the association between specific parenting dimensions and SOM/FI. It is possible that parental protection (e.g., spending more time with the child) is especially rewarding when the child likes to spend time with his/her parents, or in other words when occurring in generally 'positive' parenting environments (characterised by more warmth, less psychological control, and less negative behavioural control). On the other hand, parental protection may be especially rewarding for those children who grow up in generally 'negative' parenting environments, where parents normally spend little amounts of quality time with their children. Parental encouraging/monitoring (e.g., parents stimulate the child to go out from the house and continue performing daily activities) may be especially rewarding for adolescents who do not like to be at home (e.g., opportunity to escape from negative parenting environments). Or, for these adolescents parental encouraging/monitoring might be especially stressful (e.g., confirmation that they are not loved). Minimisation may be stressful when occurring in generally negative parenting environments: the child may for example perceive minimisation as a confirmation that the parent does not take into account the child's expressions. When minimisation occurs in generally positive parenting environments, it may be less stressful, allowing for the effect of operant learning mechanisms to take place.

Third, when parental reactions on PFC are studied, functional pain is often used as outcome variable. However, also other, non-painful PFC, such as tiredness and nausea are frequently seen in children. Furthermore, one can assume that reactions of parents on complaints can affect the tendency to report complaints in general rather than the tendency to report one specific complaint, a condition which is often referred to as response generalization (Grant & Evans, 1994). Adolescents' overall tendency to report complaints (SOM), and the related FI, have rarely been studied as outcome variables.

Fourth, most studies used cross-sectional, retrospective, or experimental designs, assessing the hypothesis that parental responses influence SOM/FI (forward relation). Although based on the above theoretical considerations (operant conditioning and stress theory) this influence may be expected, it is also possible that SOM/FI influence parental reactions (backward relation). It is for example likely to assume that adolescents' SOM/FI stimulate parents to use protective behaviours. So far, no study has considered both longitudinal relations. However, even when longitudinal relations are considered, the parallel investigation of cross-sectional associations remains valuable. After all, it is possible that the time-interval between longitudinal measurement points is too large or too small to identify longitudinal connections, or that the direction of longitudinal connections changes between the initial and final point of analyses (Biddle, Bank, & Marlin, 1980). In both situations, longitudinal relations will not be acknowledged,

and cross-sectional results may give the indication to include in additional research smaller or larger time-intervals. Further, it is possible that longitudinal relations do not exist. In that case, cross-sectional results may inform clinicians about which events are likely to co-occur. Although the above indicates the value of cross-sectional research, cross-sectional information might over- or underestimate longitudinal parameters (Maxwell & Cole, 2007). Therefore, in order to obtain a full understanding of associations, cross-sectional studies have to be supplemented with longitudinal research.

To address these four key challenges, the present study will include data from two measurement points, and investigate cross-sectional as well as forward and backward longitudinal associations between children's SOM and FI, and mothers' protective, encouraging/monitoring, and minimising reactions. Moderation of gender, emotional distress and general parenting dimensions (warmth, psychological control, and negative behavioural control) will be examined. In particular, the present study assesses two hypotheses. First, based on the above discussed theory and research findings, adolescents' higher levels of SOM and FI are hypothesised to be related to mothers' more frequent use of protective reactions and less frequent use of encouraging/monitoring. Mothers' more frequent use of minimising reactions may be related to lower levels of SOM/FI (in accordance with operant conditioning theory) or higher levels of SOM/FI (in accordance with previous research and the stress theory). In the absence of previous longitudinal results, it is not clear which directions (forward or backward) are to be expected. However, based on findings on the direction of parent-child relationships in general, both forward and backward relations are likely to occur (Pettit & Arsiwalla, 2008). Second, the links are hypothesised to be moderated by child factors (gender and emotional distress). The connection between adolescents' SOM/FI and mothers' maladaptive reactions may be stronger for adolescents showing higher levels of emotional distress and for girls (Claar et al., 2008; Peterson & Palermo, 2004; Walker et al., 2006). In addition, the links are hypothesised to be moderated by general parenting dimensions (warmth, behavioural control, psychological control) (Cummings et al., 2000). Since little previous research exists concerning this domain, no sound hypotheses can be made (cf. supra for an extensive discussion of possible hypotheses).

Methods

Participants

Mothers and adolescents included in this research were participants in the JOnG!-study, a longitudinal research program on development, parenting, behaviour and health in three cohorts of Flemish children (Grietens, Hoppenbrouwers, Desoete, Wiersema, & Van Leeuwen, 2010). The present article included data from the first (2009; Time 1 = T1) and second (2010; Time 2 = T2) data-waves of the adolescents' 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 925 (64.0% of T1 respondents) and 904 (62.6% of T1 respondents). The socio-economic profile of the responders-group matched that of the target population (Flemish families with a child born in 1996) (Guérin et al., 2012). Families were excluded if at least one of the following child problems were reported: congenital defect (T1) and/or lifetime diagnosis of serious health problems (T1 and T2; problems concerning the respiratory system, heart functioning, muscles and movement function, nervous system, sensory system, or other areas of functioning). Since past research suggested that, on average, mothers provide more reliable information on children's medical problems (Yeung, Sandberg, Davis-Kean, & Hofferth, 2001), data from respondents other than the mother were not included in the analyses. The final sample included 990 families, of which 557 (56.3%) with all four questionnaires available (mother and child questionnaire at two time points); 37 (3.7%) with

Demographics[I]	**Families who returned all 4 questionnaires (*n* = 557) Valid %**	**Families who returned 1, 2 or 3 questionnaires (*n* = 433) Valid %**	X^2	***p***
Gender child (*N* = 990)			4.6	[c]
Male	41.5	48.3		
Origine (*N* = 984)[II]			13.3	[b]
Belgian	92.1	87.1		
WHO A	4.5	4.0		
WHO B-D	3.4	8.9		
Mothers' occupation (*N* = 966)			1.9	
Paid work	85.7	82.4		
Fathers' occupation (*N* = 884)			2.5	
Paid work	95.1	92.5		
Mothers' education (*N* = 967)			15.5	[a]
Bachelor/master	61.0	50.5		
Highschool	39.0	49.5		
Fathers' education (*N* = 869)			8.3	[c]
Bachelor/master	49.8	42.0		
Highschool	50.2	58.0		
Family structure (*N* = 975)			17.6	[a]
Two-parent	84.6	74.2		
Newly-formed	5.6	11.6		
Single-parent	9.8	14.2		
Family income (*N* =787)			14.9	[b]
< 1500 €	2.8	7.6		
1500 – 3000 €	38.8	44.8		
> 3000 €	58.4	47.6		

[a] $p < .05$ [b] $p < .01$ [c] $p < .001$; [I] based on T1 mother-questionnaires; [II] based on country of birth and nationality of the parents; WHO = World Health Organisation (WHO, 2011)

Table 1: Comparison of Demographic Characteristics of Families with Complete and Incomplete Data

three questionnaires; 378 (38.2%) with two questionnaires and 18 (1.8%) with one questionnaire. The adolescents' mean age was 12.77 years at T1 (*SD* 0.31) and 13.97 years at T2 (*SD* 0.30). Families that completed all four questionnaires differed significantly from those who did not, on various demographic characteristics, except for parents' paid work (**Table 1**). Possible implications of this inequality were taken into account by

the use of multiple imputation in replacing missing values.

Measures

Questionnaires completed by mothers. Mothers' reactions on PFC of their children were assessed with three scales of the Dutch version of the Adults' Responses to Children's Symptoms (ARCS; Van Slyke & Walker, 2006). Included scales were 'protection' (e.g., parents give special treats or gifts in reaction to the adolescents' PFC), 'encouraging/monitoring' (e.g., parents encourage the child to do something he/she likes; e.g., parents check how their child feels) and 'minimisation' (e.g., parents tell the child that it has to get tougher). A total of 29 items were filled out on a five-point Likert scale (1 = never; 5 = always). In this study, Cronbach's alphas were higher than .75 at both waves, except for 'minimisation' (.53 at T1, .51 at T2). Six exploratory factor analyses (one per scale and one per measurement point) all showed unidimensionality, indicating that the scales had construct validity. Total scale scores were obtained by averaging responses across scale items (min = 1, max = 5).

General parenting dimensions were assessed by means of the subscales 'warmth/support' (e.g., I ask my child about hobbies and interests) and 'negative behavioural control' (e.g., I give my child a shaking when we have a fight) of the Parental Behaviour Scale (PBS; Van Leeuwen & Vermulst, 2004). Additionally, the Dutch translation of the Psychological Control Scale (PCS; Barber, 1996; Kuppens, Grietens, Onghena, & Michiels, 2009) was completed (e.g., I try to change the thoughts and feelings my child has about certain subjects). In total, 33 items were filled out on a five-point Likert scale ranging from 'never' (1) to 'always' (5). Total scale scores were obtained by averaging responses across scale items (min = 1, max = 5). Cronbach's alphas varied between .74 and .84.

Questionnaires completed by adolescents. Adolescents' SOM was assessed by means of the Somatic Complaint List (SCL; Jellesma, Rieffe, & Terwogt, 2007), containing 11 types of physical complaints (e.g., dizziness, tiredness). For every complaint, the adolescent indicated how often he/she suffered from it in the last four weeks, using a five-point Likert scale ranging from 1 (almost never) to 5 (quite often). SCL Cronbach's alphas were .82 at T1 and .84 at T2. A total SOM score was obtained by averaging all item scores (min = 1, max = 5).

FI was measured by the Dutch translation of the Strengths and Difficulties Questionnaire – social impairment supplement (SDQ; Goodman, 1999; Widenfelt, Goedhart, & Treffers, 2003). The adolescent was asked to what extent the SCL-complaints hamper his/her daily live at 'home', concerning 'friendships', 'studying in class' and 'leisure time activities'. All four questions were answered on a four-point Likert scale, ranging from 1 (not at all) to 4 (very much). Cronbach's alpha coefficients were .73 at T1 and .75 at T2. A total FI score was obtained by averaging responses across items (min = 1, max = 4).

Adolescents' psychological distress was assessed by means of the depressive mood (6 items) and fear (6 items) subscales of the Early Adolescent Temperament Questionnaire – Revised (EATQR; Ellis & Rothbart, 2001). The 12 items (e.g., I think my friends have more fun than I do; I worry about my family if I am not with them) were filled out on a five-point Likert scale ranging from 1 (= almost never true) till 5 (= almost always true). Cronbach's alphas varied between .66 and .77. Total scale scores were computed by averaging the individual item scores (min = 1, max = 5).

Procedure

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. A detailed description of the region-selection can be found in Hermans et al. (2008). In a second phase (2009), all

families living in the selected regions with a child born in 1996, were informed by mail about the study and invited to participate. Adolescents and parents who were interested in participating, first completed a shared consent form and subsequently filled out their own questionnaire. After one year (2010), a second questionnaire was sent to those parents and adolescents who consented to participate at T1. The study was approved by the Medical Ethics Committees of the universities of Leuven and Ghent.

Data Analyses

Cross-sectional and longitudinal associations between mothers' reactions to PFC and adolescents' SOM and FI were assessed by means of univariate hierarchical multiple regression analysis (UHMRA), using PASWstatistics19 (IBM, Chicago, IL, USA), following guidelines of Aiken and West (1991).

Concerning cross-sectional associations between mothers' responses and adolescents' SOM/FI, a set of 28 UHMRA was performed. Seven combinations of independent variables (seven models) were regressed against the two dependent variables (FI and SOM), at T1 and T2. In the basic model respectively SOM (when the dependent variable was FI) or FI (when the dependent variable was SOM) were entered as a control variable in block 1 (Peterson & Palermo, 2004; Wendland et al., 2010). In block 2, mothers' responses to PFC were included. In all models except for the basic model, an additional independent variable was added in block 2 (gender, depressive mood, fear as child characteristics, and warmth, negative behavioural or psychological control as general parenting dimensions), and interaction effects between the additional independent variable and mothers' responses to PFC were entered in block 3.

Concerning forward and backward longitudinal associations between mothers' responses and adolescents' SOM/FI, a set of 35 UHMRA was performed. Seven models (combining different T1 independent variables) were tested on their prediction of five T2 dependent variables (FI, SOM, protection, encouraging/monitoring, and minimisation). For the basic model, in a first block, control variables were included, namely T1 SOM and T1 FI (when the dependent variables were T2 SOM and T2 FI) or T1 protection, T1 encouraging/monitoring and T1 minimisation (when the dependent variables were T2 protection, T2 encouraging/monitoring and T2 minimisation). In a second block, T1 protection, T1 encouraging/monitoring and T1 minimisation, respectively T1 SOM and T1 FI were entered. In all models except for the basic model, an additional independent variable was added in the second block (gender, depressive mood, fear as child characteristics, and warmth, negative behavioural or psychological control as general parenting dimensions), whereas in a third block interaction effects between this additional independent variable and all other in block two added variables were included.

For regression equations including interaction terms, Aiken and West (1991) state that neither traditional unstandardized nor standardised regression coefficients are appropriate to report. However, when the crossproduct is based on centred scores, it is appropriate to use the unstandardized solution when describing interaction terms (Aiken & West, 1991).

Data Preparation

Concerning multivariate normality, all continuous variables' distributions met skewness and kurtosis standards (respectively $<|2|$ and <7; West, Finch, & Curran, 1995). Missing values varied from 4.8 to 46.5% per item. Little's MCAR test suggested that the data were missing completely at random ($X^2(17287) = 17444.32$, $p = 0.20$). Because families who returned all four questionnaires (parent and adolescent questionnaire at both measurement points) differed significantly on various demographic characteristics from families who returned less

questionnaires, multiple imputation on item-level was used to replace missing values (Schafer & Graham, 2002; Sterne et al., 2009). The imputation model contained all items included in the analysis, plus the socio-economic auxiliary variables 'family income' and 'parental education' since they have a well-known link with PFC (Garralda, 2010). A total of five complete datasets was constructed, using the statistical package PASWstatistics19 (IBM, Chicago, IL, USA). Given a missing value rate between 10 and 50%, the efficiency of an estimate base on five imputations is approximately 98 till 91% (Schafer & Graham, 2002).

Results

Descriptives

Means, standard deviations, and Pearson product-moment correlation coefficients are presented in **Table 2**. All variables presented sufficient variability to allow robust testing of hypotheses. Correlations varied between 0.01 and 0.55. Further examination of multicollinearity amongst the predictors revealed no problems: VIF-values were consistently lower than 1.93, tolerance-values higher than 0.52 (Miles & Shelvin, 2003).

Cross-sectional analyses at T1 and T2

Table 3 shows the output of the cross-sectional analyses.

As regards the ***main effects between SOM and FI***, block 1 results showed that adolescents who reported higher levels of FI also reported significantly higher levels of SOM. This significant association was present both at T1 [block 1 $F(1,988) = 231.00$, $p < .001$] and T2 [block 1 $F(1,988) = 352.48$, $p < .001$]. At T1, SOM and FI explained 19% of each other's variance, at T2 this was 26%.

Concerning ***main effects of specific parenting reactions***, block 2 results of the basic model (no interaction) indicated that at T1, adolescents whose mother used higher amounts of minimisation, reported significantly higher levels of SOM [block 2 $F(4,985) = 62.16$, $p < .001$, $\Delta F = 4.96$, $p < .01$] and FI [block 2 $F(4,985) = 59.88$, $p < .001$, $\Delta F = 2.50$, $p > .05$]. However, the second block

Variables	Min	Max	*M*	*SD*	1	2	3	4	5	6	7	8	9
Time 1													
1 pro	1	5	2.69	.58									
2 enc/mon	1	5	3.76	.54	.51[a]								
3 min	1	5	2.18	.54	-.16[a]	.01							
4 som	1	5	1.65	.52	.01	.01	.16[a]						
5 fi	1	4	1.30	.44	.04	.01	.13[a]	.44[a]					
Time 2													
6 pro	1	5	2.58	.57	.52[a]	.27[b]	-.11[b]	.02	.05				
7 enc/mon	1	5	3.67	.54	.24[c]	.37[c]	-.01	.00	.00	.56[c]			
8 min	1	5	2.15	.52	-.11[c]	-.02	.49[a]	.13[b]	.06	-.07	.02		
9 som	1	5	1.58	.53	-.03	-.01	.08	.46[a]	.23[a]	.03	.05	.11	
10 fi	1	4	1.25	.42	-.05	-.02	.05	.25[a]	.25[b]	-.02	.05	.01	.51[a]

[a] $p < .05$ [b] $p < .01$ [c] $p < .001$; pro = protection; enc/mon = encouraging/monitoring; min = minimisation; som = somatisation; fi = functional impairment

Table 2: Correlations and Descriptive Statistics of the Study Variables ($N = 990$)

	Dependent variable = Somatisation													
	Time 1							Time 2						
	No interaction	Interaction gender	Interaction dep	Interaction fear	Interaction pos	Interaction nbc	Interaction pc	No interaction	Interaction gender	Interaction dep	Interaction fear	Interaction pos	Interaction nbc	Interaction pc
Block1														
fi	1.00[a]	1.00[a]	1.00[a]	1.00[a]	1.00[a]	1.00[a]	1.00[a]	1.23[a]	1.23[a]	1.23[a]	1.23[a]	1.23[a]	1.23[a]	1.23[a]
r^2 block1	.19	.19	.19	.19	.19	.19	.19	.26	.26	.26	.26	.26	.26	.26
Block2														
fi	.96[a]	.96[a]	.72[a]	.91[a]	.96[a]	.96[a]	.96[a]	1.25[a]	1.24[a]	1.00[a]	1.22[a]	1.25[a]	1.24[a]	1.25[a]
pro	.02	.03	.02	.01	.01	.02	.02	.11	.11	.07	.11	.07	.13	.08
enc	.00	.00	.06	.01	.07	.00	.01	-.01	-.02	.04	.00	.11	-.03	.05
min	.21[a]	.21[a]	.12[c]	.16[b]	.20[a]	.22[a]	.19[b]	.22	.22	.18	.18	.19	.24[c]	.18
interaction variable		.15[c]	.53[a]	.29[a]	-.23[b]	-.06	.07		.37[a]	.39[a]	.18[b]	-.24	-.12	.11
r^2 block2	.01	.02	.14	.06	.02	.01	.01	.03	.06	.10	.05	.04	.04	.04
Block3														
fi		.96[a]	.72[a]	.91[a]	.94[a]	.97[a]	.95[a]		1.24[a]	1.01[a]	1.22[a]	1.25[a]	1.24[a]	1.26[a]
pro		-.13	.01	.00	.01	.02	.02		-.01	.07	.11	.07	.13	.08
enc		-.07	.06	.01	.07	.00	.01		-.16	.03	.00	.11	-.03	.04
min		.31	.10[c]	.15[b]	.20[a]	.22[a]	.19[b]		.09	.18	.18	.19	.24[c]	.18
interaction variable		.15[c]	.53[a]	.28[a]	-.24[b]	-.06	.08		.37[a]	.39[a]	.18[b]	-.24	-.12	.11
interaction variable *pro		.10	.07	.12	-.05	-.01	.05		.08	.01	-.04	.06	-.03	-.05
interaction variable *enc		.05	.07	-.05	-.04	-.10	.09		.09	.02	.04	.03	-.01	.03
interaction variable *min		-.07	.07	.10	.01	.10	-.08		.08	.01	-.01	-.01	-.04	.01
r^2 block3		.00	.00	.00	.00	.00	.00		.00	.00	.00	.00	.00	.00

Contd.

	Dependent variable = Functional impairment													
	Time 1							Time 2						
	No interaction	Interaction gender	Interaction dep	Interaction fear	Interaction pos	Interaction nbc	Interaction pc	No interaction	Interaction gender	Interaction dep	Interaction fear	Interaction pos	Interaction nbc	Interaction pc
Block 1														
som	.84[a]	.84[a]	.84[a]	.84[a]	.84[a]	.84[a]	.84[a]	.98[a]	.98[a]	.98[a]	.98[a]	.98[a]	.98[a]	.98[a]
r^2 block 1	.19	.19	.19	.19	.19	.19	.19	.26	.26	.26	.26	.26	.26	.26
Block 2														
som	.81[a]	.82[a]	.72[a]	.82[a]	.81[a]	.81[a]	.81[a]	1.00[a]	1.03[a]	.88[a]	.98[a]	1.01[a]	1.01[a]	1.01[a]
pro	.10	.10	.10	.11	.10	.10	.10	-.17	-.16	.18	-.18	-.15	-.17	-.11
Enc	-.05	-.05	-.03	-.05	-.02	-.05	-.03	.12	.12	.13	.12	.06	.11	.03
Min	.13[c]	.13[c]	.11	.13[c]	.13[c]	.10	.09	-.13	-.13	-.13	-.13	-.11	-.14	-.06
interaction variable		-.06	.14[b]	-.01	-.10	.11	.17		-.16[a]	.19	.01	.10	.04	-.20[b]
r^2 block 2	.01	.01	.01	.01	.01	.01	.01	.02	.03	.04	.03	.02	.02	.03
Block 3														
som		.82[a]	.73[a]	.82[a]	.80[a]	.81[a]	.80[a]		1.04[a]	.88[a]	.99[a]	1.01[a]	1.01[a]	1.01[a]
pro		.29	.12	.11	.11	.10	.10		-.09	-.19	-.20	-.15	-.18	-.13
enc		.01	-.03	-.05	-.03	-.05	-.03		.32	.14	.15	.07	.11	.05
min		-.00	.12[c]	.13[c]	.12[c]	.10	.09		-.05	.14	-.15	-.11	-.14	-.08
interaction variable		-.06	.15[b]	-.01	-.11	.09	.19[c]		-.16[c]	.19	.04	.09	.03	-.19[c]
interaction variable *pro		-.12	-.05	-.06	-.14	.20	.01		-.05	.06	.01	.03	.08	.04
interaction variable *enc		-.04	.07	.04	-.05	.06	.15		-.13	-.10	-.03	-.08	-.07	-.09
interaction variable *min		.08	-.16[c]	-.02	.11	-.06	-.16		-.05	.06	.07	.09	.08	.09
r^2 block 3		.00	.00	.00	.00	.00	.00		.01	.01	.01	.00	.00	.01

[a] $p < .001$ [b] $p < .01$ [c] $p < .05$; all dependent variables are z-scores, independent variables are centred; all scores are unstandardised B, except for r^2 (indicated in table); pro = protection; enc = encouraging/monitoring; min = minimisation; som = somatisation; fi = functional impairment; gen = gender; dep = depressive mood; pos = positive parenting behaviour; nbc = negative behavioural control; pc = psychological control

Table 3: Cross-sectional Links between Mothers' Reactions on PFC and Adolescents' SOM and FI: Main and Interaction Effect

explained only 1% of the variance in T1 SOM and T1 FI.

With reference to ***main effects of other child characteristics***, block 2 results of the models including child moderators (gender, depression and fear), showed that girls reported significantly higher levels of SOM than boys, both at T1 [block 2 $F(5,984) = 51.36$, $p < .001$, $\Delta F = 5.41$, $p < .001$] and T2 [block 2 $F(5,984) = 94.82$, $p < .001$, $\Delta F = 22.62$, $p < .001$], but significantly lower levels of FI than boys at T2 [block 2 $F(5,984) = 9.64$, $p < .001$, $\Delta F = 2.01$, $p < .05$]. The second blocks including gender explained respectively 2 and 6% of the variance in T1 and T2 SOM, and 3% of the variance in T2 FI. Depressive mood was significantly related to SOM: children who scored higher on depressive mood also reported higher levels of SOM, both at T1 [block 2 $F(5,984) = 98.52$, $p < .001$, $\Delta F = 53.20$, $p < .001$] and T2 [block 2 $F(5,984) = 114.56$, $p < .001$, $\Delta F = 40.83$, $p < .001$]. Further, at T1, depressive mood was significantly related to FI: children with higher scores on depressive mood reported significantly higher levels of FI [block 2 $F(5,984) = 50.14$, $p < .001$, $\Delta F = 4.18$, $p < 0.01$]. The second blocks including depressive mood explained variances between 1 (for dependent variable FI at T1) and 10–14% (for dependent variable SOM at T1 and T2). In addition, children who reported higher fear scores had significantly higher SOM scores, both at T1 [block 2 $F(5,984) = 60.38$, $p < .001$, $\Delta F = 19.35$, $p < .001$] and T2 [block 2 $F(5,984) = 88.54$, $p < .001$, $\Delta F = 16.85$, $p < .001$]. Block 2 including the variable fear explained respectively 6 and 5% of the variance in T1 and T2 SOM.

Regarding ***main effects of general parenting dimensions***, block 2 results of the models including general parenting moderators (warmth, negative behavioural control, and psychological control) revealed that higher levels of warmth had a significant link with lower levels of SOM at T1 [block 2 $F(5,984) = 51.53$, $p < .001$, $\Delta F = 5.59$, $p < .001$]. Block 2 including warmth explained 2% of the variance in T1 SOM. Higher levels of psychological control related significantly to lower levels of FI at T2 [block 2 $F(5,984) = 81.69$, $p < .001$, $\Delta F = 10.57$, $p < .001$], with block 2 explaining 3% of the variance. Mothers' report of negative behavioural control was not significantly related to SOM or FI.

Concerning ***interaction effects between specific parenting reactions, and child and general parenting features***, which were included in block 3, one significant interaction between mothers' minimisation and adolescents' depressive mood on adolescents FI was distinguished, at T1 [block 3 $F(8,981) = 62.52$, $p < .001$, $\Delta F = 2.01$, $p < .05$, $\Delta r^2 = .00$]. Simple slope analyses revealed non-significant minimisation-slopes for children with high levels of depressive feelings ($t = 0.14$, $p > .05$), however significant slopes were seen for children with average ($t = 5.43$, $p < .05$) and children with low levels of depressive feelings ($t = 7.52$, $p < .01$). In other words, the link between T1 minimisation and T1 FI was only significant for children with low or average levels of depressive feelings. Simple slopes are presented in **figure 1**.

Longitudinal analyses

Table 4 shows the output of the longitudinal analyses. With regard to the ***logitudinal main effects of SOM and FI***, higher levels of T1 SOM significantly predicted higher levels of T2 SOM [block 1 $F(2,987) = 131.54$, $p < .001$]. Higher levels of T1 FI and higher levels of T1 SOM significantly predicted higher levels of T2 FI [block 1 $F(2,987) = 48.35$, $p < .001$]. The in block 1 included T1 child factors predicted together respectively 21 and 9% of the variance in T2 SOM and FI. Block 2 results revealed that adolescents' T1 SOM or T1 FI did not signficantly predict mothers' T2 specific parenting reactions, or in other words no longitudinal backward associations were revealed.

Concerning the ***longitudinal main effects of specific parenting reactions***, block 1 results revealed that higher levels of T1 protection, encouraging/monitoring and

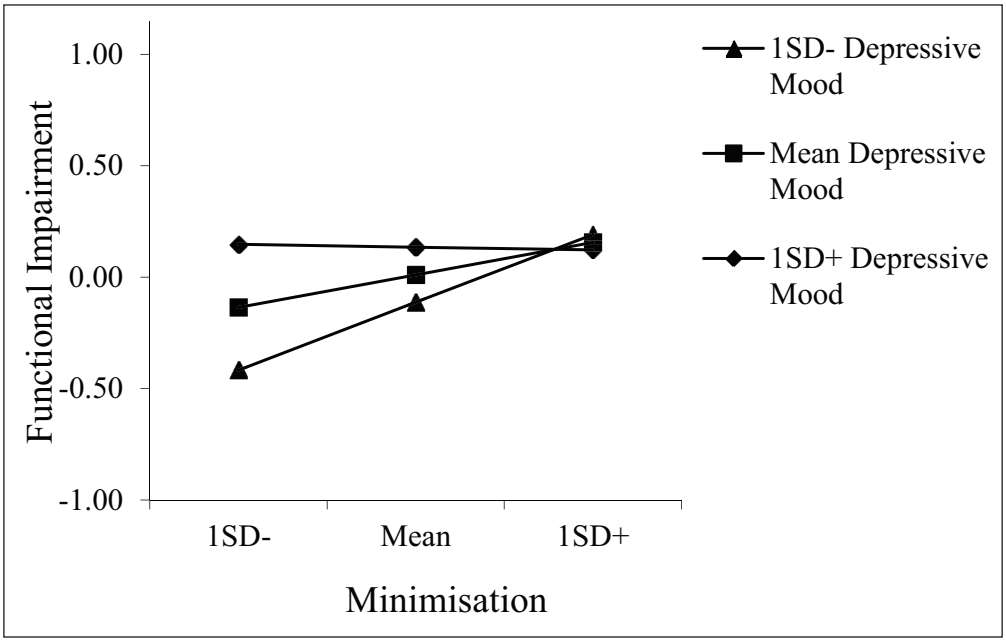

Figure 1: Simple slopes for the significant interaction effect of mothers' minimisation of physical functional complaints and adolescents' depressive mood on adolescents functional impairment

minimisation significantly predicted respectively higher levels of T2 protection [block 1 $F(3,986) = 127.57$, $p < .001$], higher levels of T2 encouraging/monitoring [block 1 $F(3,986) = 58.42$, $p < .001$] and higher levels of T2 minimisation [block 1 $F(3,986) = 104.85$, $p < .001$]. The in block 1 integrated T1 specific parenting reactions predicted together respectively 28, 15 and 24% of the variance in T2 protection, encouraging/monitoring and minimisation. Block 2 results revealed that mothers' T1 specific parenting reactions did not predict adolescents' T2 SOM or FI, or in other words no longitudinal forward associations were revealed.

With regard to ***longitudinal main effects of other child characteristics***, gender singificantly predicted T2 SOM [block 2 $F(6,983) = 52.59$, $p < .001$, $\Delta F = 10.56$, $p < .001$], with girls reporting higher amounts of problems than boys. Higher levels of T1 depressive mood significantly predicted higher levels of T2 SOM [block 2 $F(6,983) = 48.15$, $p < .001$, $\Delta F = 5.26$, $p < .01$] and higher levels of T2 FI [block 2 $F(6,983) = 21.26$, $p < .001$, $\Delta F = 7.13$, $p < .01$]. The second blocks containing significant child feature predictors, predicted 2 to 3% of the outcome variables' variances.

Also ***longitudinal main effects of general parenting dimensions*** were seen. Higher levels of T1 warmth significantly predicted lower levels of T2 FI [block 2 $F(6,983) = 19.80$, $p < .001$, $\Delta F = 5.13$, $p < .01$]. The second block containing warmth explained 2% of variance in FI.

No ***longitudinal interaction effects*** were seen.

Discussion

The present study considered adolescents' somatisation (SOM) and functional impairment (FI) in relation to mothers' responses to physical functional complaints (PFC). First, cross-sectional links were explored, using information from two data waves separately. Results revealed that adolescents with higher levels of SOM had mothers who reported more frequent use of PFC minimisation (e.g.,

	Dependent Variable = t2 Somatisation							Dependent Variable = t2 Functional Impairment						
	No Interaction	Interaction gender	Interaction dep	Interaction fear	Interaction pos	Interaction nbc	Interaction pc	No Interaction	Interaction gender	Interaction dep	Interaction fear	Interaction pos	Interaction nbc	Interaction pc
Block1														
t1 som	.84[a]	.84[a]	.84[a]	.84[a]	.84[a]	.84[a]	.84[a]	.34[b]	.34[b]	.34[b]	.34[b]	.34[b]	.34[b]	.34[b]
t1 fi	.09	.09	.09	.09	.09	.09	.09	.40[c]	.40[c]	.40[c]	.40[c]	.40[c]	.40[c]	.40[c]
r^2 block1	.21	.21	.21	.21	.21	.21	.21	.09	.09	.09	.09	.09	.09	.09
Block2														
t1 som	.84[a]	.81[a]	.74[a]	.82[a]	.83[a]	.84[a]	.84[a]	.34[b]	.33[b]	.21[c]	.30[b]	.32[b]	.34[b]	.34[b]
t1 fi	.10	.11	.07	.10	.10	.10	.10	.41[c]	.41[c]	.38[c]	.41[b]	.40[c]	.40[b]	.43[c]
t1 Pro	-.08	-.07	-.08	-.08	-.08	.08	-.08	-.12	-.12	-.12[c]	-.12	-.13	-.13	-.10
t1 Enc	.02	.02	.04	.02	.04	.02	.02	.02	.02	.05	.03	.12	.03	-.01
t1 Min	-.01	.00	-.02	-.01	-.01	-.01	-.01	-.02	-.02	-.05	-.03	-.03	-.07	.03
t1Interaction variable		.34[a]	.17[c]	.05	-.08	.00	.03		.03	.21[c]	.09	-.30[c]	.18	-.23
r^2 block2	.00	.03	.02	.01	.01	.00	.00	.01	.00	.03	.01	.02	.01	.02
Block3														
t1 som		.81[a]	.74[a]	.82[a]	.83[a]	.84[a]	.84[a]		.34[b]	.21[c]	.31[b]	.32[b]	.34[b]	.35[b]
t1 fi		.11	.07	.10	.10	.10	.10		.41[c]	.39[c]	.41[c]	.40[c]	.41[b]	.43[b]
t1 Pro		-.02	-.08	-.07	-.09	-.07	-.08		-.23	-.12	-.11	-.13	-.12	-.11
t1 Enc		-.03	.04	.02	.05	.02	.02		.16	.05	.03	.12	.03	.00
t1 Min		-.24	-.02	-.01	-.01	.00	-.01		-.07	-.05	-.03	-.03	-.06	.02
t1Interaction variable		.34[a]	.17[c]	.06	-.09	.00	.03		.03	.20[c]	.09	-.31[c]	.19	-.21
t1Interaction variable*pro		-.03	-.11	-.02	.24	.03	.01		.07	-.02	-.07	-.05	-.05	.13
t1Interaction variable*enc		.03	.00	-.01	-.11	-.15	-.17		-.09	-.02	.02	-.01	-.05	-.20
t1Interaction variable*min		.16	.05	-.04	-.10	-.11	.03		.03	.09	-.08	-.05	-.12	-.05
r^2 block3		.00	.00	.00	.00	.00	.00		.00	.00	.00	.00	.00	.01

Contd.

	Dependent variable = t2 Protection							Dependent variable = t2 Encouraging / monitoring						
	No Interaction	Interaction gender	Interaction dep	Interaction fear	Interaction pos	Interaction nbc	Interaction pc	No Interaction	Interaction gender	Interaction dep	Interaction fear	Interaction pos	Interaction nbc	Interaction pc
Block 1														
t1 Pro	.88[a]	.88[a]	.88[a]	.88[a]	.88[a]	.88[a]	.88[a]	.11	.11	.11	.11	.11	.11	.11
t1 Enc	.02	.02	.02	.02	.02	.02	.02	.55[a]	.55[a]	.55[a]	.55[a]	.55[a]	.55[a]	.55[a]
t1 Min	-.05	-.05	-.05	-.05	-.05	-.05	-.05	-.02	-.02	-.02	-.02	-.02	-.02	-.02
r^2 block1	.28	.28	.28	.28	.28	.28	.28	.15	.15	.15	.15	.15	.15	.15
Block2														
t1 som	.02	.01	-.03	.01	.03	.02	.02	.00	.00	-.03	.00	.02	.01	.00
t1 fi	.06	.06	.05	.06	.07	.06	.05	-.01	-.01	-.02	-.01	-.01	-.02	-.02
t1 Pro	.88[a]	.88[a]	.88[a]	.88[a]	.89[a]	.88[a]	.87[a]	.11	.11	.11	.11	.12	.10	.11
t1 Enc	.02	.02	.03	.03	-.06	.02	.04	.55[a]	.55[a]	.56[a]	.55[a]	.50[a]	.56[a]	.56[a]
t1 Min	-.06	-.06	-.07	-.06	-.06	-.05	-.08	-.02	-.02	-.03	-.02	-.02	-.06	-.03
t1Interaction variable		.07	.08	.01	.28	-.06	.09		.07	.05	.02	.19	.17	.03
r^2 block2	.00	.00	.00	.00	.01	.00	.00	.00	.00	.00	.00	.01	.01	.00
Block3														
t1 som		-.13	-.03	.03	.03	.01	.02		-.20	-.01	.01	.02	.01	.00
t1 fi		-.03	.04	.05	.07	.06	.05		-.01	-.03	.01	-.01	-.02	-.02
t1 Pro		.88[a]	.88[a]	.88[a]	.89[a]	.88[a]	.87[a]		.11	.12	.11	.12	.11	.11
t1 Enc		.02	.03	.02	-.06	.02	.04		.55[a]	.56[a]	.55[a]	.50[a]	.56[a]	.55[a]
t1 Min		-.06	-.07	-.06	-.05	-.05	-.08		-.02	-.02	-.02	-.02	-.06	-.02
t1Interaction variable		.07	.08	.01	.28	-.06	.09		.07	.05	.02	.19	.17	.02
t1Interaction variable*som		.09	-.04	-.08	-.04	.01	-.04		.12	-.06	-.03	-.01	-.06	-.01
t1Interaction variable*fi		.06	.05	.13	-.05	-.05	-.03		.00	.06	-.03	-.18	-.04	.09
r^2 block 3		.00	.00	.00	.00	.00	.00		.00	.00	.00	.00	.00	.00

Contd.

	Dependent variable = t2 minimisation						
	No Interaction	**Interaction gender**	**Interaction dep**	**Interaction fear**	**Interaction pos**	**Interaction nbc**	**Interaction pc**
Block 1							
t1 Pro	-.04	-.04	-.04	-.04	-.04	-.04	-.04
t1 Enc	-.02	-.02	-.02	-.02	-.02	-.02	-.02
t1 Min	.90[a]	.90[a]	.90[a]	.90[a]	.90[a]	.90[a]	.90[a]
r^2 block1	.24	.24	.24	.24	.24	.24	.24
Block2							
t1 som	.13	.13	.10	.11	.13	.13	.12
t1 fi	-.06	-.05	-.06	-.05	-.05	-.07	-.07
t1 Pro	-.04	-.04	-.04	-.04	-.04	-.06	-.06
t1 Enc	-.02	-.02	-.02	-.02	-.05	-.01	.01
t1 Min	.89[a]	.89[a]	.88[a]	.88[a]	.89[a]	.82[a]	.83[a]
t1Interaction variable		.01	.05	.04	.08	.29[c]	.25
r^2 block2	.00	.01	.01	.01	.01	.02	.02
Block3							
t1 som		.10	.11	.12	.13	.13	.13
t1 fi		-.05	-.06	-.06	-.05	-.05	-.07
t1 Pro		-.04	-.04	-.04	-.04	-.06	-.06
t1 Enc		-.02	-.02	-.02	-.05	-.01	.02
t1 Min		.89[a]	.88[a]	.89[a]	.89[a]	.82[a]	.82[a]
t1Interaction variable		.01	.05	.04	.08	.29[c]	.27
t1Interaction variable*som		.02	-.03	-.06	-.02	.03	-.17
t1Interaction variable*fi		.00	-.02	.05	.07	-.20	-.12
r^2 block 3		.00	.00	.00	.00	.00	.00

[a] $p < .001$ [b] $p < .01$ [c] $p < .05$; all dependent variables are z-scores, independent variables are centred; all scores are unstandardised B, except for r^2 (indicated in table); t1 = time 1; t2 = time 2; pro = protection; enc = encouraging/monitoring; min = minimisation; som = somatisation; fi = functional impairment; gen = gender; dep = depressive mood; pos = positive parenting behaviour; nbc = negative behavioural control; pc = psychological control

Table 4: Longitudinal Links between Mothers' Reactions on PFC and Adolescents' SOM and FI: Main and Interaction Effects

'brace yourself'). In addition, even when controlled for SOM, higher levels of FI had a significant link with higher amounts of minimisation, however only for adolescents with low and average levels of depressive mood. These main and interaction effects were only significant for T1 measurements.

Contrary to what was expected, no significant cross-sectional links were present between parental protection and adolescents' SOM/FI. A first explanation is that, opposite to the studies that did find significant results (Peterson & Palermo, 2004; Walker et al., 2002), in this study information of multiple informants was used: adolescents reported on their SOM/FI and mothers reported on their reactions to adolescents' PFC. Therefore, the stronger associations in earlier research may be explained by shared method variance (Holmbeck, Li, Shurman, Friedman, & Coakley, 2002). A second explanation for the inconsistent results is that, contrary to some earlier research (Claar et al., 2008; Peterson & Palermo, 2004; Walker et al., 2002), in the current study only mothers were included to report on parental reactions. Past studies suggested that fathers' reactions may be differently related to children's somatisation than mothers' reactions (Walker & Greene, 1989) or that the impact of parents' reactions may depend on whether the parent and child match on gender (Chambers, Craig, & Bennett, 2002; Filligim, Doleys, Edwards, & Lowery, 2003). Third, it is salient that other studies performed in Belgium or the Netherlands did not find a link between higher levels of mothers' protection and higher levels of children's PFC either (Jellesma et al., 2008; Merlijn et al., 2003). Hence, one might hypothesise that cultural aspects play a role. It is possible that although the construct 'protection' makes sense in Belgium, as well as in the Netherlands (supported by high Cronbach's alphas and unidimensionality in exploratory factor analysis), other constructs are more important. An observational study on cultural differences in parental reactions on PFC might reveal other (culture specific) constructs that have a stronger link with PFC/SOM and FI. Fourth, most of the studies who did find significant results reported on clinical samples (Claar et al., 2008; Langer et al., 2009; Peterson & Palermo, 2004; Walker et al., 2002). It is possible that the proposed relations are moderated by the adolescents' levels of SOM/FI. For example Walker et al. (2006) argued that somatising adolescents may be especially attentive for those parental responses that are in line with their own interests (e.g., staying home from school because of physical complaints).

This study did not find evidence for cross-sectional associations between encouraging/monitoring and SOM/FI. So far, only a few studies have considered this association. Claar et al. (2008) revealed that parental encouraging/monitoring was not related to SOM and only weakly associated with FI. The authors suggested that discrepancy between items adopted in the encouraging/monitoring scale may explain the weak connections (some items concern 'distracting children from pain', while others relate to 'directing children's attention towards the pain'). Although this interpretation is plausible, we believe that also other explanations should be explored, such as those mentioned above concerning protective reactions.

Further, this study revealed a significant cross-sectional link between higher amounts of minimisation and higher levels of SOM. However, the association is opposite to what we hypothesised based on the operant learning principles of reinforcement. Though, other operant learning principles might explain the findings. First, the phenomenon of extinction burst might be at stake, where behaviour that is ignored initially increases in frequency and/or intensity (Ferrster & Skinner, 1957). Second, it is probable that parents who frequently minimize, sometimes do give attention to the PFC, and thereby use one of the most powerful reinforcement schedules, namely unpredictable reinforcement (Ferrster & Skinner, 1957). Another

well-known theory of the determination of SOM is the stress theory (Lovallo, 2005). One may assume that in the link between higher amounts of minimisation and higher levels of SOM, adolescents' increased levels of stress following an unpleasant parental reaction (minimisation) are involved.

As hypothesised, the cross-sectional link between minimisation and FI was significantly moderated by adolescents' depression. However, contrary to what was expected, the link was only significant for adolescents with medium to low levels of emotional distress. A possible explanation for this unexpected result is that previous studies reported on a clinical sample (Claar et al., 2008; Peterson & Palermo, 2004; Walker et al., 2002). In other words, it is possible that a three-way interaction exists between parental reactions, adolescents' emotional distress, and adolescents' level of FI.

No significant cross-sectional connections were found between parental reactions and adolescents' SOM/FI at T2. Earlier research stated that the association between parental reactions and children's SOM/FI might depend on the age/pubertal status of the child (Janssens et al., 2011; Merlijn et al., 2003). A possible explanation might be that when children develop into adolescence, other persons than parents (e.g., peers) start to play a significant role, especially concerning operant influences (Biddle et al., 1980). Further research may elaborate on this hypothesis by including children of various age ranges and a variety of informants.

No significant longitudinal forward or backward relations between mothers' reactions and adolescents' SOM/FI were observed. First, it might be that the one year time-frame is too long or too short to make significant predictions. Future research should include shorter follow-up periods (e.g., sequential analyses of observed parent-child interactions; Bringmann et al., 2013), or longer follow-up periods to check this hypothesis. Second, concerning the forward relationships, it was seen that especially higher levels of T1 SOM and FI played a role in predicting higher levels of T2 SOM and FI. This points to a certain SOM and FI stability. Other prospective studies generally showed a high intra-individual stability of more severe SOM during life: patterns of SOM develop throughout childhood and remain quite stable in adolescence and adulthood (Walker, Guite, Duke, Barnard, & Greene, 1998). Besides the relative stability of SOM and FI, this study revealed that child characteristics, such as depressive mood and gender, are important in the prediction of SOM and FI. Higher levels of T1 depressive mood were significantly related to higher T2 SOM and FI scores, and girls had significantly higher SOM scores. These findings stress the importance of child features in the development of SOM and FI, however they do not necessarily indicate a causal relation between the factors. An alternative hypothesis is that depressive mood, gender, SOM and FI are related to the same underlying vulnerability (e.g., hormonal processes, emotional processing). In this case, the preceding of SOM and FI by depressive mood might be an age specific expression of this vulnerability (Lieb, Pfister, Mastaler, & Wittchen, 2000). Child factors are not the only features predicting T2 SOM/FI: lower levels of T1 parenting warmth showed a significant link with higher T2 FI scores. The link between warmth and several PFC outcome variables has been revealed in other studies (Binzer & Eisemann, 1998; Feldman, Ortega, Koinis-Mitchell, Kuo, & Canino, 2010; Kristjansdottir & Rhee, 2002; Rhee, Holditch-Davis, Miles, & Miles, 2005). Third, concerning the backward relationships, this study revealed that T2 mothers' reactions were significantly predicted by T1 mothers' reactions. Future research should study the mechanisms underlying this stability of mothers' reactions on PCF (e.g., do mothers deliberately choose to react in a certain way, or are they unaware of their responses and/or alternative ways to react?). Another possible explanation for the fact that no significant backward relationships were found is that most parents

might assume that adolescents' somatisation is exclusively caused by medical features. As a result, parents might be less likely to adapt their parenting behaviour in reaction to their child's SOM/FI.

In sum, the results of this study suggest that parental reactions (minimisation) may be related to adolescents' SOM/FI, especially in 12–13 years old adolescents. However, also other features (child characteristics and general parenting dimensions) play a significant (moderating) role. Concerning clinical practice, these results support the idea of multidimensional assessment/treatment of adolescents suffering from SOM/FI (Bronfenbrenner, 1979; Cummings et al., 2000; Palermo & Chambers, 2005). The idea of multidimensional assessment/treatment entails two important aspects. First, assessment and treatment should address several dimensions. For example, current clinical practice concerning SOM/FI often focuses on medical and psychological child aspects (Eminson, 2007). This study supports the relevance of an additional pedagogical point of view, in particular the consideration of parents' minimising responses. However, the results of this study also revealed dimensions which may be less important to address in clinical practice, namely parental protection and encouraging/monitoring. Second, information of different points of view should be integrated. For example, this study supported the idea that depending on the adolescents' depressive mood, the relation between parents' minimisation and adolescents' FI may be different. A practical application of the idea of multidimensional assessment/treatment can be found in the process-oriented approach, advocated by Cummings et al. (2000). The process-oriented approach stresses the necessity of not only gathering information from multiple domains regarding child and context, but also to assess how various features respond to one another, and how responses change over time.

Further studies should address the theoretical explanations of the associations between adolescents' SOM/FI and mothers' responses. We believe that this can be done by including shorter follow-up periods (e.g., sequential analyses of observed parent-child interactions; Bringmann et al., 2013), and/or longer follow-up periods. However, also additional variables should be included, such as adolescents' processing of parental reactions (cf. hypotheses given in the introduction of this paper).

Concerning design, a strength of this study is its large sample size and longitudinal data. Conceptually, the current study is unique with regard to its emphasis on the broad tendency to express somatic symptoms rather than one complaint, the inclusion of more than one parental reaction (not only protection), and the inclusion of so far understudied moderators (Beck, 2008). With regard to methods, the assessment of mothers' reactions to PFC by means of parent-report instead of child-report was a deliberate choice. First, it prevents shared-method variance bias, since information on dependent and independent variables is provided by different informants (child and parent; Holmbeck et al., 2002). Second, although child perception of parenting behaviours is important to consider while studying child outcome, also the view of parents is informative. After all, researchers have recently stressed that parents probably give the most accurate estimation of frequency of parenting behaviours (Barry, Frick, & Grafeman, 2008).

Inevitably this research has limitations. An important limitation is the fact that the selection of participants partially relied on mothers' self-report of their adolescents' medical problems. Although this might be a problem at first sight, one can argue that the occurrence of medical neglect is low, especially in a country where health care assurance is provided for all citizens. For Flanders, the prevalence of minors being medically neglected is estimated at 0.09% (based on the amount of official reports of 'physical neglect of < 18 years old', compared to the amount of < 19 years old residents of Flanders; Het kind in

Vlaanderen, 2010; Nationaal Instituut voor Statistiek, 2012). Further, one can assume that parents who are capable of filling out a questionnaire are also capable to provide valuable health information, and that the risk of socially desirable answers is low for emotionally neutral topics such as children's health (Holtgraves, 2004). Another limitation is the low Cronbach's alpha of the minimisation-scale. A low Cronbach's alpha indicates that the measurement error of the total scale score is high (Field, 2009). Therefore, the results concerning minimisation should be interpreted with caution until additional research (cf. the above-mentioned call for an observational study on culturally specific constructs of parental reactions on PFC) is conducted.

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