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An experimental study on negative emotionality-based
differential susceptibility in school-aged children

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THESIS

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Abstract

Belsky (1997) provided a fundamentally different way of examining the temperament x parenting interaction; the differential susceptibility hypothesis. This hypothesis tells us that individuals who are most vulnerable to stressors also benefit the most when exposed to positive factors like environmental support and warm parenting. This experimental study, amongst 160 children aged 5-7 ($M=6,6$) years, examines whether children with negative emotionality are more susceptible for both negative and positive parenting. The research has been performed using questionnaires and an experimental manipulation through primes, followed by a prosocial behavior task and an antisocial behavior task. The expected outcome is that harsh parenting predicted more antisocial behavior and warm parenting predicted more prosocial behavior in children with negative emotionality, compared to children without such temperament. Due to imbedded gender stereotypes, a sensitivity difference between boys and girls is expected. Nevertheless, no significant main or moderating effects have been found. This means that no evidence has been found in this study for the differential susceptibility hypothesis, neither for boys nor for girls.

Samenvatting

Belsky (1997) bedacht een fundamenteel andere manier om de interactie tussen temperament en opvoeding te bekijken; de *differential susceptibility* hypothese. Deze hypothese gaat er van uit dat personen die het meest kwetsbaar zijn voor verschillende stressoren, ook het meest zullen profiteren van positieve factoren als support uit de omgeving en een warme opvoeding. In deze experimentele studie is er bij 160 kinderen van 5 tot 7 jaar ($M=6,6$) gekeken of kinderen met een hoge negatieve emotionaliteit gevoeliger waren voor zowel negatieve als positieve opvoeding. Dit is onderzocht door middel van vragenlijsten en een experiment met

een manipulatie door middel van primes, gevolgd door een antisociale en een prosociale gedragstaak. Verwacht werd dat kille opvoeding meer antisociaal gedrag zal voorspellen en een warme opvoeding juist meer prosociaal gedrag. Door diep ingebedde sekse stereotypen werd een verschil verwacht tussen jongens en meisjes. Er is in deze studie echter geen significant bewijs gevonden dat bovenstaande hypothesen ondersteunt. Dit betekent dat er in deze studie geen ondersteuning is gevonden voor de *differential susceptibility* hypothese, dit geldt zowel voor jongens als voor meisjes.

Keywords: Differential Susceptibility, Negative emotionality, Temperament, Parenting, Gender, Prosocial behavior, Antisocial behavior.

Introduction

It is commonly accepted that individuals vary in the way they react due to experiences they have had. This expresses itself for instance through our temperamental traits. Temperamental traits are generally assumed to be rather stable, although there is some development over the course of a lifetime (Rothbart & Bates, 2006). Scientists are increasingly interested in measuring the effects of these traits. So far, much attention is given to problem behavior of children and to how this problem behavior is rooted in negative parent-child interactions. Parents are important, because they provide the social context in which their children develop themselves (Bates & Pettit, 2007). The underlying thought in this area of research has been based on the transitional/dual-risk model (Sameroff, 1983), also known as the diathesis-stress model (Monroe & Simons, 1991; Zuckerman, 1999). These models are built upon the idea that some individuals, due to vulnerability in their personality structure or genetic make-up, react adversely when faced with a stressor in their environment (Belsky & Pluess, 2009). According to research based on the diathesis-stress model, a child with negative emotionality also known as a difficult temperament, is most likely to function poorly when faced with environmental stressors (Belsky & Pluess, 2009). In science there has been much attention for children's negative emotionality trait combined with the diathesis-stress model.

However, due to the diathesis-stress orientation it is rarely examined whether children with negative emotionality are more sensitive for parenting in general compared to children without or with low negative emotionality. Belsky (1997) provided a fundamentally different way of examining the *temperament x parenting* interaction. He came up with the differential susceptibility hypothesis. This hypothesis tells us that those individuals who are more vulnerable to a variety of stressors, also benefit the most when exposed to positive factors like

environmental support and warm parenting (Belsky, 1997, 2005; Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007; Belsky & Pluess, 2009; Boyce & Ellis, 2005). Most evidence supporting the differential susceptibility hypothesis is drawn from reanalyzed data of prior research focused on antisocial behavior. These studies are generally based on questionnaires or interviews instead of experimental procedures. To get solid evidence for the differential susceptibility hypothesis it is essential to take into account both the antisocial as well as the prosocial aspects, by making use of experimental procedures. Experimental evidence which supports the hypotheses that children with negative emotionality are highly sensitive to optimal parenting is rather scarce (Klein Velderman, Bakermans-Kranenburg, Juffer & van IJzendoorn, 2006; Van Zeijl et al., 2007). Klein Velderman et al. (2006) found experimental support in their study on a group of 81 children aged 7 to 10 months. A study by Van Zeijl et al. (2007) also found empirical evidence for the differential susceptibility hypothesis moderated by negative emotionality on children in the age of 1-3 years old. Due to the age homogeneous sample they could not exclude the possibility that differential susceptibility may act differently when examining older children.

The present experimental study considers whether there is evidence for the differential susceptibility hypothesis in a group of children aged 5 to 7 years old. Possible gender differences with regard to differential susceptibility are also considered.

Theoretical Foundations

The main issue in differential susceptibility is the developmental plasticity of an individual (Belsky & Pluess, 2009). It is suggested that persons who are considered to be more 'plastic' or 'flexible' are more sensitive to a harsh environment and show more adverse behavior than less 'plastic' persons. Likewise when placed in a supportive and warm environment, more 'plastic' persons will respond more positive than less 'plastic' persons.

The lower the degree of plasticity and thus the more “fixed” a person is, the less a person is affected by developments in the direct environment (Figure 1 & Figure 2).

In the context of an evolutionary perspective, the differential susceptibility hypothesis seems to be a clearly explainable hypothesis (Belsky & Pluess, 2009). The future has been and will always be uncertain (Pluess & Belsky, 2010a). It is unclear what kind of behavior leads to the best, reproductive and fitness, offspring. The optimal strategy in evolution will be to keep a varied population with children that have different degrees of ‘plasticity’ (Belsky, 2005). This means some children are more influenced by the parenting styles to which they are exposed to than others.

To demonstrate differential susceptibility the moderation needs to reflect a cross-over interaction (Belsky et al., 2007). This cross-over interaction needs to cover the positive and negative aspects of the environment, in this case parenting, as shown in Figure 1. The moderation effect has to have a slope which is non zero and is significantly steeper in the susceptible subgroup compared to the non-susceptible subgroup (Belsky et al., 2007).

The article of Belsky & Pluess (2009) gives an extensive overview of different studies in the subject of differential susceptibility. Phenotypic, endophenotypic and genetic markers are distinguished in the article to define different markers of differential susceptibility. In the present study the focus is on the phenotypic marker, more specifically the moderating effect of negative emotionality. Many of these studies in Belsky & Pluess (2009) have shown evidence for the differential susceptibility based only on the diatheses-stress model (i.e. focusing on negative environmental factors and outcome behaviors only). A growing number of studies have overcome this limitation, revealing for better and for worse rearing effects. For example Van Aken, Junger, Verhoeven, Van Aken and Dekovic (2007) found that 16-19 month-old boys with negative emotionality show the smallest increase in externalizing

problems when reared by sensitive mothers who only infrequently use negative control. The largest increase was found for boys with negative emotionality with insensitive mothers who rely heavily on negative control (Belsky & Pluess, 2009). Most evidence for the differential susceptibility hypothesis has been found reanalyzing data of previously conducted research, for example the large scale longitudinal NICHD study of Early Child Care and Youth Development (Pluess & Belsky, 2010b; Bradley & Corwyn, 2008). In the study of Bradley and Corwyn (2008) evidence has shown that higher quality parenting predict fewer problems and that poorer quality parenting predict more problems, this effect proved to be strongest for those with negative emotionality. Children with intermediate levels of negative emotionality showed a smaller effect. The smallest effect was found for those with an even lower degree of plasticity, scoring low on negative emotionality.

In addition to the for-better-or-worse measurements, it is essential to make use of an experimental procedure to get solid evidence for the differential susceptibility hypothesis. The studies of Klein Velderman et al. (2006) and of Van Zeijl et al. (2007), which both make use of intervention procedures, claim to have found empirical evidence for the differential susceptibility hypothesis moderated by negative emotionality. Klein Velderman et al. (2006) have assigned 81 selected first-time mothers, with children in the age of 7-10 months, to one of two intervention groups or a control group. The interventions are most effective for high sensitive children and their mothers. They show an increase in their infant attachment security which is significantly associated with the increase of maternal sensitivity of their mother. For less sensitive infants no association between the infant attachment security and the maternal sensitivity of their mother are made. These findings show that highly sensitive children are more susceptible to environmental change than less sensitive children.

The results of Van Zeijl et al. (2007) indicate that children with negative emotionality benefit the most from intervention efforts. Children with negative emotionality are more vulnerable to negative discipline as compared to those with a relatively low score on negative emotionality. Additionally they find that children with negative emotionality are also more influenced by positive discipline than children with relatively low negative emotionality. Physical aggression and mother-reported externalizing behavior are less when their mother shows more positive discipline. They use parental questionnaires and child observation, hereby showing the moderation effect of children's negative emotionality in a group of 227 children in the age of 1 to 3 years. Due to the age homogeneous sample they cannot exclude the possibility that differential susceptibility may act differently in older children. Importantly, in the research of Van Zeijl et al. (2007) there is no moderating effect of gender in differential susceptibility.

Gender as moderator

Through the increase of emancipation over the past decades, a new level of awareness has come about on the wide range of roles possible for both genders. However, strong beliefs about sex differences remain (Berk, 2006), and gender stereotypes are pervasive in our society. Children as early as the age of 2 years are aware of this (Martin, 1991; Signorella, Bigler, & Liben, 1993). Traits like competence, aggressiveness and assertiveness are seen as masculine. In everyday life situations, boys appear to be more aggressive than girls (Aronson, Wilson & Akert, 2005; Maccoby & Jacklin, 1974). Prosocial traits like empathy, awareness of others' feelings, caring, and sensitivity are considered to be more feminine in children (Frieze & Li, 2010). Many adults view children through a gender-based lens and treat boys and girls differently (Powlishta, 2000; Snow, Jacklin & Maccoby, 1983).

Van Zeijl et al. (2007) have found evidence for differential susceptibility in both boys and girls. Through the pervasive predisposition of gender stereotypes, a difference in the degree of sensitivity on differential susceptibility is expected to be found in the present study. Due to their gender stereotype and difference in relation with their parents, girls with negative emotionality are expected to be more sensitive for positive parenting, i.e. boys with negative emotionality will show the same positive reaction only less intense. Girls are expected to act more prosocial (Knafo & Plomin, 2006), because of their predisposition of empathy and awareness of others' feelings. For boys, it is expected that the aggressive predisposition increases the risk of developing more antisocial behavior (Veenstra, Lindenberg, Oldehinkel, De Winter & Ormel, 2006). Due to higher sensitivity for harsh parenting styles the antisocial reaction of boys with negative emotionality will be more intense compared to girls with negative emotionality. In the present study, the relation of this predisposition of gender stereotype and sensitivity on parenting styles is examined.

Present study

The present experimental study among 160 children aged 5-7 years examines whether children with negative emotionality are more susceptible to negative and positive parenting than children with low negative emotionality. The main research question is whether harsh parenting predicts more antisocial behavior and warm parenting predicts more prosocial behavior in children with negative emotionality compared to children without such negative emotionality. The hypothesis is that harsh parenting predicts more antisocial behavior and warm parenting predicts more prosocial behavior in children with negative emotionality compared to children without such negative emotionality. Another hypothesis concerns a possible gender difference. Specifically, girls with negative emotionality are expected to be more sensitive for warm parenting, showing more prosocial behavior as consequence. Boys

with negative emotionality are expected to have a heightened sensitivity reaction on the harsh parenting prime by showing more antisocial behavior.

Methods

Participants

Eighty-eight elementary schools throughout the Netherlands were asked to participate in the study in order to provide participants. Nine elementary schools agreed to participate in this study and provided 172 participants. They were aged 5-7 years (for boys $M=6.05$, $SD=.70$ and for girls $M=6.11$, $SD=.67$). The children's parents were informed at forehand by letters and their approval was asked for their children to participate. Eight hundred five letters were sent to parents, including a consent form and questionnaires. Eventually 172 (21%) parents returned the questionnaires and agreed to participate. Some participants were disregarded due to absence, made errors during the task or had too many missing values in their questionnaire. The results of 160 participants (86 boys and 74 girls) were included in the analysis of this study. The children were randomly assigned to one of the two experimental conditions. All children were enrolled in a 2 (parental warmth vs. parental harshness) x 2 (negative emotionality present vs. not present) design. The homogeneity of variance was tested with a Levine's test. There were no significant differences between the participating children regarding initial level of antisocial behavior $F(1,158) = .079$, *ns*, and prosocial behavior $F(1,158) = .593$, *ns*.

Questionnaires

The Child Behavior Questionnaire (CBQ) was designed to assess three broad dimensions of temperament: Negative Affect, Surgency and Effortful control (Rothbart, Ahadi, Hershey & Fisher, 2001). This questionnaire consisted of 36 items on a 7-point Likert scale ranging from 'extremely untrue' to 'extremely true'. Some examples of items are: 'If

he/she is angry, this takes ten minutes or more', 'It is hard to calm him/her when upset', and 'Feels comfortable with almost anyone'. The results of the CBQ were used to determine which children were seen as highly reactive children based on their negative emotionality and which children were not. This was done using the mean score ($M= 3.36$, $SD=.75$) on the subscale of Negative Affect. A score above the mean on this subscale meant the child was assigned to the highly reactive category, having negative emotionality. The internal consistency coefficient (Cronbach's alpha) for the negative emotionality dimension 'Negative Affect' was .684.

The Alabama Parenting Questionnaire (APQ) was designed to tap into the most important aspects of parenting practices related to disruptive behavior problems in children: parental involvement, monitoring/supervision, use of positive parenting techniques, inconsistency in discipline, and harsh discipline (Shelton, Frick and Wootton, 1996). This questionnaire consisted of 42 items rated on a 5-point Likert scale. To get some idea of the type of parenting style, some of the subscales were combined. To measure warm parenting the subscales 'Involvement' and 'Positive Parenting' were clustered. From this cluster two questions were eliminated because they were not relevant for children aged 4 to 7. The results of the APQ were used to check if there was an equal distribution of warm and harsh parenting between the experimental conditions. The internal consistency coefficient (Cronbach's alpha) for the warm parenting scale was .715. To measure harsh parenting the subscales 'Poor Monitoring/Supervision', 'Inconsistent Discipline', and 'Corporal Punishment' were clustered. The internal consistency coefficient (Cronbach's alpha) for the harsh parenting scale was .692. Examples of items were; 'You threatened to punish your child and then actually punish him/her', 'You let your child know when he/she is doing a good job with something'.

The Strengths and Difficulties Questionnaire (SDQ) was designed to assess the most important current domains of child psychopathology as well as personal strengths that needed to be completed by parents, teachers and youths themselves (Van Berkel et al. 2006). The questionnaire consisted of 25 items, describing positive and negative attributes of children and adolescents. The questions were rated on a 3-point Likert scale varied from 'not true'; to 'partly true'; and 'certainly true'. For the present study, the subscales 'Prosocial' and 'Conduct Problems' were examined. The internal consistency coefficients (Cronbach's alphas) for the various SDQ scales were .50 for the prosocial behavior subscale and .63 for the conduct behavior subscale. Examples of some items were; 'Shares readily with other children (treats, toys, pencils etc.)', and 'Often fights with other children or bullies them'. The concurrent validity of the SDQ was good. The questionnaire scores correlated with other indexes of psychopathology like the Rutter and Achenbach questionnaires (i.e. Child Behavior Check List) (Muris, Meesters & Van den Berg, 2003).

Priming

To manipulate the children, they were primed with different types of parental behavior. Three stories were created with different parental outcomes. Each story had a version ending with either a warm parental outcome and a version with a harsh parental outcome (Appendix 1). To check if the primes were a correct manipulation for harsh and warm parenting, they were presented to an expert panel ($N=10$). The expert panel of developmental psychologists judged the presented primes on a 1 to 10 scale to the degree of harsh (1) or warm (10) parenting. To analyze the difference between the primes a dependent t -test is performed. For these primes there seemed to be a significant negative correlation coefficient ($r = -.744$). The primes turned out to be significantly different from each other,

$t(9) = -10.78, p < .05$. This means that the difference between the means of both conditions, harsh and warm parenting, was large enough not to be a result by chance.

Design and Procedures

To divide children randomly across the harsh ($N=79$) and warm ($N=81$) parenting conditions, we scheduled these children in alphabetic order. The participating children did some tasks on a computer at a quiet place in school, in groups of four at a time. Of each group, the first two children were randomly assigned to the warm condition and the last two were assigned to the harsh condition. Children were told that they were going to hear three different fictive stories. They were instructed to listen carefully because they would have to answer a question about it afterwards. The children were listening to warm or harsh stories, depending on their assigned condition. Each condition had three stories which were in baseline identical, only the outcome was warm or harsh parenting. To check if the manipulation in the stories was successful, the children answered a question about their overall feelings concerning these stories. This was done by choosing between two emoticons: a happy smiley and a sad smiley (Appendix 2).

Noise blast-task

Directly after having received either the harsh or warm parenting prime, children performed both a sticker sharing (prosocial) and noise blast (antisocial) task. The sequence of the prosocial and antisocial task was divided at random across participants. The noise blast-task was used to measure the antisocial behavior. The children were told the opponent in the game was a same-gender child from another school. The game instructions were given to the children in text and in audio. A traffic light with the lights off appeared on the screen. It was instructed to press the red key when the traffic light turned red, and to press the green key if the light turned green. These red and green keys were made with colored stickers pasted on

the keyboard. In advance, the children were instructed to do this as quickly as possible. The game started and the children got the opportunity to give it a try in the trial condition. Then the real game started and the children played five of these trials. After these five trials they were told they had lost the game. Every participant was programmed to lose regardless of their reaction time or score. The aim of letting the participants lose was to provoke feelings of frustration, irritation and anger towards the other child. After completing the first game, the children had to play the same game against the same child again. However, this time it was possible to give a noise blast to the other child after every trial. The volume of the noise blast could be adjusted by the participant, ranging on a 0 to 10 scale. A volume level of 8 or higher was explained to the children as very loud and painful. In the present study, the mean volume of the noise blast given to the other child over five trials was used as a measure for antisocial behavior. The reliability of the mean score on the noise blast subtask measured by Cronbach's alpha was .669.

Sticker task

Prosocial behavior was measured using a sharing task (Benenson, Pascoe & Radmore, 2007). An envelope containing twenty attractive stickers, different for gender, was presented to the child. The child was able to take as many stickers as he or she liked. However, it was told that the remaining stickers would be given to another child from a different school. They were told to place the remaining stickers for the other unknown child back into the envelope. Through this task, the children were able to share stickers with another child. The amount of stickers remaining in the envelope were used as a measure of prosocial behavior, resulting in a range of 0 to 20.

Debriefing

After performing both tasks the experiment was finished and the children were debriefed in groups of four. Their opinion about the tasks was asked and they were able to blow off some steam. All remaining questions were answered and there was no reason to believe that the children left with any hard feelings. None of the children gave signs of understanding the actual purpose of the experiment in advance. This ensured that it could be assumed that none of the children did their best to act socially desired while performing the tasks.

Results

Preliminary Analyses

Baseline scores were analyzed to examine whether there were significant differences between the conditions (warm and harsh parenting prime) for the variables age, gender and subscales of the APQ, SDQ and CBQ. To measure if the randomization was successful, a one-way analyses of variance (ANOVA) was used. It turned out that the subscale of the APQ warm parenting ($t(158)= 2.00, p= <.05$) and the subscale prosocial ($t(158)= 2.19, p= <.05$) of the SDQ differed significantly between the two conditions. Therefore, prosocial behavior and warm parenting were included as covariates in all further analyses. As a manipulation check an independent-samples t-test was used. The test variable was the chosen smiley and the given prime (warm or harsh condition) the grouping variable. Children assigned to the harsh parenting condition chose for 92% the expected sad smiley ($M= 1.9$). Of the children assigned to the warm parenting condition, 49,4% chose the expected happy smiley ($M= 1.5$). Even though the children in the warm parenting condition gave variable results, the primes were significantly different ($t(158)= 6.59, p= .00$). The manipulation check was seen as successful.

To differentiate between children with negative emotionality and a low score on negative emotionality, cut-off scores were used (mean level: $M= 3.36$).

Primary Analyses

An Analysis of Covariance (ANCOVA) was conducted in order to explain the differences between children's antisocial and prosocial behavior based on parental prime and children's negative emotionality. In these analysis either antisocial or prosocial behavior was used as dependent variable. The experimental condition (i.e. warm vs. harsh parenting prime) was the fixed independent factor. As random factor the dichotomized variable Negative Affect was specified. In Table 1, the mean scores and standard deviations for prosocial and antisocial behavior can be found, differentiated for high and low Negative Affect per prime condition.

To examine whether there was a moderating effect for gender another ANCOVA was used, with gender as random factor. When controlling for the parental report of prosocial behavior by their children and their own reported score on warm parenting, no significant main effect of the condition (warm or harsh prime) was found on prosocial or antisocial behavior (Table 2). Also, no significant main effect of the variable Negative Affect on prosocial or antisocial behavior was found. Thus, prime condition and the measured negative emotionality variable Negative Affect were both not of direct influence on the degree of shown prosocial and antisocial behavior. Furthermore, there was no significant interaction effect found of prime condition and the negative emotionality variable Negative Affect on prosocial and antisocial behavior. This means that the negative emotionality variable Negative Affect had no moderating effect on the relation between prime condition and children's anti- or prosocial behavior. Finally, there was no moderating effect of gender in the effect of the parenting prime on children's prosocial or antisocial behavior.

Discussion

The present study examined whether a subgroup of negative emotionality children was more susceptible for harsh and warm parenting primes compared to children with no negative emotionality. The main research question was whether harsh parenting predicts more antisocial behavior and whether warm parenting predicts more prosocial behavior in children with negative emotionality compared to children without such negative emotionality. The results from this study demonstrated that this was not the case, neither for boys nor for girls.

Although no significant moderation effect was found for gender, some of the expected differences were found at a trend level (Table 3). Girls with negative emotionality showed an increase in prosocial behavior in the warm condition ($M=10.76$) compared to the girls that were exposed to the harsh condition ($M=9.47$). With regard to the antisocial task, a trend emerged for the boys. Boys who were exposed to the harsh prime ($M=8.58$) gave a higher mean score than the boys that were exposed to the warm prime ($M=7.83$). These trends were in line with the expectations. More research is needed to see whether statistically sound support can be found for this trend, when these associations are examined with greater statistical power in bigger samples of children and their parents.

As discussed previously, a for-better-and-worse approach is needed to find empirical evidence to support the differential susceptibility hypothesis. In this study two dependent variables were used, one for antisocial behavior and a second for prosocial behavior. Therefore, this was one of the first studies taking into account the prosocial part of differential susceptibility in an experimental setting. To be able to draw truly causal conclusions from gathered data, it was essential to perform experimental research. In the literature, some evidence was previously found supporting the differential susceptibility hypothesis using experimental research, though these studies were all based on children during their infant and

toddler years. This study examined children who were 5 till 7 years old, which made the present study distinctive from earlier conducted research. This distinction with other research could be the cause for the discrepant results. According to Boyce and Ellis (2005) a canalization of sensitivity takes place during life, inducing a reduction or even diminishing plasticity. It was suggested, although without certainty, that this calibration of sensitivity takes place over the first 3-5 years in life. Not finding significant results in the present study may support this suggestion, however further research is required.

Strengths and Limitations

The prosocial and the antisocial behavior tasks used during this present study were frequently used to measure prosocial and antisocial behavior. Nevertheless, the tasks were possibly not appropriate in this experiment. More specifically, with these primes it had been better to use tasks at a feeling level (i.e. becoming more sad, angry or happy) instead of behavior. Next to that, more attention should be given to the elaboration of the primes. First, children in the warm prime condition found it difficult to define between a positive or negative feeling. It seemed they assessed the event of the child in the stories, instead of the effect of the parental behavior on their feelings. The primes were meant to unconsciously trigger a parenting style. When the children were asked which smiley fitted the stories the best, they were asked to give an answer on a conscious level. A better prime check could be retrieved when asking more explicit to what feelings the parents gave them. Another way to gather more information on prime impact is using a pretest before priming. Secondly, primes could be more personal, for example by using their own parents to create the primes. This made identification easier and would possibly increase impact of the prime. Furthermore, results may have been influenced by the experimental setting of testing the children in groups of four at a time. Although they were told not to, children in some instances still told each

other what they were doing. Furthermore, the negative emotionality division between a high and low score on Negative Affect ideally needs to be done differently. Instead of a division based on the mean score, it is preferred to set the division at least one standard deviation from the mean. In the present study this was not possible due to the lack of statistical power.

Future Directions

In general, it is preferred to have a large number of participants, in this way the results will be more reliable and a desired statistical power will be guaranteed. Due to the possible canalization of plasticity (Boyce & Ellis, 2005), it is also preferred to make use of an infant-toddler sample. Furthermore, it is advised to create a longitudinal study, combined with an intervention instead of primes. This leads to a more ecologically valid and relevant research and hereby possibly increasing the impact on the child. Intervention efforts proved to be effective in Van Zeijl et al. (2007) and Klein Velderman et al. (2006). In common therapies, parent training has proven to be effective within treatment of problem behavior or specific disabilities like Attention Deficit and Hyperactivity Disorder (ADHD) (De Mey & Merlevede, 2008; Braet & Bögels, 2008). By making use of a longitudinal study combined with an intervention it creates the possibility to see whether specific parenting behavior results in lasting changes of child behavior. Finally, it is recommended for future research to give special attention to the trend found with regard to gender. In the present study, these trends are only based on small differences. It requires more statistical power to find significant evidence for this relatively small trend. Therefore, a bigger sample size is required. Specifically, to see whether significant results can be found between boys and girls, showing sensitivity steepness differences based on parenting style.

Summarizing, future research should include enough children (infants and toddlers) to make a good distinction between children that initially have a high score on Negative Affect.

Furthermore it should include parental intervention efforts, i.e. teaching an intervention group of parents how to use warm and positive parenting. By comparing behavior of the children between the intervention group and a control group with no intervention, direct effect of parenting on child behavior can be examined. This will potentially shed more light on the validity of the currently intriguing differential susceptibility hypothesis.

Literature

- Aronson, E., Wilson, T. D., & Akert, R. M. (2005). *Social Psychology* (6th edition). New Jersey: Pearson Education, Inc.
- Bates, J. E., & Pettit, G. S. (2007). Temperament, parenting and socialization. In J. E. Grusec, & P. D. Hastings (Eds.), *Handbook of Socialization: Theory and Research*. Guilford publications, New York.
- Belsky, J. (1997). Theory testing, effect-size evaluation, and differential susceptibility to rearing influences: the case of mothering and attachment. *Child Development*, *68*, 598-600.
- Belsky, J. (2005). Differential susceptibility to rearing influences: An evolutionary hypothesis and some evidence. In B. Ellis & D. Bjorklund (Eds.), *Origins of the social mind: Evolutionary psychology and child development* (pp. 139-163). New York: Guilford.
- Belsky, J., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2007). For better and for worse. Differential susceptibility to environmental influences. *Current Directions in Psychological Science*. *16*(6).300-304.
- Belsky, J., & Pluess, M. (2009). Beyond Diathesis Stress: Differential Susceptibility to Environmental Influences. *Psychological Bulletin*. *135*(6), 885-908.
- Benenson, J. F., Pascoe, J., & Radmore, N. (2007). Children's altruistic behavior in the dictator game. *Evolution and Human Bulletin*, *135*, 885-908.
- Berk, L. E. (2006). *Child Development*. Boston: Pearson Education, Inc.
- Boyce, W. T., & Ellis, B. J. (2005). Biological sensitivity to context: 1. An evolutionary-developmental theory of the origins and functions of stress reactivity. *Development and Psychopathology*, *17*, 271-301.

- Bradley, R. H., & Corwyn, R. F. (2008). Infant temperament, parenting, and externalizing behavior in first grade: a test of the differential susceptibility hypothesis. *Journal of Child Psychology and Psychiatry*, 49(2), 124-131.
- Braet, C., & Bögels, S. (2008). *Protocollaire behandelingen voor kinderen met psychische klachten*. Amsterdam: Boom.
- De Mey, W., & Merlevede, E. (2008). Protocol voor behandeling van jonge kinderen met gedragsproblemen. In C. Braet, & S. Bögels (Eds.), *Protocollaire behandelingen voor kinderen met psychische klachten*. Amsterdam: Boom.
- Frieze, I. H., & Li, M. (2010). Gender, aggression and prosocial behavior. In J. C. Chrisler & D. R. McCreary (Eds.), *Handbook of Gender Research in Psychology* (pp. 311-335). New York: Springer.
- Klein Velderman, M., Bakermans-Kranenburg, M. J., Juffer, F., & van IJzendoorn, M. H. (2006). Effects of attachment-based interventions on maternal sensitivity and infant attachment: Differential susceptibility of highly reactive infants. *Journal of Family Psychology*, 20, 266-274.
- Knafo, A., & Plomin, R. (2006). Prosocial behavior from early to middle childhood: Genetic and environmental influences on stability and change. *Developmental Psychology*, 42(5), 771-786.
- Maccoby, E. E., & Jacklin, C. N. (1974). The psychology of sex differences. In E. Aronson, T. D. Wilson & R. M. Akert (2007). *Social psychology* (6th edition). New Jersey: Pearson Education.
- Martin, C. L. (1991). The role of cognition in understanding gender effects. In H. W. Reece (Ed.), *Advances in child development and behavior* (pp. 113-164). San Diego, CA: Academic Press.

- Monroe, S. M., & Simons, A. D. (1991). Diathesis-stress theories in the context of life stress research: Implications for the depressive disorders. In J. Belsky & M. Pluess (2009). *Beyond Diathesis Stress: Differential Susceptibility to Environmental Influences. Psychological Bulletin, 135*(6), 885-908.
- Muris, P., Meesters, C., & Van den Berg, F. (2003). The Strengths and Difficulties Questionnaire (SDQ) Further evidence for its reliability and validity in a community sample of Dutch children and adolescents. *European Child & Adolescent Psychiatry, 12*, 1-8.
- Pluess, P., & Belsky, J. (2010a). Children's differential susceptibility to effects of parenting. *Family Science, 1*(1), 14-25.
- Pluess, P., & Belsky, J. (2010b). Differential susceptibility to parenting and quality child care. *Developmental Psychology, 42*(2), 379-390.
- Powlishta, K. K. (2000). The effect of target age on the activation of gender stereotypes. *Sex Roles, 42*, 271-282.
- Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at 3-7 years: The Children's Behavior Questionnaire. *Child Development, 72*, 1394-1408.
- Rothbart, M. K. & Bates, J. E. (2006). Temperament. In N. Eisenberg & W. Damon (Eds.), *Handbook of child psychology: Social, emotional, and personality development* (p. 99–166). New York, NY: Wiley.
- Sameroff, A. J. (1983). Developmental systems: Contexts and evolution. In J. Belsky & M. Pluess (2009). *Beyond diathesis stress: Differential susceptibility to environmental influences. Psychological Bulletin, 135*(6), 885-908.

- Shelton, K. K., Frick, P. J., & Wootton, J. (1996). Assessment of parenting practices in families of elementary school-age children. *Journal of Clinical Child Psychology, 26*(3), 317-129.
- Signorella, M. L., Bigler, R. S., & Liben, L. S. (1993). Developmental differences in children's gender schemata about others: a meta-analytic review. *Developmental Review, 13*, 106-126.
- Snow, M. E., Jacklin, C. N., & Maccoby, E. E. (1983). Sex-of-child differences in father-child interaction at one year of age. In P.K. Smith & H.H. Craig (2004) *Blackwell Handbook of Childhood Social Development*. Malden, MA: Blackwell Publishing Ltd.
- Van Aken, C., Junger, M., Verhoeven, M., Van Aken, M. A. C., & Dekovic, M. (2007). The interactive effects of temperament and maternal parenting on toddlers' externalizing behaviours. *Infant and Child Development, 16*, 553-572.
- Van Berkel, A., Crone, M. R., Neppelenbroek, S., Spijkers, E., Vellema, M., & Vogels, A. G. C. (2006). *Handleiding voor het gebruik van de SDQ binnen de jeugdgezondheidszorg*. Zutphen: Markant Congressen.
- Van Zeijl, J., Mesman, J., Stolk, M. N., Alink, L. R. A., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Juffer, F., & Koot, H. M. (2007). Differential susceptibility to discipline: The moderating effect of child temperament on the association between maternal discipline and early childhood externalizing problems. *Journal of Family Psychology, 21*(4), 626-636.
- Veenstra, R., Lindenberg, S., Oldehinkel, A. J., De Winter, A. F., & Ormel, J. (2006). Temperament, environment, and antisocial behavior in a population sample of preadolescent boys and girls. *International Journal of Behavioral Development, 30*(5), 422-432.

Zuckerman, M. (1999). In Belsky, J., & Pluess, M. (2009). Beyond Diathesis Stress:

Differential Susceptibility to Environmental Influences. *Psychological Bulletin*, 135(6),
885-908.

Table 1

Mean Scores and Standard deviations for Prosocial and Antisocial Behavior per Condition (warm or harsh prime). Differentiated for high and low Negative Affect (NA)

	Prosocial behavior				Antisocial behavior			
	High NA		Low NA		High NA		Low NA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Warm Prime	10.36	4.88	11.57	4.60	8.00	1.84	8.83	1.45
Harsh Prime	10.62	5.45	10.26	5.21	8.62	1.59	8.63	1.66

Note. There are differences in range of the scores on the prosocial behavior task (min= 0, max= 20) and scores on the antisocial behavior task (min=1, max=11)

Table 2

Output ANCOVA's for the Prosocial and Antisocial behavior as dependant variable with Condition (warm and harsh primes) and Negative Emotionality (Negative Affect variable)

Antisocial behavior				
	<i>df</i>	<i>F</i>	<i>sig.</i>	<i>Partial η²</i>
Conditie	1/1.027	.657	.563	.390
Negative emotionality	1/1.018	.	.416	.622
Conditie* Negative emotionality	1/154	2.136	.146	.014
Prosocial behavior				
	<i>df</i>	<i>F</i>	<i>sig.</i>	<i>Partial η²</i>
Conditie	1/1.046	.657	.772	.170
Negative emotionality	1/1.031	.341	.661	.248
Conditie* Negative emotionality	1/154	1.279	.260	.008

Table 3

Mean score and Standard Deviations of the children with a high score on Negative Affect for Prosocial and Antisocial behavior divided on Gender and Condition (Prime)

	Prosocial behavior				Antisocial behavior			
	Girls		Boys		Girls		Boys	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Warm Prime	10.76	4.78	9.84	5.08	8.12	1.66	7.83	2.08
Harsh Prime	9.47	5.30	11.65	5.52	8.67	1.76	8.58	1.48

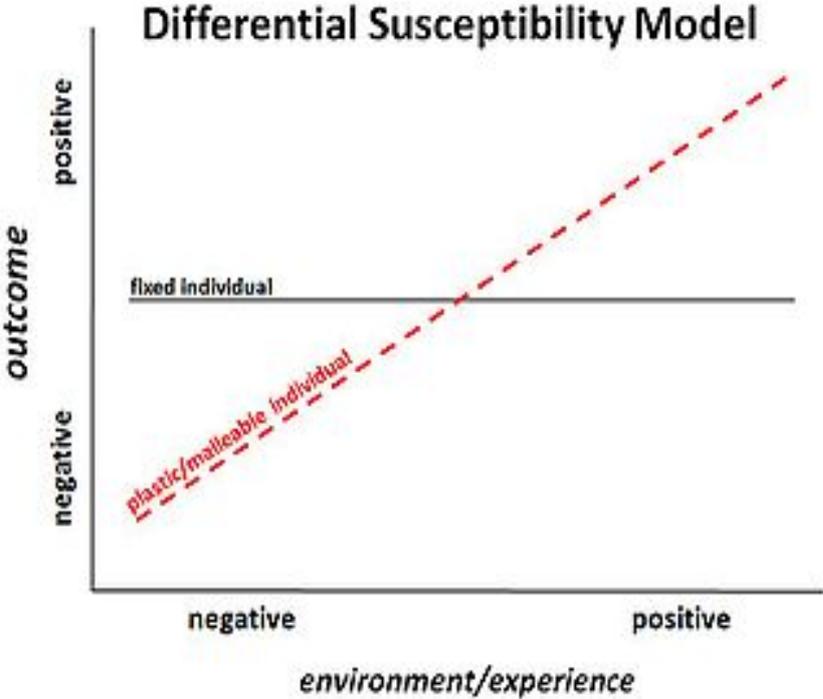


Figure 1 Differential susceptibility model.

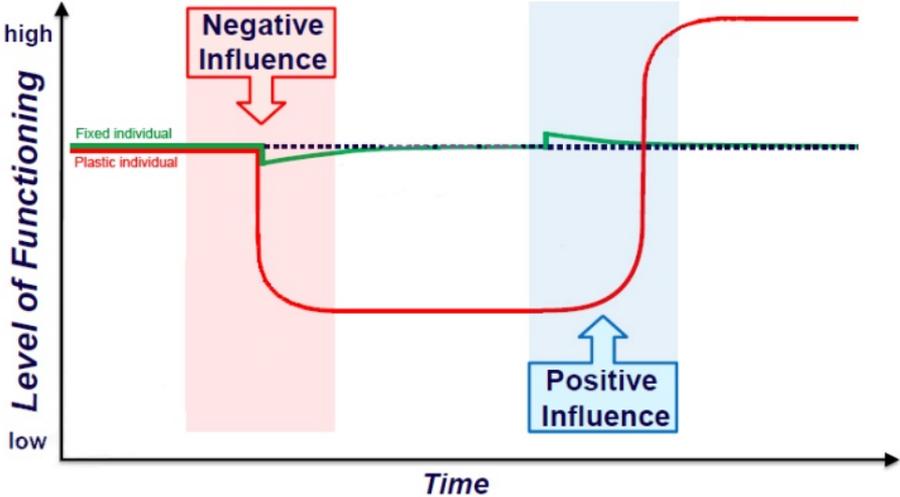


Figure 2 Differential susceptibility model defined for parental influences.

Appendix 1 Prime stories

Story about sensitivity in parenting manipulated to a warm and harsh condition:

Warm

Moeder en Jan zijn samen in de woonkamer. Terwijl moeder op de bank aan het lezen is maakt Jan aan tafel een tekening. Jan is klaar met de tekening, kijkt naar zijn moeder en roept: 'klaar.' Moeder kijkt op, lacht en vraagt: 'ooh, heb je de tekening afgemaakt? Wat goed van je.' Jan vraagt: 'mama wil je mijn tekening zien?' Moeder legt haar boek weg en komt naar de tekening kijken. 'Wat een mooie tekening heb jij gemaakt zeg, echt knap hoe je dat gedaan hebt. Jan lijkt niet helemaal tevreden over de tekening. Moeder ziet het en vraagt: 'klopt het dat je niet helemaal tevreden bent.' 'Ik wilde liever iets anders tekenen dat ik nog mooier vind, maar dat lukte niet goed.' Zegt Jan. Moeder zegt: 'dat geeft niks, ik vind dat je het heel goed geprobeerd hebt, ik denk dat het je de volgende keer zeker lukt. Moeder geeft Jan een aai over de bol gaat weer op de bank zitten en pakt haar boek. Jan begint snel aan een nieuwe tekening.

Harsh

Moeder en Jan zijn samen in de woonkamer. Terwijl moeder op de bank aan het lezen is maakt Jan aan tafel een tekening. Jan is klaar met de tekening, kijkt naar zijn moeder en roept: 'klaar.' 'Hmm' zegt moeder, kijkt niet op en blijft lezen in haar boek. Jan vraagt: 'mama wil je mijn tekening zien?' Moeder zucht, legt haar boek weg en komt naar de tekening kijken. 'Wat heb je precies getekend?... ik vind het nergens op lijken!' Jan lijkt niet helemaal tevreden over de tekening. Moeder zegt: 'Moest ik verder nog ergens naar kijken anders ga ik weer verder met lezen.' Jan zegt: 'ik wilde liever iets anders tekenen dat ik nog mooier vind, maar dat lukte niet goed.' Moeder zegt: 'niet zo zeuren hoor, je moet ook niet iets gaan tekenen dat je eigenlijk niet kan'. Moeder gaat met een diepe zucht weer op de bank zitten en pakt haar boek. Jan begint met tegenzin toch maar aan een nieuwe tekening.

Story about comfort in parenting manipulated to a warm and harsh condition:

Warm

Op een dag gaat Thijs buiten spelen. Op het pleintje voor zijn huis ziet hij de fiets van de buurjongen liggen. De buurjongen is nergens te zien dus denkt Thijs: “het is vast niet erg als ik er even een rondje mee ga fietsen”. Thijs springt snel op de fiets. Hij is zo blij dat hij even vergeet dat hij nog nooit eerder zonder zijwieltjes heeft gefietst.

En voor hij het in de gaten heeft is hij gevallen op het plein. “AUW, zegt Thijs”. Thijs ligt op de grond en ziet dat zijn broek en zijn knie helemaal kapot zijn. Hij schrikt zo erg dat hij meteen in huilen uitbarst.

Al snel komt zijn moeder aangerent. Ze heeft vanaf het garagepad gezien wat er gebeurde en begint Thijs te troosten. “Het geeft niets hoor” zegt mama en geeft Thijs nog een aai over zijn bol. “We gaan gewoon een andere broek aan doen en vanmiddag of morgen zal papa met jou proberen of je op je eigen fiets zonder zijwieltjes kan leren fietsen”. Dat vindt Thijs erg fijn en stopt met huilen. Samen met mama loopt hij naar binnen.

Harsh

Op een dag gaat Thijs buiten spelen. Op het pleintje voor zijn huis ziet hij de fiets van de buurjongen liggen. De buurjongen is nergens te zien dus denkt Thijs: “het is vast niet erg als ik er even een rondje mee ga fietsen”. Thijs springt snel op de fiets. Hij is zo blij dat hij even vergeet dat hij nog nooit eerder zonder zijwieltjes heeft gefietst.

En voor hij het in de gaten heeft is hij gevallen op het plein. “AUW, zegt Thijs”. Thijs ligt op de grond en ziet dat zijn broek en zijn knie helemaal kapot zijn. Hij schrikt zo erg dat hij meteen in huilen uitbarst.

Thijs blijft een tijdje zo liggen. Hij is vooral heel erg verdrietig omdat de fiets van zijn buurjongen nu vol met krassen zit en zijn broek kapot is.

Zijn moeder heeft vanaf het garagepad gezien wat er gebeurde en roept “Stommerik, nu is je broek wéér kapot”. “En stop nu maar met janken want ik ben het helemaal zat!”

Huilend komt Thijs overeind en loopt naar binnen.

Story about warmth in parenting manipulated to a warm and harsh condition:

Warm

Roos gaat naar bed. Ze heeft haar tanden zelf al gepoetst en haar pyjama al aangedaan. Haar vader en moeder zitten beneden. Met haar knuffel staat Roos bovenaan de trap en roept naar haar vader en moeder dat ze klaar is om naar bed gebracht te worden. “Ik kom eraan” roept moeder.

Terwijl Roos naar haar kamer loopt en in bed gaat liggen, hoort ze voetstappen op de trap. Haar moeder komt naar boven gelopen en zegt: “Zo lieverd, ga maar lekker in bed liggen. Mama is zo trots op jou dat je helemaal zelf je tanden hebt gepoetst en je pyjama hebt aangedaan”. Moeder stopt Roos lekker in, geeft haar een grote knuffel en een kus op haar voorhoofd.

Nu komt ook vader naar boven gelopen en hij gaat bij Roos en moeder op bed zitten. Vader begint een mooi slaapliedje te zingen. Terwijl Roos langzaam in slaap valt, eindigt het lied. Ze krijgt nog een laatste knuffel, een hele grote, van vader en moeder tegelijk.

Harsh

Roos gaat naar bed. Ze heeft haar tanden zelf al gepoetst en haar pyjama al aangedaan. Haar vader en moeder zitten beneden. Met haar knuffel staat Roos bovenaan de trap en roept naar haar vader en moeder dat ze klaar is om naar bed gebracht te worden. Roos hoort geen reactie.

Terwijl Roos naar haar kamer loopt en in bed gaat liggen, hoort ze voetstappen op de trap. Haar moeder komt naar boven gelopen en ze loopt langs Roos de badkamer binnen. Ze roept naar Roos: “je moet wel de dop op de tandpasta doen als je perse zelf je tanden wilt poetsen”. Moeder doet de deur op slot en Roos hoort de douche aangaan.

Nu komt ook vader naar boven gelopen. Hij ziet dat de deur van Roos haar kamer nog openstaat. Met een harde klap slaat hij de deur dicht en loopt hij zijn werkkamer binnen. Terwijl Roos langzaam in slaap valt, hoort ze de muziek van haar vader door de muur dreunen.

Appendix 2 Manipulation check smiley's

Welk gezichtje past het allerbeste bij de verhaaltjes?

