Effects of coping strategy, caregiving impact, and parent attachment on stress in children of parental illness

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Contents

Abstract

Over the past two decades, research on the functioning of children living with parental illness has increased substantially. However, few studies have focused on the psychosocial impact of caregiving (Ireland & Pakenham, 2010). In this study, this was assessed by investigating effects of coping strategy, caregiving impact, and parent attachment on stress in children of parental chronic illness by conducting a cross-sectional study in the Netherlands. Children ($N = 248$) between 10 and 20 years of age completed questionnaires of these variables: 136 children with parental illness and 112 children of healthy parents (the target and control group, respectively). We predicted that (1) the target group used less coping strategies and perceived higher caregiving impact, parent attachment, and stress than the control group. In both groups, we expected that (2) coping strategy, caregiving impact, and parent attachment predicted stress, (3) age and gender moderated the link between coping strategy and stress, and (4) coping strategy mediated the relation between parent attachment and stress. Results confirmed that caregiving impact was higher in the target than in the comparison group; other differences were absent. In the target group, caregiving impact and quality of paternal attachment predicted stress. In the comparison group, age was found to moderate the relation between the coping strategy *seeking social support* and stress; increased age coincided with higher stress. No mediation effects were found. This study demonstrated that caregiving impact affects stress in young caregivers. Family factors (e.g., paternal attachment; Chambers, 2003) may be considered influential factors in stress-related research.

Key words: young caregivers, parental chronic medical condition, coping strategy, caregiving impact, parent attachment, stress

1. Introduction

1.1. Children as carers

When a parent becomes chronically ill, children are confronted with a range of implications that may affect their well-being. For instance, children show higher stress levels, they cope ineffectively with the parent's illness through avoidance, and the quality of their relation with the ill parent deteriorates (Mackay & Pakenham, 2012; Worsham et al., 1997). Over the past few decades, it has been acknowledged that children of ill parents face increased caregiving responsibilities (Aldridge & Becker, 1999; Johnson, 2000). These children, who provide a substantial amount of care for an ill parent that restricts them in their development, have been referred to as *young caregivers* (Bursnall, Cannon, Chiu, Okochi, & Pakenham, 2006). Especially in young caregivers of parental chronic medical condition (CMC), the burden of care is heavy as the period of caretaking is prolonged. Bursnall et al. (2006) demonstrated that longer disease duration was related to lower quality of coping strategies, more problems in the parent-child relationship, and greater impact on the family. Parental CMC occurs frequently; the prevalence has been estimated to be 10% (Leij, Meijer, Oort, Sieh, & Visser-Meily, 2010). Research on children of parental CMC remains underdeveloped when compared to studies on parental adjustment to their child's illness (Korneluk & Lee, 1998). Therefore, this study looks into effects of parental CMC on children. The following section describes the study variables.

1.2. Stress

One of the first researchers who studied stress was scientist Selye, who defined stress as *"the nonspecific response of the body of an organism to any demand made on it"* (Selye, 1936, p.32). Research has demonstrated that parental illness is associated with moderate levels of stress in children (Armistead, Klein, & Forehand, 1995). In children of parental CMC, higher levels of caregiving have been linked to increased stress (Pakenham, 2009). They face many stressors, including diminished parental availability and uncertainty about their recovery from illness (Evans, Keenan, & Shipton, 2007). Stressors result in adverse outcomes especially in young children, as they are less emotionally prepared to cope with these due to maturing cognitive resources (Evans, Keenan, & Shipton, 2005).

1.3. Coping strategy

Selye (1950) stated that stress is caused by anything that threatens life, unless adaptive responses are mobilized to deal with it. Lazarus and Folkman (1984) developed a theory on

adaptation to a chronic illness, the Transactional Model of Stress and Coping (TSC model; see Figure 1). They described coping strategy as cognitive and behavioural steps that one takes in response to stressors. Bijstra (1994) added that it covers the ways that people apply to manage developmental tasks and react to problems. Originally, coping strategy had two forms: *problem-focused coping* and *emotion-focused coping*. Problem-focused coping strategies include efforts to solve a problem (e.g., picking a solution). In contrast, emotion-focused coping strategies (e.g., seeking social support) aim to lower a person's negative emotional reaction to stress. Recent studies separate coping strategy into three categories: (1) *primary control engagement coping*, or efforts to cope with the stressor directly (e.g., problem solving), (2) *secondary control engagement coping*, or attempts to cope with the stressor by changing thoughts (e.g., acceptance), and (3) *disengagement coping*, or efforts to avoid stress or emotions (e.g., denial; Connor-Smith, Compas, Saltzman, Thomsen, & Wadsworth, 2000). Mackay and Pakenham (2012) found that avoidance coping predicted higher stress in young caregivers. The use of problem- and emotion-focused coping strategies depend on the personal meaning of a problem (*primary appraisal*) and on one's coping resources (*secondary appraisal*). Appraisal comprises the way in which a person interprets an event (Pakenham et al., 2006). The TSC model proposes that the perception of a stressor is mediated by both appraisal and coping strategy. Mediation means that the effect of an independent variable on a dependent variable occurs through a third (mediator) variable (Edwards & Lambert, 2007).

The bulk of studies on coping strategy claim that emotion-focused coping strategies are maladaptive (Baker & Berenbaum, 2007; Compas et al., 2001; Pakenham et al., 2007), while other studies found inconsistent results (e.g., Pakenham, 2012). Because the nature of emotion-focused coping strategies is ambiguous, Baker and Berenbaum (2007) replaced this term by *emotional-approach coping*, which involves the identification and expression of emotions. In
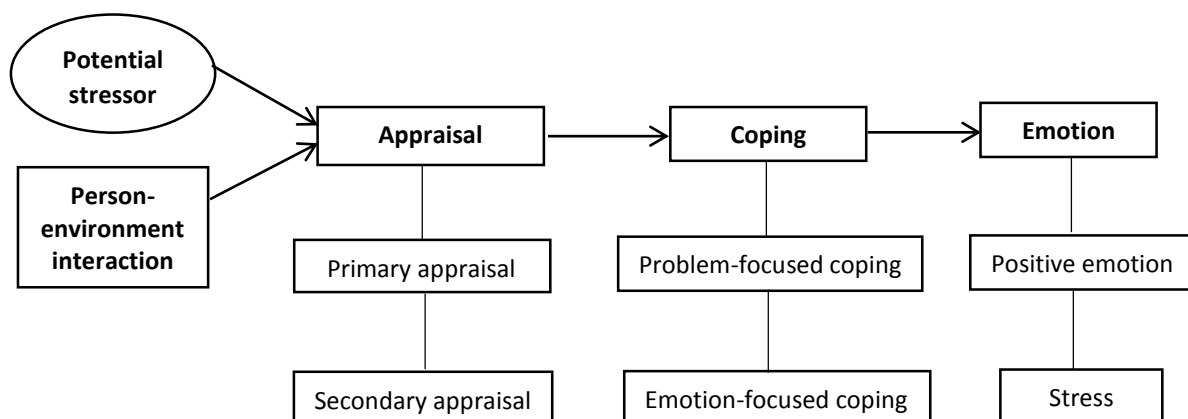

Figure 2. The transactional model of stress and coping of Lazarus and Folkman (1984).

this study two coping strategies are included: active problem solving and seeking social support. The first is considered a problem-focused coping strategy and the latter an emotion-focused coping strategy (Compas et al., 2001). The variable appraisal is not incorporated in this study.

1.4. Moderators in stress research

Children's age and gender might moderate the relation between coping strategy and stress. Moderation occurs when the strength of the relation between an independent and dependent variable varies due to a third (moderator) variable (Edwards & Lambert, 2007). Research is inconclusive about the moderating effects of gender on stress in children. Lindeman, Otte, Post, Van de Port, and Visser-Meily (2007) stated that female gender is a risk factor for stress in children, whereas other studies did not find age or gender differences in child report of stress (e.g., Hellhammer, Kirschbaum, Kudielka, & Schmidt-Reinwald, 1999). In regard of coping strategies, age (but not gender) differences were found by Folkman, Lazarus, Pimley, and Novacek (1987). Younger individuals used more interpersonal, active, and problem-focused forms of coping, whereas older individuals used more passive, intrapersonal, and emotion-focused coping strategies. Older children may perceive parental illness as a threat of loss more often than younger children, as they have more knowledge about consequences of the disease (Pedersen & Revenson, 2005). Girls report that they apply more ruminative coping strategies than boys (Grant & Compas, 1995). In conclusion, age and gender may affect stress and coping strategy and these parameters should be controlled for in stress- or coping-related research.

1.5. Caregiving impact

Studies on the relation between coping strategy, caregiving impact, and stress are scarce. However, Pakenham et al. (2006) investigated caregiving impact by designing an instrument to measure it: the Young Caregiver Of Parent Inventory (YCOPI). The YCOPI includes eight reliable scales that connect to several coping and stress variables. The YCOPI scales *activity restrictions* and *feelings of isolation* were positively related to maladaptive coping strategies (e.g., denial). Young caregivers may experience activity restrictions when caregiving prevents them from undertaking other activities. Feelings of isolation may be caused by little social support or unavailability of parents (Aldridge & Becker, 1993). Pakenham et al. (2006) found that young caregivers reported higher caregiving impact and face adverse outcomes because of their caregiving role, such as activity restrictions and feelings of isolation (Banks et al., 2001; Mukherjee, Sloper, & Lewin, 2002).

In addition to these negative outcomes, young caregivers may perceive increased responsibility to help parents. Parental CMC changes family roles (i.e., *parentification*; Pedersen & Revenson, 2002) and the parent-child relationship; young caregivers may adopt caregiving or household tasks that are not suited for their age. Grant and Compas (1995) found that children who took on extra tasks experienced more stress; girls reported stress and adopted caregiving tasks more often than boys. Armistead, Klein, and Forehand (1995) found that a disruption of parenting (e.g., reduced parental support) moderated the relation between parental illness and child functioning, possibly leaving children feeling isolated or restricted in activities. Thus, higher caregiving impact (i.e., caregiving responsibilities, activity restrictions, and feelings of isolation) may account for increased stress in children.

1.6. Parent attachment

Few studies have investigated parent-child attachment security in families that are affected by parental illness (Ireland & Pakenham, 2010). Ainsworth and Bowlby (1991) developed attachment theory. Bowlby specified attachment as a child's enduring and intense affectional bond to the parent that can be damaged through separation or loss. Ainsworth (1979) extended the theory by identifying the mother as a secure base who helps the child to feel safe to explore the environment. Securely attached children search for protection from caregivers; insecurely attached children withdraw from caregivers, who often react inconsistently to the child.

Secure attachment is important to children's social, cognitive, and emotional health. Hammen (2004) found that family discord exposes children to stress and maladaptive models of coping, affecting children's social and coping skills. Evans et al. (2007) found that children of mothers with chronic pain were more often insecurely attached than children in a control group. However, Ireland and Pakenham (2010) found that lower parent attachment was not related to poorer youth adjustment. Armsden and Greenberg (1987) developed an instrument to measure parent attachment: the Inventory of Parent and Peer Attachment (IPPA). They indeed found that attachment quality was related to psychological health. Highly securely attached adolescents sought social support more often and coped better with stress than ones who were insecurely attached. Parental CMC disrupts children's psychological health through the family-child relationship (Armistead et al., 1995). Mikulincer and Shaver (2012) corroborated the mediating role of emotion regulation on the relation between attachment security and stress. Wei, Heppner, and Mallinckrodt (2003) found that coping strategy mediated the relation between attachment anxiety and stress completely in undergraduate students. Thus, coping strategy might mediate the relation between quality of parent attachment and stress in children.

1.7. Motivation of this study

Advances in policy for young caregivers did not improve until 1995 (Aldridge & Becker, 2002). In recent years, young carers have been acknowledged as a social category in policy, social assistance, and research. This caused an increase in the number of studies analyzing effects of parental CMC on children (Hamilton & Adamson, 2013). However, effects of caregiving impact, quality of parent attachment, and gender on stress in young caregivers have been understudied (Ireland & Pakenham, 2010).

Research on children with parental CMC knows limitations. Many studies included a non-random sample, which restricts generalizability of findings, and used statistical tests that do not separate family- from individual level effects on stress (Pakenham & Cox, 2012). Further, research is often qualitative and descriptive by nature (Dearden & Becker, 2000). Adequate comparison groups or large samples are often omitted. Some variables cannot be measured as adequate measures do not yet exist and newly constructed measures are sometimes not psychometrically sound (Ireland & Pakenham, 2010). This study addresses some of these limitations by using a cross-sectional design based on a validated theory, including an adequate comparison group and recruiting a relatively large sample of participants. The results may foster development of interventions that target problems related to stress, coping strategy, caregiving impact, or parent attachment that young caregivers encounter.

1.8. Aim of the study and research questions

The aims of the study are threefold: (1) to assess effects of coping strategy, caregiving impact, and quality of parent attachment on stress in children of parental CMC, (2) to determine whether age and gender moderate the relation between coping strategy and stress, and (3) to investigate whether coping strategy mediates the relation between quality of parent attachment and stress. Several research questions pertaining to differences between children of parental CMC and children of healthy parents are investigated (the target and comparison group, respectively): (1) do the groups display differences in coping strategy, caregiving impact, quality of parent attachment, and stress?, (2) do coping strategy, caregiving impact, and quality of parent attachment predict stress?, (3) do age and gender moderate the relation between coping strategy and stress?, and (4) does coping strategy mediate the relation between quality of parent attachment and stress?.

1.9. Hypotheses

The theoretical background leads to nine hypotheses (Figure 4, 5, and 6): compared to the comparison group, in the target group (1) use of coping strategies is less, (2) caregiving impact (i.e., caregiving responsibilities, activity restrictions, and feelings of isolation) is higher, (3) quality of parent attachment is higher, and (4) stress is higher. Further, for both groups, (5) coping strategy, caregiving impact, and quality of parent attachment predict stress, (6) older age and female gender moderate the relation between coping strategy and stress, and (7) coping strategy mediates the relation between quality of parent attachment and stress.
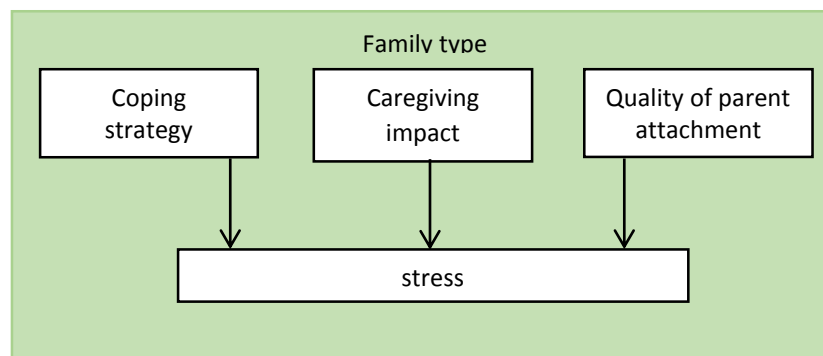

Figure 4. Coping strategy, caregiving impact, and quality of parent attachment as predictors of stress in both groups.
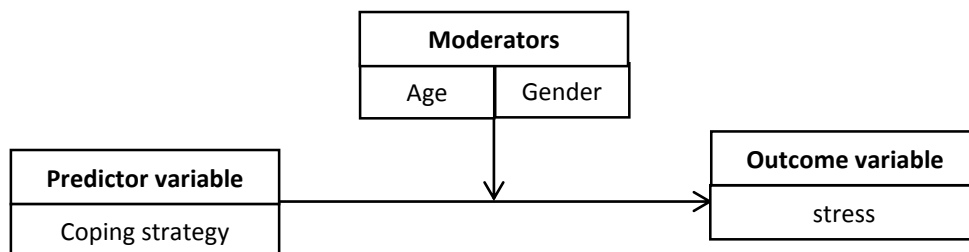

Figure 5. Age and gender as moderators of the relationship between coping strategy and stress.
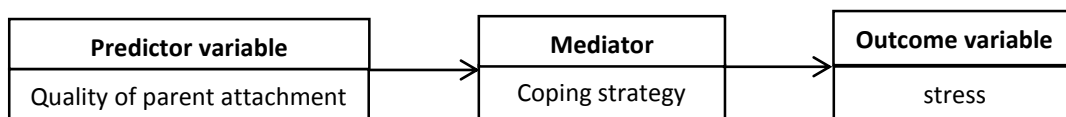

Figure 6. Coping strategy as a mediator between quality of parent attachment and stress.

2. Method

2.1. Research design

This study has a cross-sectional design and includes a target and comparison group. Data were collected in 2011-2012 as part of a longitudinal study of Sieh (2012). Search engines PubMed and Web of Science were used to find relevant literature by using a combination of keywords like: *parent* illness* OR *disease*, *child* well-being*, *chronic*, *disability*, *young carer*, *stress*, *coping strategy*, *TSC model*, *caregiv* impact*, *attachment*, *gender*, *age*, *adjustment*, and *outcome*. The forward citation search method was used to trace additional articles on a topic.

2.2. Participants

Participants were recruited between October 2008 and October 2010. Children between 10-20 years of age and living in the Netherlands were included. Children in the target group had to have a parent with one or more CMC's defined as disease that involves one or more organs, harms health, and endures for more than 6 months (Brown, 2007). Children in the comparison group needed to have two parents without a somatic condition. Participants were excluded if they did not master the Dutch language, if they had severe cognitive impairments or somatic illnesses, or if they had a parent with a psychiatric condition or cancer; cancer is not necessarily a chronic disease. The final sample consisted of a target group of 136 children from 83 families and a comparison group of 112 children from 67 families.

Figure 7 shows a diagram of participant flow. Children were excluded from analyses if they had a single parent or parents of the same sex, as this could bias results of the IPPA. Also, inclusion of the latter group would lead to two maternal- or paternal attachment scores. Erdes-Kavecan, Oljaca, Kostovic, and Kovacevic (2012) corroborated that psychosocial and physical functioning of children from single-parent families is lower relative to children from two-parent families. Regnerus (2012) found that outcomes (e.g., emotional health) were more beneficial for children of married couples relative to those of homosexual ones. In total, we excluded: 21 children from 15 families affected by parental CMC as they had a single parent, and 6 children from 6 families (of which 2 children from 2 families were in the comparison group) because they had parents of the same sex.

2.3. Procedure

The ethical commission of the research institute of Child Development and Education of the University of Amsterdam approved the study. Participants were recruited via hospitals, schools,
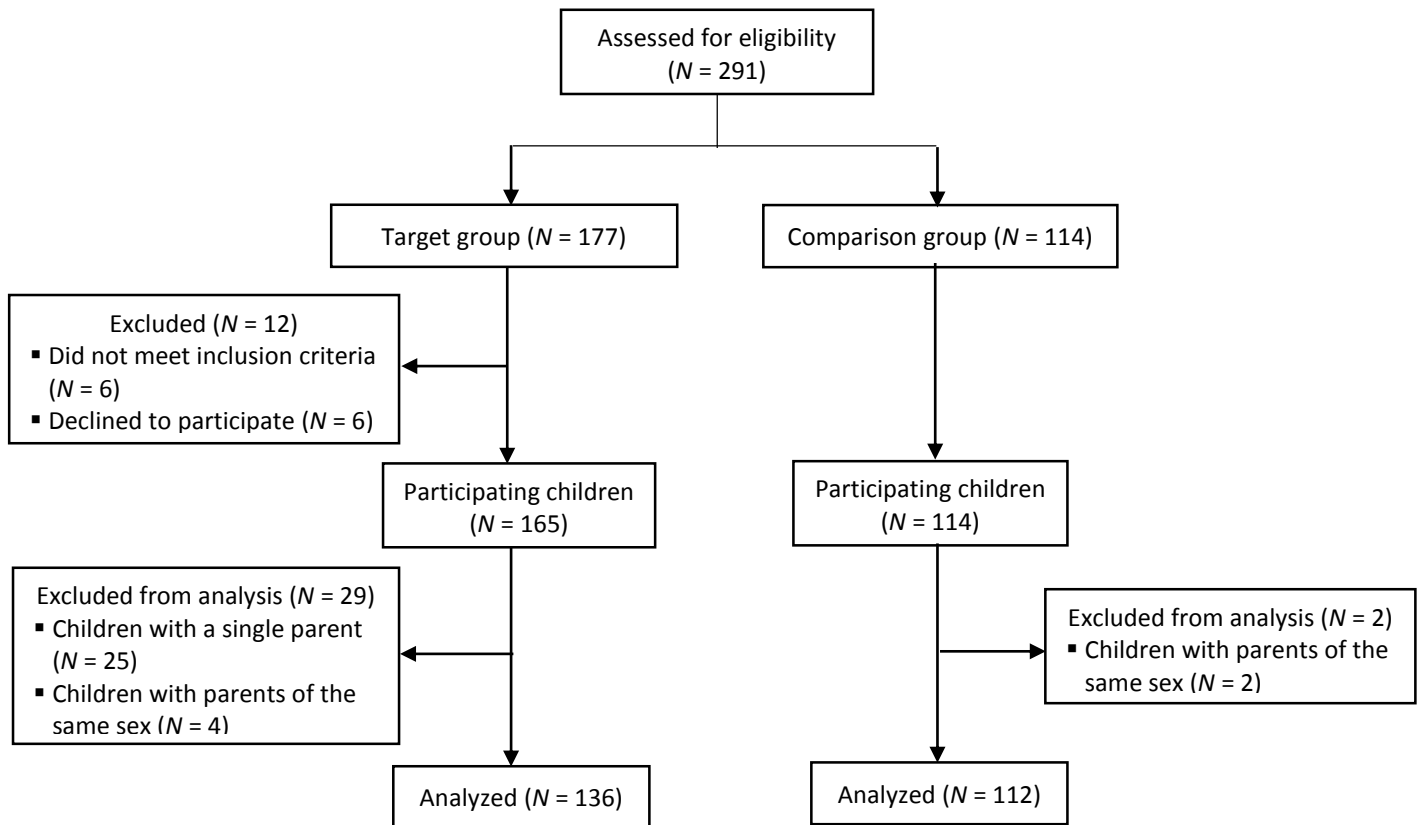
Figure 7. Flow of participants.

general practitioners, libraries, and websites of patient organizations. After both parents and children provided active informed consent (or only the child if it was older than 18 years), questionnaires were administered at home by trained research assistants. Participants were rewarded for their participation by a cinema ticket, a mobile phone cover, or a gift coupon.

2.4. Measures

2.4.1. Demographic variables
Parents with a CMC answered questions on age, gender, employment and marital status, SES, illness type and duration of illness. This was similar for healthy parents except for the last two variables. In both the target and comparison group, information was gathered on age, gender, nationality, health, school type, employment status, presence of a somatic illness, and days per week of seeing parents. A child was considered 'healthy' if a light somatic disease was absent. SES was estimated by inquiring on monthly net family income, using an 8-point scale ranging from 1 (*less than 1000 Euro)* to *8 (more than 4000 Euro).*

2.4.2. Coping strategy

The Utrecht Coping List for Adolescents (UCL-A; Bijstra et al., 1994) assesses seven coping strategies with 44 items, such as "When I have a problem, I deal with it right away". Several studies indicated low reliability of five of the seven scales of the UCL-A (e.g., Muris, Mayer, Reinders, & Wesenhagen, 2011). Therefore, this study included two 6-item scales on coping strategy with high reliability: *active problem solving* ($\alpha = .79$) and *seeking social support* ($\alpha = .87$; Bijstra et al., 1994). In this study, Cronbach's alpha for active problem solving was $\alpha = .78$ (comparison group) and $\alpha = .81$ (target group); Cronbach's alpha for seeking social support was $\alpha = .86$ (comparison group) and $\alpha = .88$ (target group). Response categories on the items ranged from 1 (*almost never*) to 4 (*very often*); higher scores indicated better coping strategies. Item scores within each scale were summed to constitute a total score (Bijstra et al., 1994).

2.4.3. Caregiving impact

The Young Caregiver of Parent Inventory (Pakenham et al., 2006) measures caregiving impact and is divided into part A and part B. Part A includes 5 scales and is intended for both the target and comparison group, whereas part B consists of 3 scales that relate to parental CMC and is directed at the target group only. To compare the data of the YCOPI between the groups, three valid scales of part A were translated into Dutch and used. Sieh et al. (2013) developed two 8-item scales: *caregiving responsibilities* ($\alpha = .77$) and *activity restrictions* ($\alpha = .85$), and a 3-item scale: *feelings of isolation* ($\alpha = .74$). In this study, Cronbach's alpha for the target group was $\alpha = .73$ (caregiving responsibilities), $\alpha = .87$ (activity restrictions), and $\alpha = .74$ (feelings of isolation); for the comparison group, reliability was $\alpha = .80$ (caregiving responsibilities), $\alpha = .82$ (activity restrictions), and $\alpha = .72$ (feelings of isolation). Possible scale items are "My parent(s) relies on me for emotional support", "I miss out on activities because of my home responsibilities" and "Other people do not understand me and my situation", respectively. The scales were scored on a 5-point scale, ranging from 0 (*strongly disagree*) to 4 (*strongly agree*). Higher scores reflect higher caregiving responsibilities, and more activity restrictions and feelings of isolation.

2.4.4. Quality of parent attachment

Quality of parent attachment was measured with six 4-item scales of the Inventory of Parent and Peer Attachment ($\alpha = .93$; Armsden & Greenberg, 1987) that measured three constructs: *communication, trust*, and *alienation*. These subscales were assessed independently for mothers ($.64 < \alpha < .84$) and fathers ($.61 < \alpha < .84$) and ranged from 1 (*almost never*) to 4 (*almost always*;

Sieh, 2012a). In this study, reliability for paternal attachment was α = .84 (target group) and α = .80 (comparison group); reliability for maternal attachment was α = .88 (target group) and α = .80 (comparison group). To measure absence of alienation, the subscale *alienation* was reverse-scored (i.e., higher scores mean less alienation). Higher scores on the three scales indicate higher quality of paternal or maternal attachment.

2.4.5. Stress

The Dutch Stress Questionnaire for Children (SVK) from Hartong, Krol, Maaskant, Te Plate, and Schuzler (2003) is a 19-item self-report questionnaire assessing stress in children over the preceding three months. Two items were not part of the stress sum score but were included to make the questionnaire more positive. Participants rated the degree to which they agreed with 19 items (e.g., "I feel at ease at school") on a 4-point scale, ranging from 1 (*not true at all)* to 4 (*completely true).* Total scores diverge between 17 and 68; a higher score signals a higher stress level. The SVK has good internal consistency (Meijer, Van Oostveen, & Stams, 2008) and reliability (.78 < α < .83) in samples of children and adolescents (Dufour, Meijer, Port, & Visser-Meily, 2006; Bögels, De Bruin, & Zijlstra, 2014). In this study, Cronbach's alpha was high: α = .88 (target group) and α = 80 (comparison group).

2.5. Statistical analyses

2.5.1. Preparations

Prior to analyses, the data were inspected for normality of the data distribution, linearity, and presence of missing values. Normality of the variables was assessed visually by creating: (1) a normal probability plot, which compares the cumulative distribution of the variable with the expected distribution, (2) a Normal Quantile-Quantile Plot (Q-Q plot), which uses a scatter plot to compare these distributions, (3) a Detrended Normal Q-Q plot visualizing the deviation of the data points from the horizontal zero line. The Kolmogorov-Smirnov test was executed as the sample size exceeded 50 (De Vocht, 2011). Linearity was tested by plotting the standardized predicted values against the standardized residuals of the dependent variable. If the graph does not resemble a random array of dots that separate around zero and instead display a pattern, nonlinearity is present. Missing values were analyzed by a missing value analysis; missing at random was applied and cases were excluded pairwise (Field, 2009). Finally, bivariate correlations were computed per group between (1) family type and coping strategy, caregiving impact, quality of parent attachment, and stress, and (2) age, gender, coping strategy, and stress.

All variables were of interval level except for gender, family type, and children's health, which were converted into dummy variables (male = 1, female = 2; target group = 1, comparison group = 2; healthy = 1, presence of somatic disease = 2). Differences in demographics (i.e., age, gender, level of education, days per week having contact with parents, SES, presence of somatic disease) between the groups were explored with independent samples *t*-tests, using family type as grouping variable. Descriptive statistics (e.g., means, standard deviations, total scores) were calculated per measure. Effect sizes (Cohen, 1992) were calculated with reliability analysis, applying listwise deletion. To determine the magnitude of effect sizes, Cohen's index of small (.20), medium (.50) and large (.80) was used. All statistical analyses were two-tailed, used a significance level of $p = .05$, and were performed by IBM SPSS Statistics, version 22.

2.5.2. Statistical tests

The first four hypotheses concern differences in scores on coping strategy, caregiving impact, quality of parent attachment, and stress between the groups. These hypotheses were tested with multiple independent samples *t*-tests, using one of these variables as independent variable per *t*-test and family type as grouping variable. Homogeneity of variances was tested with Levene's test, which is robust to non-normality (Gastwirth, Gel, & Miao, 2009). Secondly, we hypothesized that coping strategy, caregiving impact, and quality of parent attachment predicted stress in each group. First, multicollinearity, homoscedasticity, normality of outliers, and independent and normally distributed error terms were checked. Multicollinearity poses a problem on a regression model if two predictors correlate too highly (i.e., $r > .80$); a correlation matrix including all predictors was inspected to detect this. Furthermore, the *Variance Inflation Factor (VIF)* was calculated, which detects strong linear relations between predictors; a VIF of 10 is cause for concern. The average VIF was computed, which must not exceed 1. Tolerance values (indicated by 1/VIF) were also calculated, which may not be lower than 0.2 (Field, 2009). Homoscedasticity holds that the residuals at each level of the predictors should have the same variance (Field, 2009). This, and normality of residuals and outliers, was checked by visual inspection of the plot of predicted residuals and standardized residuals. Cook's distance was calculated to detect cases that exerted an undesirably large influence on the model (i.e., values > 1). Lastly, independence of error terms was verified by computing the Durbin-Watson statistic, which varies between 0 and 4; values below 1 or above 3 are reason for concern (Field, 2009). After checking these assumptions, we tested the hypothesis with a stepwise multiple regression analysis, applying listwise deletion of missing values. Variables (i.e., age or gender) that correlated significantly with stress in either group were entered as covariates.

2.5.3. Moderation

To test the hypothesis that older age and female gender moderate the relation between (1) active problem solving and stress and (2) seeking social support and stress in both groups, we examined moderation effects of age and gender. Prior to testing moderation, the data file was split by family type. Per family type, Pearson correlation coefficients (Pearson's r) and rank order correlations (Spearman's rho) were calculated between moderators (age and gender, respectively) and study variables. Significance of the differences in Pearson's r and Spearman's rho per group were assessed by Fisher's r-to-z transformation (Cohen & Cohen, 1983). The moderation analysis was executed using Hayes' method of moderation. He developed a tool called *Process*, a statistical procedure for SPSS that applies moderation and mediation analyses, and their combination in a conditional model using path analysis. Process centralizes predictors automatically and calculates interaction terms between them. It has the advantage that a model can be specified and moderation and mediation effects can be estimated easily (Hayes, 2013). In the analysis, main and interaction effects were examined using listwise multiple regression.

2.5.4. Mediation

This study intended to verify that coping strategy (i.e., active problem solving and seeking social support; J_1 and J_2) mediated the relation between quality of parent attachment (X) and stress (Y) in both groups (see Table 1). Analyses of mediation in psychological research are often guided by the procedure of Baron and Kenny (1986), who propose that variable J mediates the relation between X and Y if (1) X significantly predicts Y, (2) X significantly predicts J, (3) J significantly predicts Y when controlling for X, and (4) X and J significantly predict Y. In Table 1, B is the intercept with its coefficient i. Complete mediation implies that the effect of X on Y is reduced to zero when controlling for J, whereas partial mediation occurs when the effect of X on Y decreases (but not to zero; Preacher & Hayes, 2004).

Table 1. Steps to explore mediational effects

	Type of effect	Proposition
Step 1	Does X predict Y?	$\hat{Y} = B_i + B_iX + e$
Step 2	Does X predict J?	$\hat{J} = B_i + B_iX + e$
Step 3	Does J predict Y?	$\hat{Y} = B_i + B_iJ_{1,2,3} + e$
Step 4	Do X and J predict Y?	$\hat{Y} = B_i + B_iX + B_2 J_{1,2,3} + e$

3. Results

3.1. Checking assumptions

Normality of the data distribution of the variables was only present for coping strategy. The Kolmogorov-Smirnov test, Normal Q-Q plot, and Detrended Normal Q-Q Plot did not always yield significant results for the variables in both groups. However, linearity and normality of the distribution of residuals were validated in both groups. Although not all outcomes were satisfactory, we presumed data to be normal as the sample size exceeded 30 (De Vocht, 2011).

3.2. Descriptive statistics

3.2.1. Demographic or illness characteristics of parents in both groups

Chronically ill parents were between 32 and 64 years old, with a mean age of 47 years. Nearly all ill parents were Dutch (98%), two thirds were female and most of them were married. Parental CMC's included MS (28.7%), rheumatoid arthritis (20.2%), neuromuscular disease (16%), brain damage (14.9%), paraplegia (7.4%), inflammatory bowel disease (5.3%), Parkinson Disease (5.3%), and diabetes type I (2.1%). Illness duration was 12 years on average and ranged from 1 to 49 years. Two thirds of ill parents were unemployed or received income from disability insurance. More than half of them reported a net monthly family income of 1500-3000 euros on average, while one out of five stated that it exceeded 4000 euros. In comparison, Campbell et al. (2014) found that one out of four chronically ill patients earned less than 2200 euros per month, while half of patients earned more than this.

Healthy parents were on average 48 years old (age ranged from 30 to 65 years) and half of them were female. The majority was Dutch and lived together with their partner. Two thirds of healthy parents worked. In six out of ten families, net income ranged between 3000-4000 euros per month on average and one out of five families earned more than 4000 euros. Noble et al. (2015) studied families consisting of healthy parents ($N = 1100$) and found that their net monthly income was 7000 euros on average.

3.2.2. Demographic characteristics of children in both groups

The distributions of age and gender of children in the target and comparison group were similar; around 50 percent of children were female and mean age was 14.5 years. Demographic statistics are shown in Table 2. An independent samples t-test showed that children with ill parents were significantly less likely to be healthy than children of healthy parents, $t(246) = 2.33$, $p = .02$.

Table 2

Individual characteristics presented as a proportion of the sample or as a mean score with standard deviation or range

	Target group (*N* = 136)	Comparison group (*N* = 112)
Female gender	52.2%	53.6%
Mean age (*SD*)	15.2 (2.3)	15.1 (2.2)
Healthy[a]	83.1%	92.9%
Lives with parents the entire week	98.5%	96.4%
Nativity		
Caucasian	100%	98.2%
Icelandic	0%	1.8%
Level of education[b]		
Mean education (*SD*)	7.0 (3.3)	7.5 (3.0)
Lower education	14.7%	13.4%
High school	48.5%	68.8%
Lower Vocational Education	17.6%	9.8%
Intermediate Vocational Education	14.7%	4.5%
Higher education	2.2%	0.9%
University	2.2%	2.7%
Employed	41.9%	44.6%
Mean work hours per week (range)	4.3 (0-40)	3.0 (0-40)

Note. [a] Healthy indicates absence of a non-severe somatic illness. [b] Education level varies from 1 (primary education) to 6 (university).

3.3. Statistical analyses

3.3.1. Preliminary analyses

Pearson correlation coefficients were calculated per group for scale and total scores of all variables and also for age and gender (see Table 3 and 4). In the target group, it appears that scales that measure the same construct and should correlate did so significantly. In contrast, in the comparison group, the two subscales of coping strategy (i.e., active problem solving and seeking social support) did not correlate significantly. In both groups, it appears that increased age is related to more feelings of isolation and stress. There also seems to be a link between gender and seeking social support. Further, correlations between stress and feelings of isolation were significant in both groups, but only in the target group the correlation was large (*r* = .68). Only in the target group a relatively large positive correlation was found between quality of paternal attachment and active problem solving, a large negative correlation was observed between quality of maternal attachment and feelings of isolation, and a modest positive correlation was visible between gender and feelings of isolation. Multicollinearity was absent in either group.

Table 3
Pearson correlation coefficients between study parameters in the target group

	APS	SSS	RESP	AR	ISO	PA	MA	Stress	Age	Gender
APS	1									
SSS	.42**	1								
RESP	.19*	.31**	1							
AR	-.13	-.11	.40**	1						
ISO	-.06	.00	.26**	.57**	1					
PA	.43**	.38**	-.08	-.47**	-.39**	1				
MA	.35**	.38**	-.06	-.39**	-.46**	.56**	1			
Stress	-.20*	-.04	.14	.54**	.68**	-.49**	-.47**	1		
Age	.11	-.08	.06	.16	.29**	-.20*	-.27**	.20*	1	
Gender	.01	.24**	-.09	.02	.22**	-.02	-.09	.29**	.07	1

Note. N = 136. APS = Active problem solving, SSS = Seeking social support, RESP = Caregiving responsibilities, AR = Activity restrictions, ISO = Feelings of isolation, PA = Quality of paternal attachment, MA = Quality of maternal attachment. * p < .05 (two-tailed), ** p < .01(two-tailed).

Table 4
Pearson correlation coefficients between study parameters in the comparison group

	APS	SSS	RESP	AR	ISO	PA	MA	Stress	Age	Gender
APS	1									
SSS	.17	1								
RESP	-.08	.04	1							
AR	-.10	.00	.30**	1						
ISO	-.15	-.06	.24*	.38**	1					
PA	.10	.10	.01	-.29**	-.28**	1				
MA	.18	.31**	-.03	-.18	-.17	.48**	1			
Stress	-.18	-.05	.04	.22*	.30**	-.36**	-.29**	1		
Age	-.03	-.05	-.01	-.04	.19*	-.31**	-.38**	.29**	1	
Gender	-.04	.41**	.01	.03	.12	-.06	.16	.09	-.07	1

Note. N = 112. APS = Active problem solving, SSS = Seeking social support, RESP = Caregiving responsibilities, AR = Activity restrictions, ISO = Feelings of isolation, PA = Quality of paternal attachment, MA = Quality of maternal attachment. * p < .05 (two-tailed), ** p < .01(two-tailed).

3.3.2. Testing the hypotheses

Hypotheses 1-4

Children in the target group use coping strategies less often and perceive caregiving impact, quality of parent attachment, and stress to be higher than children in the comparison group.

Independent samples *t*-tests showed that the target group scored significantly higher on caregiving responsibilities ($p \leq .001$), activity restrictions ($p \leq .001$), and feelings of isolation ($p = .001$), confirming the hypothesis about caregiving impact. No significant differences were found between the groups in coping strategies, quality of parent attachment, or stress (Table 5). Results disproved predictions that were linked to these variables, see Table 6 including effect sizes. Most effect sizes were small ($d < .20$; Cohen, 1992). Subscales of caregiving impact obtained medium ($.20 \leq d \leq .50$) or large ($d > .50$) effect sizes.

Table 5
Model specifications resulting from independent samples t-tests, with coping strategy, caregiving impact, quality of paternal and maternal attachment, and stress as independent variables

Variable	t	df	p
Coping strategy			
Active problem solving	-.48	246	.635
Seeking social support	-.21	246	.832
Caregiving impact			
Caregiving responsibilities	4.78	246	.000**
Activity restrictions	4.38	233	.000**
Feelings of isolation	3.41	241.8	.001**
Quality of paternal attachment			
Communication	-.59	246	.556
Trust	.176	246	.860
Alienation	-1.40	246	.163
Quality of maternal attachment			
Communication	-.10	246	.925
Trust	-1.62	242	.118
Alienation	1.14	246	.257
Stress	1.73	244.1	.084

Note. ** = $p \leq .001$ (two-tailed).

Table 6

Comparison between the target and comparison group on coping strategy, caregiving impact, quality of paternal and maternal attachment, and stress

Variable	Target group[a]		Comparison group[b]		Items	Range	t	Effect size[d]
	M (SD)	α[c]	M (SD)	α	(n)			
Coping strategy								
Active problem solving	14.2 (3.5)	.81	14.5 (3.4)	.78	6	6-24	-.21	-.09
Seeking social support	13.6 (4.1)	.88	13.7 (3.9)	.86	6	6-24	-.48	-.02
Total	27.9 (6.4)	.87	28.2 (5.6)	.80	12	12-48	-.41	-.05
Caregiving impact								
Caregiving responsibilities	13.2 (5.3)	.73	9.9 (5.7)	.80	7	0-28	4.78**	.60
Activity restrictions	6.1 (5.5)	.87	3.6 (3.6)	.82	7	0-28	4.38**	.54
Feelings of isolation	3.8 (3.0)	.74	2.7 (2.1)	.72	3	0-12	3.41**	.42
Quality of PA								
Communication	10.0 (2.9)	.72	10.2 (2.7)	.74	4	4-16	-.59	-.07
Trust	13.7 (2.2)	.74	13.6 (2.0)	.72	4	4-16	.18	.05
Alienation	5.6 (1.8)	.68	5.9 (1.8)	.54	4	4-16	-1.40	-.17
Total	38.1 (5.8)	.84	38.0 (5.2)	.80	12	12-48	.23	.02
Quality of MA								
Communication	12.0 (2.9)	.77	12.0 (2.6)	.74	4	4-16	-.10	-.01
Trust	13.9 (2.3)	.77	14.3 (1.7)	.57	4	4-16	-1.62	-.20
Alienation	5.6 (2.0)	.74	5.4 (1.5)	.54	4	4-16	1.14	.14
Total	40.2 (6.2)	.88	38.0 (5.2)	.80	12	12-48	1.01	.38
Stress	34.7 (8.2)	.88	41.0 (4.7)	.80	17	17-68	1.73	-.13

Note. [a] N = 136. [b] N = 112. [c] = Cronbach's α. [d] Effect sizes are Cohen's d. All presented scores are raw scores. PA = Paternal attachment, MA = Maternal attachment. * = p < .05 (two-tailed), ** = p < .01 (two-tailed).

Hypothesis 5

Coping strategy, caregiving impact, and parent attachment predict stress in both groups.

Checking assumptions

Before conducting the multiple regression analysis to test Hypothesis 5, the assumptions were checked. Multicollinearity did not pose a problem on the regression model in either group. VIF and tolerance values were satisfactory. The average VIF values of 1.64 in the target group and 1.30 in the comparison group surpassed the threshold value of 1 but were still acceptable. Standardized residuals and outliers were normally distributed and variance of the models was constant (homoscedasticity). Independence of error terms was verified. Cook's values indicated that there were no major influential cases. The mean of 15 cases in the target group and 14 cases in the comparison group was at least two standard deviations beyond the corresponding grand mean of stress. The largest standardized residual in the target group was 3.2 standard deviations above the mean; in the comparison group, this value was 2.9.

Multiple regression analysis per group

The multiple regression analysis for the target group included age and gender as covariates, as they correlated significantly with stress ($r = .20$, $p = .02$; $r = .29$, $p = .001$). Results are shown in Table 7. Model 1 only included age and gender. Model 2 included all variables and controlled for age and gender; both models were significant, $F(9,126) = 18.97$, $p < .001$, $R^2 = .57$; $F(2,133) = 8.50$, $p < .001$, $R^2 = .11$, respectively. Model 1 explained 11.3% and Model 2 explained 57.5% of variance in stress. The change in the *F*-score was significant, $\Delta F(7,126) = 19.51$, $p \leq .001$. Results showed that both age and gender in Model 1 predicted stress significantly. In Model 2 this was the case for gender, activity restrictions, feelings of isolation, and paternal attachment.

The multiple regression analysis for the comparison group only included age as a covariate because it correlated significantly with stress ($r = .29$, $p = .002$). Results showed that both Model 1 (including age) and Model 2 (including all independent variables and controlling for age) were significant, $F(1,109) = 9.85$, $p = .002$ and $F(8,102) = 3.80$, $p = .001$, respectively. Model 1 accounted for 8.3% of variance in stress, whereas Model 2 explained 22.9% in stress scores. The change in the *F*-statistic was significant, $\Delta F(7,102) = 2.77$, $p = .011$. None of the independent variables was related to stress, except for age in Model 1 ($p = .000$; Table 7).

Table 7
Parameter specifications per model resulting from regression analyses per group, with stress as outcome variable.

	b	SE	t	p	b	SE	t	p
			Target group[a]				Comparison group [b]	
Model 1								
Age	.63	.29	2.17	.032*	.82	.25	3.14	.000*
Gender	4.46	1.34	3.34	.001**				
Model 2								
Age	-.06	.23	-.25	.805	.46	.27	1.70	.093
Gender	2.28	1.05	2.18	.031*				
Caregiving responsibilities	-.19	.11	-1.21	.230	-.04	.10	-.41	.683
Activity restrictions	.29	.12	2.44	.016*	.10	.18	.93	.357
Feelings of isolation	1.27	.22	5.41	.000**	.55	.28	1.65	.103
Quality of paternal attachment	-.27	.11	-2.35	.021*	-.26	.13	-1.78	.078
Quality of maternal attachment	-.17	.10	-1.44	.151	-.19	.14	-.79	.430
Active problem solving	-.16	.17	-.81	.421	-.20	.16	-1.30	.198
Seeking social support	.33	.15	1.45	.149	.08	.15	.40	.692

Note. [a] $N = 136$. [b] $N = 112$. * = $p \leq .05$ (two-tailed); ** = $p \leq .001$ (two-tailed).

Hypothesis 6

Older age and female gender moderate the relation between coping strategy (i.e., active problem solving and seeking social support) and stress in both groups.

A multiple regression model was tested to examine whether moderation was present. Fisher's *r*-to-*z* transformation showed no differences in Pearson and Spearman correlation coefficients between the groups ($z = -.74$, $p = .46$; $z = 1.57$, $p = .12$, respectively). Four multiple regression models per group were tested to examine whether the relationship between the predictors and stress depended on the age or gender of children (Table 8). We used Hayes' method of moderation in which all independent variables were centered around the mean automatically.

Moderation analysis per group

Moderation analyses tested whether age and gender moderated the relation between active problem solving and stress or seeking social support and stress. Results are displayed in Table 8. In the target group, Model 1 accounted for 9.4% of variance in stress, $F(3,132) = 4.94$, $p \leq .01$. Regarding main effects, age and active problem solving were both positively related to stress (Table 8). Model 2 explained 4.7% of variance in stress, $F(3,132) = 2.34$, $p = .08$. Age predicted stress significantly ($p = .03$). In Model 3 the predictors gender and active problem solving predicted stress significantly; 14.2% of variance in stress was explained, $F(3,132) = 6.07$, $p \leq .01$. Gender and active problem solving predicted stress individually, in contrast to their interaction term. In Model 4, only gender was a significant predictor of stress; 9.4% of variance in stress was accounted for, $F(3,132) = 4.39$, $p \leq .01$. Moderation was not present as none of the main effects and interaction terms per model were significant.

Regarding the comparison group, Model 1 showed that age was the only significant predictor of stress. The model explained 11.7% of variance in stress, $F(3,107) = 4.19$, $p \leq .01$. In Model 2, age and the interaction of age and seeking social support were significant predictors of stress, but seeking social support itself was not. This means that moderation is occurring; the moderation effect is displayed in Figure 9. The model rendered 14.2% of variance in stress to be significant. Model 3 and 4 yielded no significant main or interaction effects. The amount of explained variance was low: 4.0% for Model 3 and 2.4% for Model 4 ($F(3,108) = 1.57$, $p = .20$; $F(3,108) = 1.01$, $p = .40$, respectively).

Table 8

Summary of model coefficients resulting from regression analyses per group, with SSS and APS as independent variables, stress as dependent variable, and age and gender as perceived moderators

	b	t	p	SE	b	t	p	SE
		Target group[a]				Comparison group[b]		
Model 1								
Age	.83	3.03	.003*	.27	.76	3.20	.002*	.24
APS	-.52	-2.59	.011*	.20	-.27	-1.52	.131	.18
Age^APS	-.07	-.87	-.386	.08	.06	.81	.418	.08
Model 2								
Age	.67	2.22	.027*	.30	.86	3.72	.000**	.23
SSS	-.03	-.13	.896	.22	-.04	-.31	.76	.14
Age^SSS	.08	.83	.409	.09	-.16	2.82	.001**	.06
Model 3								
Gender	4.68	3.53	.001**	1.33	1.04	.86	.389	1.20
APS	-.48	-2.50	.014*	.19	-.31	-1.77	.079	.18
Gender^APS	-.64	-1.67	.097	.38	-.05	-.13	.895	.36
Model 4								
Gender	5.06	3.57	.001**	1.42	1.49	1.49	.253	1.30
SSS	-.22	-1.04	.299	.21	-.14	-.81	.421	.18
Gender^SSS	-.32	-.77	.443	.41	-.30	-.84	.402	.36

Note. [a] *N* = 136. [b] *N* = 112. ^ = interaction term. SSS = Seeking social support; APS = Active problem solving.
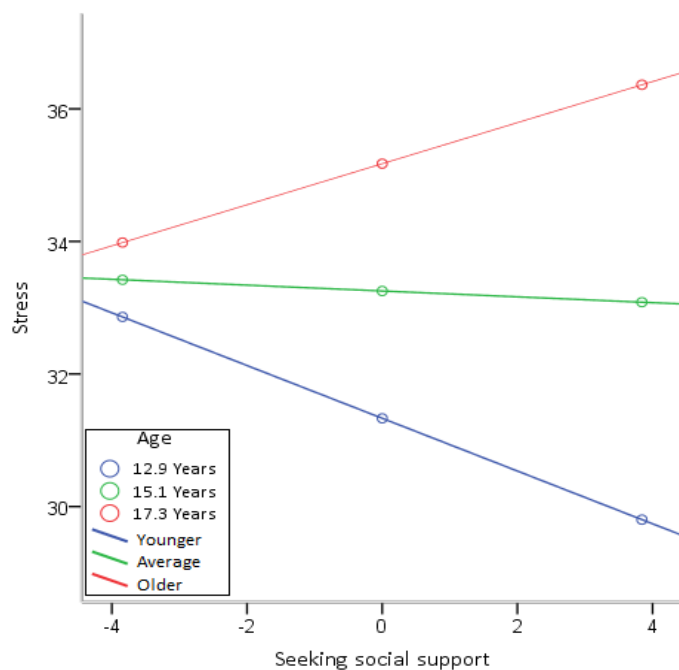* = *p* ≤ .05 (two-tailed); ** = *p* ≤ .001 (two-tailed)

Figure 9. Age moderates the relation between seeking social support and stress

Hypothesis 7

Both active problem solving and seeking social support mediate the relation between quality of paternal and maternal attachment and stress in both groups.

Mediation analysis in the target group

A mediation analysis was performed. Results (Table 9 and 10) showed that paternal attachment and seeking social support together (Model 2.4) explained the greatest amount of variance in stress (26.2%). Only seeking social support did not predict stress (Model 2.3). Model 1.1 and 1.2 indicated that paternal attachment significantly predicted stress and active problem solving. When paternal attachment and active problem solving predicted stress collectively (Model 1.4), the latter was no longer significant. Model 2.2 and 2.3 showed that paternal attachment predicted seeking social support, which did not predict stress. The relation between paternal attachment, seeking social support, and stress (Model 2.4) obtained significance. Maternal attachment predicted stress and active problem solving (Model 3.1 and 3.2); Model 3.3 rendered a significant result as well. Active problem solving did not predict stress anymore when maternal attachment was added (Model 3.4). Lastly, maternal attachment predicted seeking social support (Model 4.2), but the latter did not predict stress (Model 4.3). Nevertheless, with maternal attachment added to the model, seeking social support became a significant predictor of stress (Model 4.4). The results did not confirm mediation. Of all regression models with two independent variables in the target group, only Model 2.4 explained more variance in stress when seeking social support was added, $\Delta R^2 = .02$, $\Delta F(1,133) = 4.28$, $p = .04$. Seeking social support approached significance in additional explained variance (Model 4.4; $\Delta R^2 = .02$, $\Delta F(1,133) = 3.85$, $p = .05$).

Mediation analysis in the comparison group

Results showed that maternal attachment explained 37.8% of variance in seeking social support (Model 4.2). Half of the regression models rendered a significant result. Paternal attachment predicted stress both independently and with active problem solving and seeking social support added (Model 1.1, 1.4, and 2.4, respectively). Similarly, maternal attachment predicted stress itself and in conjunction with active problem solving and seeking social support (Model 3.1, 3.4, and 4.4, respectively). In addition, maternal attachment predicted seeking social support. Results disconfirmed that coping strategy mediated the relation between paternal or maternal attachment and stress. Model 1.4, 2.4, 3.4, and 4.4 did not explain extra variance in stress when either active problem solving or seeking social support was added to the model.

Table 9
Summary of model specifications resulting from multiple regression analyses per group

	R^2	F	df^a	p	R^2	F	df^a	p
		Target group[a]				Comparison group[b]		
Model 1.1: PA [S]	.238	41.8	1, 134	.000**	.131	16.6	1, 110	.000**
Model 1.2: PA [APS]	.184	30.2	1, 134	.000**	.010	1.07	1, 110	.303
Model 1.3: APS [S]	.041	5.7	1, 134	.018*	.033	3.72	1, 110	.056
Model 1.4: PA, APS [S]	.238	20.8	2, 133	.000**	.153	9.81	2, 109	.000**
Model 2.1: PA [S]	.238	41.8	1, 134	.000**	.131	16.6	1, 110	.000**
Model 2.2: PA [SSS]	.144	22.6	1, 134	.000**	.010	1.15	1, 110	.287
Model 2.3: SSS [S]	.002	.25	1, 134	.621	.002	.27	1, 110	.607
Model 2.4: PA, SSS [S]	.262	23.6	2, 133	.000**	.131	8.25	2, 109	.000**
Model 3.1: MA [S]	.225	38.9	1, 134	.000**	.086	10.4	1, 110	.002*
Model 3.2: MA [APS]	.125	19,2	1, 134	.000**	.033	3.7	1, 110	.057
Model 3.3: APS [S]	.041	5.7	1, 134	.000**	.033	3.7	1, 110	.056
Model 3.4: MA, APS [S]	.226	19.4	2, 133	.000**	.103	6.3	2, 109	.003*
Model 4.1: MA [S]	.225	38.9	1, 134	.000**	.086	10.4	1, 110	.002*
Model 4.2: MA [SSS]	.143	.25	1, 134	.000**	.378	12.0	1, 110	.001**
Model 4.3: SSS [S]	.002	.25	1, 134	.621	.002	.267	1, 110	.607
Model 4.4: MA, SSS [S]	.247	21.8	2, 133	.000**	.088	5.27	2, 109	.007*

Note. [a] Degrees of freedom of the regression model and the residual are displayed. [...] is the dependent variable. S = Stress, PA = Quality of paternal attachment, APS = Active problem solving, SSS = Seeking social support, MA = Quality of maternal attachment. * = $p \leq .05$ (two-tailed); ** = $p \leq .001$ (two-tailed)**.**

Table 10

The multiple regression models per group that predicted stress and active problem solving from paternal attachment, maternal attachment, active problem solving, and seeking social support

	b	t	p	SE	b	t	p	SE
		Target group[a]				Comparison group[b]		
Model 1.1								
PA [stress]	-.69	-6.47	.000**	.11	-.43	-4.01	.000**	.11
Model 1.2								
PA [APS]	.26	5.49	.000**	.05	.06	1.04	.303	.06
Model 1.3								
APS [stress]	-.47	-2.39	.018*	.20	-.32	-1.93	.056	.17
Model 1.4								
PA [stress]	-.70	-5.86	.000**	.12	-.26	-1.65	.101	.16
APS	.02	.10	.922	.20	-.42	-3.93	.000	.11
Model 2.1								
PA [stress]	-.69	-6.47	.000**	.11	-.43	-4.01	.000**	.11
Model 2.2								
PA [SSS]	.27	4.76	.000**	.06	.08	1.07	.287	.07
Model 2.3								
SSS [stress]	-.09	-.50	.621	.17	-.08	-.52	.607	.15
Model 2.4								
PA [stress]	-.78	-6.84	.000**	.11	-.43	-4.02	.000**	.11
SSS	.33	2.07	.041*	.16	-.02	-.14	.889	.14
Model 3.1								
MA [stress]	-.63	-6.23	.000**	.10	-.38	-3.22	.002*	.12
Model 3.2								
MA [APS]	.20	4.38	.000**	.05	.13	1.93	.057	.07
Model 3.3								
APS [stress]	-.47	-2.39	.018*	.20	-.32	-1.93	.056	.17
Model 3.4								
MA [stress]	-.61	-.48	.000**	.19	-.35	-2.92	.004*	.12
APS	-.09	-5.64	.629	.11	-.24	-1.43	.155	.17
Model 4.1								
MA [stress]	-.63	-6.23	.000**	.10	-.38	-3.22	.002*	.12
Model 4.2								
MA [SSS]	.05	4.72	.000**	.05	.26	3.47	.001**	.07
Model 4.3								
SSS [stress]	-.09	-.50	.621	.17	-.08	-.52	.607	.15
Model 4.4								
MA [stress]	-.70	-6.57	.000**	.11	.07	.50	.622	.15
SSS	.32	1.96	.005*	.16	-.40	-3.20	.002*	.13

Note. [a] *N* = 136. [b]*N* = 112. Scores are raw scores. […] is the dependent variable. PA = Parent attachment, APS = Active problem solving, SSS = Seeking social support, MA = Maternal attachment. * = *p* ≤ .05 (two-tailed); ** = *p* ≤ .001 (two-tailed).

4. Discussion

The main objective of this study was to examine effects of coping strategy, caregiving impact, and parent attachment on stress in children of parents with a CMC. To be able to draw adequate conclusions, a comparison group comprising children of healthy parents was included. In comparison to children of healthy parents, caregiving impact (caregiving responsibilities, activity restrictions, and feelings of isolation) was higher in children of parents with a CMC. An increase in stress in children of parental CMC was related to more activity restrictions and feelings of isolation, and less quality of paternal attachment; these factors predicted stress. In this group, no effects of coping strategy on stress were found. In children of healthy parents, coping strategy, caregiving impact, and parent attachment did not influence stress. The utility of the Transactional Stress and Coping (TSC) Model (Lazarus and Folkman, 1984), that served as a theoretical framework for this study, was not supported. The results suggested that age moderated the relation between seeking social support and stress in children of healthy parents, meaning that the effect of seeking social support on stress varies due to a child's age.

The finding that caregiving impact was higher in the target group than in the comparison group confirmed Hypothesis 2. Other studies found identical results (Banks et al., 2001; Pakenham et al, 2006). Pakenham et al. (2006) found that young caregivers and non-caregivers differed more on the YCOPI-factors than on other measures of adjustment, underlining the importance of the use of measures that are developed especially for young caregivers. No differences between the groups were found in coping strategy, parent attachment, or stress, rejecting Hypotheses 1, 3, and 4. Former research stated that problem-focused coping was related to lower stress and that more reliance on avoidance coping and benefit finding (forms of emotion-focused coping) were linked to increased stress (Mackay & Pakenham, 2012; Fitzell & Pakenham, 2010; Pakenham et al., 2007). Seeking social support was associated with lower stress in young caregivers (Lee et al, 2006; Pakenham et al, 2007). The absence of significant findings with respect to coping strategy in this study might be explained by the inadequacy of the UCL-A to measure coping strategies, the lack of a relation between seeking social support and stress ($r = .05$), or limited statistical power (9 predictors with sample sizes of 136 and 112). Also, the effect of coping strategies on stress may vary according to situationally dependent caregiving demands (Pakenham et al., 2007); coping strategies were not measured in relation to these demands. Further, the majority of research on young caregivers found that lower quality of parent attachment was related to increased stress (Armsden & Greenberg, 1987, Evans et al., 2007; Harden, 2004). This study failed to validate this relationship, which coincided with

findings of Ireland and Pakenham (2010). The effects of parent attachment on stress might be less pronounced because parent attachment is a long-lasting affectional bond between caregiver and child (Ainsworth & Bowlby, 1991). This bond might not be instantly changed by parental illness and not cause stress in children immediately. Ireland and Pakenham (2010) asserted that children of parents with mental illness have a higher chance of lower quality of parent attachment than children of parents with a CMC. Lastly, differences in stress between the groups were not confirmed; this did not correspond to findings of other studies (Evans et al., 2006; Fitzell & Pakenham, 2010; Pakenham et al., 2007). Our results can be explained in several ways. Evans et al. (2005) found that stressors resulting from parental illness created adverse outcomes especially in children below 10 years, because they were less emotionally prepared to cope. Children above 10 years (as in our study) might be more able to cope as coping skills are more developed. Also, a parent's illness does not necessarily cause stress in children, as it can also bring family members closer together (Pakenham et al., 2007).

Hypothesis 5 was partly confirmed, as results revealed that activity restrictions, feelings of isolation, and paternal attachment predicted stress significantly in children of parents with a CMC. A substantial amount of variance in stress (57.5%) was attributable to caregiving impact and parent attachment. Other studies also found an association between greater caregiving impact and increased stress (Pakenham et al, 2006; Banks et al., 2001). Contrary to our expectations, coping strategy, caregiving responsibilities, and maternal attachment did not predict stress in children of parents with a CMC. In children of healthy parents, none of the hypotheses were confirmed. The results further suggested that higher age (but not female gender) moderated the relation between seeking social support and stress in children of healthy parents, partially verifying Hypothesis 6. Age and seeking social support explained 14.2% of variance in stress. The interaction plot showed that as seeking social support and the child's age increased, the child's stress level increased. We propose that especially older children with elevated stress levels try to lower stress by seeking social support. When seeking social support was low, stress levels in children with healthy parents were similar for children of different ages. In children of parental CMC, age and gender did not moderate the relation between coping strategy and stress. Regarding main effects, age, gender, and active problem solving were significantly linked to stress; seeking social support was not. In children of healthy parents, only age was significantly linked to stress. Our findings that increased age and female gender were related to more stress in young caregivers was consistent with other studies (e.g., Pedersen & Revenson, 2005). Some studies found a moderating effect of young caregivers' age and gender on stress (Compas et al., 1994; Lindeman et al., 2007), while others did not (Hellhammer
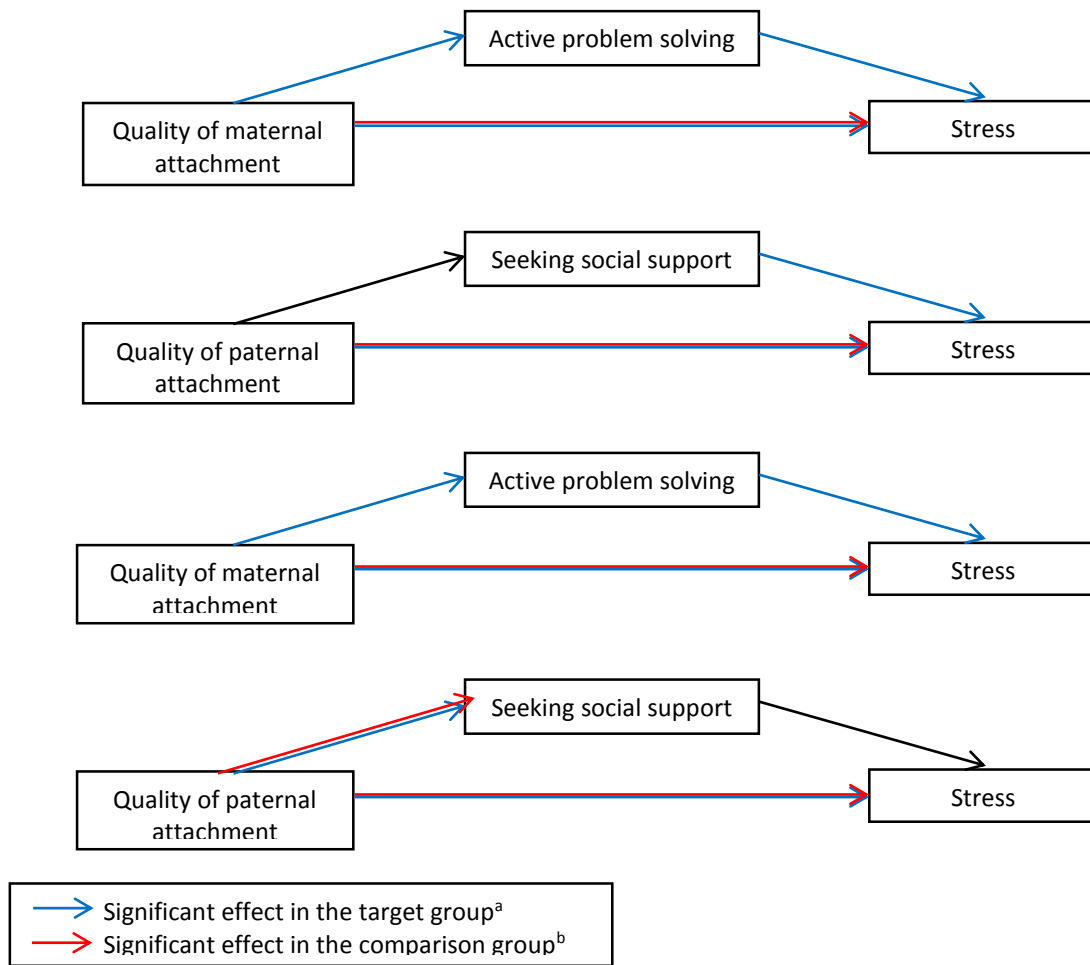
Figure 9. Results per model in multiple regression analyses testing mediation. [a,b]Significance levels varied from $p \leq .05$ (two-tailed) to $p \leq .001$ (two-tailed).

et al., 1999). More research is needed before a firm conclusion can be stated. Taking the results in both groups into account, it can be concluded that there seems to be a strong relation between caregiving impact and stress only in children of parental CMC. Especially since results of other studies corresponded with this finding, we assume that this is indeed a reliable conclusion.

We found no mediation effect of coping strategy on the relationship between quality of parent attachment and stress in either group, rejecting Hypothesis 7. Significant effects that were uncovered per group by multiple regression analyses are presented in Figure 9. Our results diverge from other studies who found a mediating effect of coping strategy on the relation between parent attachment and stress (Mikulincer & Shaver, 2012; Wei et al., 2003). Possibly, emotion-focused coping strategies act as a mediator (e.g., emotion regulation; Mikulincer & Shaver, 2012) while problem-focused strategies (e.g., active problem solving) do not.

Future research

Future studies should measure appraisal because of its close link to coping and stress (Lazarus & Folkman, 1984), they should include young caregivers who have single or homosexual parents, and assess coping strategies that are most frequently encountered by young caregivers. The utility of the TSC model should be reassessed. Multiple measurement methods should be used to approach a construct (e.g., self-report vs. behavioral observation), increasing construct validity. Family responsibilities accounted for an increase in stress in girls with ill mothers, but not in girls with ill fathers or in boys (Grant & Compas, 1995). Further research should investigate which mechanism accounts for this sex difference. Sieh (2012a) included items assessing a change in contact between children and a parent with a CMC. Further studies might assess this change in quality of parent attachment, as this is impossible in a cross-sectional study otherwise. According to Pakenham et al. (2007), social support is the strongest predictor of stress. As many young caregivers feel isolated and receive little support, seeking social support might alleviate their stress. Future studies might explore in which ways (e.g., social support group, skills training, psycho-education) young caregivers want to be assisted and how they benefit most from interventions (e.g., individually or in a group). As parental CMC affects the entire family, interventions involving all family members might have beneficial effects on young caregivers. Respite care may alleviate stress and caregiving impact in young caregivers (Jardim & Pakenham, 2010); whether these positive effects can be established in children with parental CMC remains to be investigated. To increase knowledge about effects of parental CMC on stress in children, future research should inquire effects of other factors (e.g., family factors) This renders a more complete model, enabling researchers to draw more valid conclusions.

Strengths and weaknesses of this study

Several limitations of this study should be considered. First, the sample is relatively small. Further, as findings are of correlational nature, no inferences can be made about causal relationships. Reliance on self-reported measurements contributes to measurement error and limits construct validity (Rosenthal, 2003) and external validity (i.e., generalizability of the findings; Field, 2009). However, child self-reports do not necessarily lead to less accurate measurements than parent or teacher reports (Engels, Kleinjan, Kuijpers, Otten, & Stone, 2015). Participants were children between 10-20 years old; most of them were native Dutch and followed higher education. Further, 80% of parental CMC's comprised four chronic diseases. Healthy parent families displayed a relatively high SES. Results are only generalizable to samples with similar characteristics, limiting external validity (Leary, 2008). Lastly, this study

did not control for the family cluster effect. This effect poses a problem on studies in which multiple members of the same family participate. Responses of individuals within the same family might be more equal than those of individuals in different families. When the family cluster effect is not accounted for, standard errors might be underestimated and conclusions less accurate (Lapointe et al., 2011).

In this section, validity is discussed. Construct validity (i.e., the degree to which a measure assesses the construct that it claims to assess; Drew, Westen, & Rosenthal, 2003) was not compromised as multicollinearity between all study variables in either group was absent. Secondly, content validity refers to the precision to which a measure samples a domain of interest (Rosenthal, 2003). The content validity of the UCL-A and YCOPI are disputable. The number of subscales of the UCL-A was deducted from 7 to 2 in this study, which casts doubts on the question whether the construct of coping strategies is adequately covered. Also, scales of part B of the YCOPI that were aimed at children with ill parents could not be used. Inclusion of part B could have provided more insight in the effects of caregiving on children. Further, internal validity is "the degree to which conclusions about the effects of the predictor variable are accurate" (Leary, 2008, p. 204). Selection bias threatens internal validity. More participants in the target group than in the comparison group were excluded in order to adhere to exclusion criteria (25 vs. 2, respectively). We counteracted this form of selection bias by rendering the groups equal on common factors (e.g., age), increasing intergroup homogeneity. No pre-existing differences between groups were found (except for higher perceived health, which was higher in the comparison group). Thus, selection bias had no considerable impact on results.

Despite these limitations and aspects regarding validity this study possesses multiple strengths that have to be noticed. Mostly, prior research lacked adequate comparison groups and refrained from examining inter-group differences in psychosocial variables. Multiple studies compared children of parents with a CMC to children of parents with a mental illness (Mackay & Pakenham, 2012), which might obscure the effects of parental CMC on children. This study responded to these shortcomings; we used a cross-sectional design, included a comparison group, and used an established and comprehensive theory to guide our research. Psychological and behavioral constructs were measured with psychometrically sound measures. In addition, this study investigated approaches to research on young caregivers on which prior research was inconclusive (e.g., gender and age effects on the link between coping and stress).

Clinical implications

In this study, variables that differed significantly between the groups had similar effect sizes. The effect sizes of all subscales of caregiving impact were medium to large, meaning that these effects were of considerable strength. The effect size is a standardized measure that gauges the strength of the effect in the population (Field, 2009). Therefore, we conclude that it is likely that this effect can also be found in a larger population. The findings of this study have significant implications for rehabilitation services, policy makers, and health care practitioners. Rehabilitation practitioners have to identify young caregivers who need support. To establish this they have to set up partnerships with schools, children's social services and GP's, as young caregivers might turn to individuals working in these facilities for help. Problems that young caregivers frequently encounter (e.g., low school grades, difficulties with contact with peers) are most visible for teachers. When young caregivers are identified, rehabilitation practitioners have to evaluate if they need help and in which form (e.g., emotional or practical support). Emotional and practical support may help young caregivers to come to terms with their parents' illness and to reduce caring responsibilities. In this way, children may feel more relieved and caregiving impact and stress or worries may be reduced. Emotional support may be provided individually by someone who young caregivers can talk to. Creating opportunities for young caregivers to meet each other may also be helpful. Aldridge and Becker (1999) advocate a whole-family approach to young caregiving, which means that a child's caring activities are performed in the interest of the whole family. Therefore, the needs of young caregivers need to be contemplated in the context of the entire family. Needs assessment of individual family members may help to make clear what is needed and how this can be achieved. Practical support may be given to ill parents in the form of practical tips on parenting or tips about which institutions to approach for direct support (e.g., social services).

In conclusion, results support the transactional model of stress and coping. Caregiving impact strongly relates to stress in young caregivers; decreasing caregiving impact might lower stress in children with parental CMC. In children of healthy parents, older children seem to be at increased risk for stress. Further studies have to investigate whether age has to be considered a risk factor for stress in young caregivers. When young caregivers with high levels of caregiving impact are identified and offered help in an early stage, stress in these children may be prevented. Ultimately, active identification of their needs might lower detrimental effects of parental CMC.

5. Planning

Goal	Tasks	Time schedule Months	Hours	Deadline
Contract	Initial literature search	November	20	05-11-14
	Research question	November	5	20-11-14
	Thesis contract	November – December	15	15-12-14: Thesis contract
Proposal	Extensive literature search	November – December	25	15-12-14
	Exploring theories	November - December	30	31-12-15
	Research proposal	December	35	20-12-15: First version
	Adjusting proposal	December - January	20	11-01-15: Second version (after peer rev. 1)
	Final version proposal	January	5	15-01-15: Proposal finished
Recruitment	Preparatory work (e.g., meetings, developing folder and flyer)	November - December	20	31-12-14
	Approaching organisations and students	January	20	31-01-15
	Data collection	January - February	10	28-02-15
	Finishing data collection, granting credits to participants	March - May	15	01-05-15
Thesis	Literature analysis	January	30	25-01-15
	Writing introduction	January - February	50	15-02-15: First version 29-02-15: Sec. version *Postponed due to internship activities
	Writing method	February	20	25-02-15: First version 05-03-15: Sec. version *Postponed due to late peer review
	Writing introduction and method	March	20	15-03-15: First version
	Finishing introduction and method	March	6	25-03-15: Second version (after peer rev. 2)
	Reviewing statistical methods	March	30	05-04-15
	Data-analysis	March - April	60	22-04-15 * Postponed due to applying for internships
	Data-analysis	April	60	30-04-15
	Writing results	April - May	40	05-05-15: First version 15-05-15: Second version *Postponed due to start internship
	Writing results	May	80	14-05-15: First part 26-05-15: First version

				02-06-15: Second version (after peer rev. 3)
Writing discussion	June	30		11-06-15: First version 19-06-15: Second version (after peer rev. 4) * Postponed due to internship
Writing discussion	June-July	30		01-07-15: First version 05-07-15: Second version (after peer rev. 5)
Writing abstract	July	3		08-07-15 > 26-07-15 * Postponed due to holiday and internship
Final editing (APA, grammar, lay-out, spelling check)	July-August	15		10-07-15 > 02-08-15 * Postponed due to holiday and internship
Concept of final version to supervisor	August	5		18-07-15 > 02-08-15 * Postponed due to holiday and internship
Final version thesis	August	/		06-08-15 > 31-08-15 * Postponed due to internship

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