Unravelling the effect of household chaos on parenting

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Testing for whom household chaos affects parenting most: sensory-processing sensitivity and self-regulation as moderators.

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Abstract

Previous studies have found evidence for a causal effect of household chaos on parenting, with lower parenting quality in more chaotic environments. Also, studies point to the possibility that this effect of household chaos may be stronger for parents with higher sensory-processing sensitivity (SPS) or lower self-regulation. The current study investigates whether primary caregivers of children around age 1.5-2 years show greater improvement in parenting after a decrease in household chaos if parents have higher SPS or lower self-regulation. The study employs an RCT design with an intervention aimed at reducing household chaos. Household chaos and parenting were measured through objective as well as self-report measures, including videotaped parent-child interactions and home observations. The effect of the intervention to reduce household chaos on parenting was not dependent on SPS or self-regulation. When studying the relation between change in measures of household chaos and posttest parenting, decreased self-reported household chaos was related to less harsh discipline in parents with higher self-regulation, and to more harsh discipline in parents with lower self-regulation. No moderation by SPS was found. Future research should study whether SPS and self-regulation are important for the effect of household chaos on parenting in highly chaotic households.

Keywords: RCT, household chaos, parenting, sensory-processing sensitivity, self-regulation

Introduction.

Previous studies have shown that more household chaos (i.e., high noise levels, clutter, crowding, and a lack of family and week routines; Evans & Wachs, 2010; Matheny, Wachs, Ludwig & Phillips, 1995) is related to lower parenting quality, such as more harsh or negative parenting and less positive parenting (e.g., Coldwell, Pike & Dunn, 2006; Deater-Deckard, Wang, Chen & Bell, 2012; Dumas et al., 2005). As these studies were mostly correlational, results could not be causally interpreted. Two recent experimental studies showed evidence of the causal effect of household chaos on parenting (Andeweg, Bodrij, Prevoo, Rippe, & Alink, 2020; Chapter 4). However, effects were small and were not found for all parenting outcomes that were tested. One explanation for these small and inconsistent effects is that some parents may be more susceptible to the effect of household chaos than others. Two likely factors that may influence this susceptibility are sensory-processing sensitivity (SPS) and self-regulation. There is evidence that higher SPS is related to a stronger decline in caregiving quality in a chaotic environment, and that higher self-regulation is related to more favorable behavioral responses to stressful or chaotic environments (Andeweg et al., 2020; Sprague, Verona, Kalkhoff & Kilmer, 2011). Therefore, in the current study we investigate whether reducing household chaos in families leads to a stronger improvement in parenting quality in parents with higher SPS or lower self-regulation.

Household chaos is one of the salient factors for parenting in young children and is defined as high noise levels, clutter, crowding, and a lack of family and week routines (Evans & Wachs, 2010; Matheny, Wachs, Ludwig & Phillips, 1995). Previous research has consistently found that more household chaos is related to more negative and harsh parenting and to less positive parenting, including measures of sensitivity and harsh discipline (e.g., Coldwell et al., 2006; Deater-Deckard et al., 2012; Dumas et al., 2005). Furthermore, parenting mediated the relation between more chaotic households and child development, with more conduct and language development problems in more chaotic households (Mills-Koonce et al., 2016; Vernon-Feagans, Garrett-Peters, Willoughby, Mills-Koonce & The Family Life Project Key Investigators, 2012). Two recent experimental studies found evidence for a causal effect of household chaos on parenting (Andeweg et al., 2020; Chapter 4). However, the effects were small and were not consistent for all parenting measures that were tested. In a lab setting, female young adults (non-parents) who took care of an infant simulator showed less sensitivity towards the infant simulator in a chaotic setting than in a neutral setting. An RCT using an intervention to reduce household chaos found a decline in harsh parenting, but no difference in sensitivity (Chapter 4). Therefore, further research is needed to unravel the effects of household chaos, and should consider whether some parents are more susceptible to the effect of household chaos on parenting than others.

One of the potential parent characteristics that makes parents more susceptible to the effect of household chaos is SPS. This reflects how easily a person notices stimuli and how aroused (in general or negatively) a person is by stimuli (Aron & Aron, 1997; Evans & Rothbart, 2008). Parents with high SPS are considered to notice the higher number and/or intensity of stimuli in more chaotic households more readily and/or to be more affected by these stimuli, which would translate into greater susceptibility to the effect of household chaos on parenting. Previous studies support this line of reasoning: Higher observed household chaos was experienced as more chaotic only by mothers with high SPS, whereas observed and self-reported household chaos were uncorrelated in mothers with low SPS (Wachs, 2013). Female young-adults with higher SPS showed a stronger decline in caregiver sensitivity in a chaotic environment compared to those with lower SPS (Andeweg et al., 2020). Thus, SPS could moderate the effect of household chaos on parenting: Parents with higher SPS may be more affected by household chaos, and could therefore benefit more from reducing household chaos than parents with lower SPS.

Another potential moderator of the effect of household chaos on parenting is self-regulation. Self-regulation consists of attentional and inhibitory control and is often also referred to as effortful control or executive functioning (e.g., Bridgett, Oddi, Laake, Murdock & Bachmann, 2013). Low self-regulation has been linked to lower quality parenting (e.g., Crandall, Deater-Deckard, & Riley, 2015). This is thought to be due to having lower inhibition and attention shifting skills, which would make it harder to refrain from harsh parenting and to maintain positive discipline strategies for parents with low self-regulation. Demanding situations, such as chaotic or stressful environments, may be harder for these parents. A recent study found that the relation between higher self-reported household chaos and more harsh parenting was diminished in mothers with higher self-regulation (Park & Johnston, 2020). Studies on stressful environments found similar results: In a low SES community sample, stress was related more strongly to aggressive behavior in adults with lower self-regulation compared to adults with higher self-regulation (Sprague et al., 2011). In contrast, Deater-Deckard et al. (2012) found that parents with high self-regulation only showed less harsh discipline in demanding parenting situations in non-chaotic households, meaning that higher self-regulation may not buffer the effect of household chaos on parenting. Also, the effect of household chaos on sensitivity in a lab setting with a neutral and chaotic living room was not dependent on self-regulation (Chapter 3). How self-regulation potentially moderates an effect of household chaos on parenting is thus not yet clear and needs further exploration.

Current study

The aim of the current study was to test whether a causal effect of household chaos on parenting is stronger in parents with higher SPS or lower self-regulation (see Prevoo, Bodrij, Andeweg, & Alink, 2020). Our study used an RCT design, in which we aimed to reduce household chaos in the intervention group while not discussing household chaos in the control group. No specific parenting advice was given in both groups. We expected that parents with higher SPS or lower self-regulation would show greater improvement in parenting quality after reducing household chaos (Chapter 4). Our previous findings suggested that only harsh discipline was significantly reduced in the intervention group, and we did not find evidence for significantly reduced levels of household chaos or improved sensitivity. It is possible that an effect of household chaos is stronger or perhaps only present in parents with certain characteristics. Therefore, we tested SPS and self-regulation as moderators of the effect of the intervention on parenting. As we were not able to detect a significant reduction in measures of household chaos (Chapter 4), we also tested whether the relation between change in household chaos measures and parenting was moderated by SPS or self-regulation.

Method

Participants

Parents who spent the most time with their child (i.e. the primary caregiver) of around the age of 1.5 years were recruited for the current study. Contact information of eligible parents was received from Dutch municipalities in the province of South Holland. An invitation letter to fill out a screening questionnaire was sent to these parents, in which demographic information was collected and the level of household chaos was self-reported by the primary caregiver. Exclusion criteria were mental and/or physical problems of the primary caregiver and/or participating child (e.g. depression, autism, chronic diseases affecting everyday life), and the presence of a child older than 12 years living in the same household. Twins or multiples were excluded. Inclusion criteria were that the child lived with the primary caregiver and that the primary caregiver was fluent in Dutch. Parents who rated one or more items of the Confusion, Hubbub And Order Scale (CHAOS; Matheny et al., 1995) questionnaire as true or completely true (i.e., a 4 or 5 on a 5-point Likert scale) were invited to participate. In total, 7,550 families were invited to fill out the screening questionnaire, of which 2,010 completed the questionnaire. Of these 2,010, 792 families met all inclusion criteria and were invited to participate. Of this group, 125 families entered the RCT. All primary caregivers were the biological parent (89% mothers) and all children lived with both parents. The primary caregiver was 34.32 years old on average (SD = 4.13). The children were 19.17 months old on average (SD = 1.90; 54% boys). Our sample had a relatively high socio-economic status, as 82% of the participants had a monthly income of above €3000, compared to the

average gross monthly income of €2662 in 2018 in The Netherlands according to the Netherlands Bureau for Economic Policy Analysis (CPB, 2019). In addition, for 74% of primary caregivers their highest educational level was college or university.

Procedure

Pre and posttest

This study was approved by the ethics committee of the Institute of Child and Education Studies from Leiden University (number ECPW 2015-090) and was preregistered on Open Science Framework (OSF; Prevoo et al., 2020). Participation consisted of two home visits as pretest, randomization to the intervention or control group, and a posttest of two home visits. Informed consent was obtained during the first home visit. During the pre- and posttest, the parent and child carried out a structured play task (5 min), a don't touch task (2 min not allowed to play with a set of toys, 2 min play with the least interesting toy) and a naturalistic play task (5 min) in which parents and children played together in their house as they normally would. These observations were videotaped for later coding. Also, observations of the living room and child's bedroom were made to code clutter. In between the two visits within the pre- and posttest, a decibel meter was placed in the living room to measure noise levels and parents answered questions through a diary app. During all visits, questionnaires were filled out. Other aspects of participation included collecting saliva and hair samples to measure physiological stress. These data were not used in the current report. Participants received €75 as a reward and children received small gifts for participating in two home visits.

Intervention

After the pretest, participants were randomized to the intervention (n = 60) or control group (n = 65). An intervention to reduce household chaos was designed specifically for this study and consisted of four home visits and three follow-up phone calls, with one week in between. Parents formulated goals to decrease clutter and noise levels and to increase family routines and structure. Each week, one topic was discussed. The sequence of the topics was determined by the parent after completing a Q-sort in which the importance of the different aspects of household chaos for individual parents was assessed. During the home visits, parents chose a goal from a predetermined list and were allowed to choose an additional goal within a topic outside of the list. Gifts (such as a family planner), printed information and text messages were used to aid the parent in achieving their goal (Haines et al., 2013). In between home visits, phone calls were made to discuss all previous topics and two text messages were sent to remind the parent of their goal. During the entire intervention, the intervener used motivational interviewing to guide parents in formulating goals (Emmons & Rollnick, 2001). Interveners were trained extensively (including videotaped training sessions) and met regularly to prevent drifting from the techniques of motivational interviewing.

Control group

The control condition consisted of seven weekly phone calls about how the child was developing (e.g., playing, sleeping, eating). As in Van Zeijl et al. (2006), parents received a booklet with information about child development, which was revisited during the weekly phone calls. Parents received two text messages a week with reminders about the discussed information. Household chaos was not discussed and no specific parenting advise was given.

Measures

Sensitivity

Videos of the free play task and the naturalistic play task were used for sensitivity coding with the Ainsworth Sensitivity Scales for sensitivity and non-intrusiveness (Ainsworth, Bell & Stayton, 1974). This scale uses a 9-point scale, ranging from 1) very insensitive or intrusive to 9) very sensitive or non-intrusive. Good inter-coder reliability was reached, with a mean intra-class coefficient of all different pairs (single measure, absolute agreement) of .82 (range .70 - .92, $N = 29$). To prevent coder drift, coding was discussed regularly. As sensitivity and non-intrusiveness scores were strongly correlated ($ps < .001$ with rs between .78 and .80), these scores were averaged, leading to one sensitivity score for the free play task and one for the naturalistic observation. Higher scores indicated more sensitivity.

Harsh discipline

Harsh discipline was coded from the videos of the don't touch task and was measured using three subscales. These subscales measured 1) frequency and intensity of physical discipline strategies, 2) laxness of the caregiver, and 3) verbal and non-verbal overreactivity (Chapter 4; Joosen, Mesman, Bakermans-Kranenburg, & IJzendoorn, 2012). All subscales were coded from 1 to 5, with higher scores reflecting more harsh discipline. Good inter-coder reliability for harsh discipline was reached with a mean intra-class coefficient of all different pairs (single measure, absolute agreement) of .79 (range .66 - .92, $N = 24$). Again, coding was discussed regularly to prevent coder drift. As participants showed very little laxness, this subscale was not used. To create one score for harsh discipline, physical discipline and overreactivity scores were summed (correlations within pre- and posttest with rs between .17-.35 ps between <.001 - .070). A higher score reflected more harsh discipline.

Sensory-processing sensitivity

To measure sensory-processing sensitivity, two questionnaires were used. The Orienting Sensitivity subscale from the Adult Temperament Questionnaire Short form (ATQ-OS, Evans & Rothbart, 2007) was used to measure awareness of stimuli and how affected a person is by stimuli. We used a version with 22 items, in which some of the original 15 items were split to ease interpretation (see Andeweg et al.,

2020), e.g., "I am often aware how the color and lighting of a room affects my mood" was split for an item about color and an item about lighting. Items were answered on a 5-point Likert scale, ranging from "never" to "always", with an additional option to indicate that one had never been in that situation (treated as missing). Item scores were averaged, with a higher score reflecting more sensory-processing sensitivity (Cronbach's alpha = .84). The second questionnaire was the Noise Sensitivity Scale (NSS; Weinstein, 1978). We used a version consisting of 24 items after splitting some of the original 21 items to ease interpretation (see Andeweg et al., 2020), e.g., "At movies, whispering and crinkling candy wrappers disturb me." was split into an item for whispering and an item for crinkling candy wrappers. A 6-point Likert scale was used, ranging from "totally disagree" to "totally agree", and an additional option to indicate that one had never been in that situation (treated as missing). Item scores were averaged (Cronbach's alpha = .88), with higher scores reflecting more noise sensitivity. The scores on the ATQ-OS and NSS were not significantly correlated (r = .12, p = .201). Thus, analyses were performed for the ATQ-OS and NSS separately, using standardized scores. Higher scores indicated more sensory-processing sensitivity.

Self-regulation

The Go/No-go task, a response inhibition computer task, was used to measure self-regulation (Braver, Barch, Gray, Molfese & Snyder, 2001). Participants were briefly shown the letter 'x' or 'k' (1000-3000 milliseconds) and were asked to only press the space bar after 'x' and not press any key after 'k'. Twenty of the 100 stimuli were 'k's. The number of correct rejections, i.e. the number of times the participant rightfully did not press the space bar, was used as an indicator of self-regulation (Braver et al., 2001). A higher score reflected better self-regulation. Scores were standardized.

Household chaos

Household chaos was measured in four ways during the pre- and posttest (Chapter 4). The CHAOS questionnaire was used to measure self-reported household chaos (Matheny et al., 1995). Participants indicated to what extent 15 items (e.g. "We almost always seem to be rushed") were true for their family on a 5-point Likert scale, ranging from 1) Completely not true, 2) Not true, 3) Sometimes true, sometimes not true, 4) True, 5) Completely true, and with a sixth option for not applicable (coded as system missing). The mean score was calculated, with a higher score indicating more self-reported household chaos (Cronbach's alpha = .80). Clutter was measured by coding observations of the living room and the child's bedroom using a coding scheme based on the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984) and the Purdue Home Stimulation Inventory (PHSI; Wachs, Francis & McQuiston, 1979), resulting in 14 items. Good inter-coder reliability was reached with a mean intra-class coefficient of all different pairs

(single measure, absolute agreement) of .76 (range .61 - .97, *N* = 20) and coder drift was prevented by discussing coding regularly. The 14 items were standardized and averaged, with higher scores indicating more clutter (Cronbach's alpha = .68 at pre- and posttest). Family routines were measured using a diary app, through which parents answered questions on mealtime and bedtime on four days when they were at home with their child. Standard deviations were calculated for mealtime and bedtime events, which were then averaged. A higher score indicated less stability in family routines. Lastly, noise was measured with a decibel meter, which measured the dBA per second in the participant's living room during the four days that were also reported in the diary app. Mean dBA levels were calculated during the morning (7:00-8:30) and evening (17.30-19:00) and then averaged. Higher scores reflected more noise. Change scores were calculated for each measure by subtracting the pretest from the posttest.

General intervention elements

Perceived effectiveness and therapeutic alliance were measured to control for general intervention elements (Vîslă, Constantino, Newkirk, Ogrodniczuk & Söchting, 2016; Flückiger, Del Re, Wampold, Symonds & Horvath, 2012). All participants filled out a questionnaire about the intervention or control condition (Chapter 4). Perceived effectiveness was measured with 10 items, e.g., "How fruitful was the intervention for your family as a whole?" with 1) Little, to 5) A lot (Cronbach's alpha = .96). Therapeutic alliance was measured with 12 items, e.g., "How did you experience the contact with the intervener?" with 1) Bad cooperation, to 5) Good cooperation (Cronbach's alpha = .93). Higher scores indicated more positive evaluations of perceived effectiveness and therapeutic alliance.

Analyses

Seven participants dropped out after randomization. We imputed missing data to perform intention-to-treat analyses. Multiple imputation with 5 iterations and 100 imputations was used, with functions from the mice function from the mice package (version 3.7.0). Results were pooled by using functions from mitml, miceadds, and merTools packages. Analyses were performed in SPSS version 25 and R version 3.6.1 with Rstudio version 3.4.4, with a fixed starting seed for reproducibility.

To test whether the effect of the intervention on parenting was only visible in parents with high sensory-processing sensitivity or low self-regulation, we tested models first including condition (i.e., intervention or control group) and the moderator as main effects and then testing the interaction between condition and the moderator. We included the pretest parenting score as a covariate, as the intervention group showed more harsh discipline ($M = 4.02$, $SD = 1.23$) during pretest than the control group ($M = 3.61$, $SD = 0.98$; $t(122) = -2.01$, $p = .046$). Parent

and child age, parental education, and number of children in the home were significantly related to parenting quality and/or household chaos, and thus included as covariates (see also Chapter 4). Perceived effectiveness and therapeutic alliance were also included as covariates for general intervention elements, as these are known to affect treatment outcome (Flückiger et al., 2012). As we did not find intervention effects on the household chaos variables that we measured (see also Chapter 4) but there were differences in the amount of change in the chaos measures from pre- to posttest, we tested the potential moderation of the relation between change scores in household chaos measures on parenting, by SPS and by self-regulation. When testing change scores of household chaos as a predictor, we included the pretest score as a covariate as measures of household chaos are relatively stable over time (Chapter 4). A significance level of 5% was used for all model and parameter evaluations.

Results

For descriptive statistics and correlations, see Tables 1 and 2. There were no significant correlations between the two measures of sensory-processing sensitivity, self-regulation and parenting measures or condition (Table 2). Results reported hereafter are based on imputed data, with the exception of *F*-statistics and adjusted R^2, as no multilevel combination rules exist for these measures (see Table 3). Conclusions based on analyses using observed data were equivalent, indicating robustness of our findings.

Sensory-processing sensitivity

ATQ-OS

We conducted multiple regression analyses for each parenting measure separately, with condition, ATQ-OS scores, pretest parenting score, and covariates as predictors in the first step. In the second step, we added the interaction between condition and ATQ-OS scores. For harsh discipline, a main effect of condition was found in the first step, with lower posttest harsh discipline in the intervention group ($F(9; 93) = 2.11$, $\beta = -0.32$, $p = .007$; $R^2 = .09$). No main effect of the ATQ-OS was found ($\beta = 0.02$, $p = .916$). In the second step we added the interaction between condition and the ATQ-OS. The interaction term was not significant ($F(10; 92) = 2.22$, $\beta = -.10$, $p = .236$, $R^2 = .11$). For sensitivity during free play, no main effects of condition or ATQ-OS were found in the first step, and no interaction between condition and ATQ-OS was found in the second step ($F(10; 91) = 2.70$, $\beta = .09$, $p = .765$, $R^2 = .14$). For sensitivity in the naturalistic setting also no main effects or interaction between condition or ATQ-OS were found ($F(10; 87) = 1.71$, $\beta = .10$, $p = .706$, $R^2 = .07$). Thus, effects of the chaos-intervention on the different parenting outcomes did not depend on parents' ATQ-OS levels.

Table 1
Descriptive statistics of measures of household chaos, parenting, measures of SPS, and self-regulation.

	Pretest						Posttest					
	Overall		Intervention		Control		Overall		Intervention		Control	
	M(*SD*)	Min-max	*M*(*SD*)	Min-max	*M*(*SD*)	Min-max	*M*(*SD*)	Min-max	*M*(*SD*)	Min-max	*M*(*SD*)	Min-max
Self-reported household chaos	2.29 (0.41)	1.21-3.27	2.30 (0.41)	1.47-3.27	2.28 (0.40)	1.21-3.14	2.22 (0.45)	1.27-3.21	2.20 (0.42)	1.40-3.07	2.24 (0.48)	1.27-3.21
Clutter*	0.00 (0.44)	-0.98-1.33	0.02 (0.46)	-0.81-1.06	-0.01 (0.41)	-0.98-1.33	0.00 (0.44)	-0.86-1.25	-0.02 (0.38)	-0.86-0.87	0.02 (0.50)	-0.81-1.25
Noise	43.71 (7.53)	22.38-60.20	43.63 (7.11)	28.88-59.21	43.80 (8.09)	22.38-60.20	43.06 (5.53)	25.84-58.36	42.56 (5.71)	25.84-55.81	43.59 (5.35)	29.46-58.36
Family routines*	-0.02 (0.62)	-1.08-2.66	0.00 (0.64)	-1.08-2.12	-0.04 (0.61)	-1.04-2.66	-0.03 (0.69)	-1.52-2.18	0.02 (0.69)	-1.17-2.18	-0.07 (0.70)	-1.52-1.65
Harsh discipline	3.82 (1.13)	2.00-9.00	4.02 (1.23)	2.00-9.00	3.61 (0.98)	2.00-7.00	3.50 (1.03)	2.00-6.00	3.38 (1.01)	2.00-6.00	3.62 (1.04)	2.00-6.00
Sensitivity free play	6.57 (1.63)	2.50-9.00	6.63 (1.50)	2.00-9.00	6.51 (1.78)	2.50-9.00	5.75 (1.74)	1.50-9.00	5.88 (1.78)	1.50-9.00	5.63 (1.71)	2.00-8.50
Sensitivity naturalistic	7.15 (1.55)	2.00-9.00	6.97 (1.45)	3.00-9.00	7.35 (1.63)	2.00-9.00	6.64 (1.61)	3.00-9.00	6.61 (1.63)	3.00-9.00	6.67 (1.62)	3.00-9.00
SPS: ATQ-OS*	0.00 (1.00)	-2.06-2.40	0.03 (1.04)	-2.06-2.40	-0.03 (0.96)	-1.92-2.20						
SPS: NSS*	0.00 (1.00)	-2.61-2.54	-.15 (0.96)	-2.10-2.54	-0.16 (1.02)	-2.61-2.14						
Self-regulation*	0.00 (1.00)	-4.06-1.14	0.05 (1.01)	-4.06-1.14	-0.06 (1.00)	-2.86-1.14						

Note. Descriptive statistics are based on observed cases. * = standardized scores.

Table 2
Correlations between condition, SPS measures, self-regulation, and parenting measures.

	1	2	3	4	5	6	7	8	9	10	11
1. Condition	-				-.05	-.04	-.09	.07	-.12	.07	-.02
2. SPS: ATQ-OS*	.03	-			.06	.09	-.03	-.01	-.03	.03	.05
3. SPS: NSS*	.15	.12	-		.12	.03	.08	-.07	.05	.01	-.10
4. Self-regulation*	.06	.11	.04	-	-.13	-.01	-.06	-.12	-.00	.02	-.10
5. Self-reported household chaos	.02	.05	.15	-.12	.62**	.10	.07	-.01	-.03	.05	-.00
6. Clutter*	.04	.06	-.09	.08	.16	.63**	.08	-.06	-.00	-.06	-.07
7. Noise	-.01	.19	-.15	.01	.07	.27**	.30*	-.00	-.20	.19	.21*
8. Family routines	.03	.05	.02	.06	.04	-.11	.05	.26*	-.02	-.09	-.04
9. Harsh discipline	.18*	.06	.01	-.07	.05	.03	.02	.06	.10	-.21*	.02
10. Sensitivity free play	.04	.03	-.03	.04	.01	.06	.28**	.04	-.17	.41**	.39**
11. Sensitivity naturalistic	-.12	.09	-.02	.03	-.00	.07	.20	.05	.02	.54**	.29**

Note. Below the diagonal represents correlations with pretest measures, above the diagonal represents correlations with posttest measures. The diagonal represents correlations between pre- and posttest of the same measure. Condition is coded as 1 = dummy, 2 = intervention. * $p < .05$, ** $p < .01$, *** $p < .001$.

NSS

We also tested for moderation by SPS by analyzing the NSS as the moderator. Again, a main effect of condition on harsh discipline was found (F (9; 83) = 3.37, β = -.32, p = .006, R^2 = .19). In the second step, we found no interaction between condition and the NSS (F (10; 82) = 3.02, β = -.10, p = .424, R^2 = .18). For sensitivity during free play, we found no main effects and no interaction effect between condition and the NSS in the second step (F (10; 81) = 2.43, β = .10, p = .610, R^2 = .14). This was the same for sensitivity in the naturalistic setting (F (10; 77) = 1.35, β = .10, p = .894, R^2 = .04). This meant there was no moderation by the NSS.

Self-regulation

Again, we conducted multiple regression analyses for each parenting measure separately, with condition, self-regulation, pretest parenting score, and covariates as predictors in the first step. We added the interaction between condition and self-regulation in the next step. For harsh discipline, a main effect of condition was again found in the first step (F (9; 88) = 1.78, β = -0.31, p = .007, R^2 = .07). No main effect of self-regulation was found (β = -0.02, p = .825). In the second step we added the interaction between condition and self-regulation. The interaction term was

not significant ($F(10; 87) = 1.60$, $\beta = .06$, $p = .833$, $R^2 = .06$). For sensitivity during free play, no main effects of condition or self-regulation were found in the first step, and no interaction between condition and self-regulation was found in the second step ($F(10; 86) = 2.70$, $\beta = -.23$, $p = .472$, $R^2 = .15$). For sensitivity in the naturalistic setting also no main effects were found, and in the second step no interaction between condition or self-regulation was found ($F(10; 82) = 1.62$, $\beta = -.00$, $p = .988$, $R^2 = .063$). Thus, effects of the chaos-intervention on the different parenting outcomes did not depend on parents' self-regulation.

Table 3

Multiple regression analyses to predict posttest parenting by condition, interaction with SPS: ATQ-OS, and covariates.

	Harsh discipline						Sensitivity – free play						Sensitivity – naturalistic					
	B (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2
Step 1			93 (9)	2.11	.037	.09			92 (9)	3.01	.003	.15			88 (9)	1.93	.058	.08
Intercept	4.92 (1.66)		102.70	2.95	.004		1.27 (2.44)		103.65	0.52	.604		0.34 (2.42)		103.56	0.14	.888	
Condition	-0.64 (0.23)	-0.32	97.16	-2.75	.007		0.35 (0.37)	0.10	102.28	0.96	.338		0.18 (0.35)	0.07	101.64	0.52	.608	
SPS: ATQ-OS	-0.01 (0.10)	0.02	99.35	-0.11	.916		-0.00 (0.16)	0.03	103.54	-0.01	.992		0.07 (0.15)	-0.04	106.75	0.48	.631	
Pretest parenting	0.05 (0.09)		101.29	0.60	.553		0.37 (0.10)		109.40	3.86	<.001		0.26 (0.10)		105.68	2.72	.008	
Age participant	-0.02 (0.02)		100.42	-0.71	.480		0.01 (0.04)		104.79	0.29	.771		0.01 (0.04)		104.99	0.38	.706	
Age child	-0.02 (0.05)		105.76	-0.37	.714		0.03 (0.08)		107.14	0.39	.696		0.02 (0.07)		107.59	0.29	.774	
Participant education	0.00 (0.09)		106.22	0.05	.960		0.19 (0.15)		108.90	1.29	.199		0.31 (0.14)		105.01	2.22	.029	
Number of children	-0.09 (0.13)		99.55	-0.66	.512		0.07 (0.20)		105.90	0.36	.721		0.21 (0.20)		101.52	1.07	.288	
Perceived effectiveness	0.37 (0.13)		85.26	2.91	.005		-0.07 (0.20)		93.12	-0.33	.743		-0.14 (0.19)		93.13	-0.73	.469	
Therapeutic alliance	-0.14 (0.17)		87.61	-0.82	.416		-0.18 (0.26)		97.74	-0.68	.501		0.24 (0.25)		97.30	0.97	.334	
Step 2			92 (10)	2.22	.023	.11			91 (10)	2.70	.006	.14			87 (10)	1.71	.090	.07

Table 3

Continued.

	Harsh discipline						Sensitivity – free play						Sensitivity – naturalistic					
	B (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2
Intercept	4.75 (1.67)		100.27	2.83	.006		1.40 (2.50)		102.37	0.56	.576		0.16 (2.48)		102.51	0.06	.949	
Condition	-0.62 (0.23)		95.77	-2.68	.009		0.35 (0.37)		101.46	0.95	.342		0.19 (0.35)		100.71	0.53	.596	
SPS: ATQ-OS	-0.40 (34)		102.23	-1.18	.239		0.15 (0.54)		101.28	0.28	.777		-0.11 (0.51)		100.69	-0.22	.823	
Condition*SPS: ATQ-OS	0.25 (0.21)	-0.10	99.96	1.19	.236		-0.10 (0.33)	0.09	100.94	-0.30	.765		0.12 (0.31)		101.58	0.38	.706	
Pretest parenting	0.03 (0.09)		100.32	0.35	.726		0.37 (0.10)		108.39	3.81	<.001		0.27 (0.10)		104.78	2.74	.007	
Age participant	-0.01 (0.03)		97.83	-0.41	.686		0.01 (0.04)		102.47	0.20	.843		0.02 (0.04)		103.00	0.47	.642	
Age child	-0.02 (0.05)		104.90	-0.42	.679		0.03 (0.08)		106.42	0.40	.691		0.02 (0.08)		106.76	0.28	.776	
Participant education	0.01 (0.09)		104.64	0.12	.903		0.19 (0.15)		107.94	1.26	.210		0.31 (0.14)		104.37	2.23	.028	
Number of children	-0.07 (0.13)		97.33	-0.55	.583		0.07 (0.21)		104.57	0.33	.745		0.22 (0.20)		100.42	1.10	.275	
Perceived effectiveness	0.38 (0.13)		83.43	2.92	.005		-0.07 (0.20)		92.51	-0.33	.740		-0.14 (0.19)		92.45	-0.73	.469	
Therapeutic alliance	-0.15 (0.17)		83.85	-0.88	.379		-0.17 (0.26)		97.37	-0.65	.518		0.23 (0.25)		96.99	0.94	.349	

Note. All statistics are based on imputed data, with the exception of the model statistics. Condition was coded as 1 = control group, 2 = intervention.

Table 4

Multiple regression analyses to predict posttest parenting by condition, interaction with SPS: NSS, and covariates.

	Harsh discipline						Sensitivity – free play						Sensitivity – naturalistic					
	B (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2
Step 1			83 (9)	3.37	.001	.19			82 (9)	2.61	.010	.14			78 (9)	1.48	.169	.05
Intercept	5.06 (1.69)		101.06	2.99	.004		1.41 (2.47)		103.76	0.57	.569		0.03 (2.45)		103.99	0.01	.990	
Condition	-0.65 (0.23)	-0.32	96.84	-2.80	.006		0.34 (0.37)	0.10	101.94	0.91	.363		0.22 (0.35)	0.07	101.61	0.62	.535	
SPS: NSS	0.04 (0.19)	0.02	67.95	0.31	.756		0.07 (0.17)	0.03	86.83	0.40	.691		-0.11 (0.16)	-0.04	88.08	-0.71	.481	
Pretest parenting	0.05 (0.09)		100.84	0.57	.571		0.37 (0.10)		109.15	3.86	<.001		0.27 (0.10)		104.97	2.77	.007	
Age participant	-0.02 (0.03)		99.15	-0.77	.444		0.01 (0.04)		104.36	0.23	.819		0.02 (0.04)		104.70	0.53	.596	
Age child	-0.02 (0.05)		105.02	-0.41	.685		0.03 (0.08)		106.89	0.40	.691		0.02 (0.07)		107.94	0.33	.743	
Participant education	0.00 (0.09)		106.21	0.00	.997		0.18 (0.15)		108.46	1.25	.213		0.31 (0.14)		105.23	2.25	.027	
Number of children	-0.08 (0.13)		94.94	-0.56	.578		0.09 (0.21)		103.43	0.44	0.661		0.18 (0.20)		98.56	0.89	.373	
Perceived effectiveness	0.37 (0.13)		86.01	2.91	.005		-0.07 (0.20)		93.93	-0.37	.714		-0.13 (0.19)		93.28	-0.69	.491	
Therapeutic alliance	-0.14 (0.17)		87.64	-0.84	.401		-0.18 (0.26)		97.45	-0.70	.486		0.23 (0.24)		97.78	0.96	.341	
Step 2			82 (10)	3.02	.003	.18			81 (10)	2.43	.014	.14			77 (10)	1.35	.218	.04

Table 4

Continued.

	Harsh discipline						Sensitivity – free play						Sensitivity – naturalistic					
	B (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2
Intercept	5.04 (1.70)		100.26	2.97	.004		1.38 (2.48)		103.13	0.56	.579		0.03 (2.46)		103.45	0.01	.991	
Condition	-0.67 (0.23)		96.05	-2.86	.005		0.34 (0.37)		100.90	0.93	.356		0.21 (0.35)		101.07	0.63	.532	
SPS: NSS	0.31 (0.36)		73.11	0.87	.385		-0.19 (0.52)		91.73	-0.35	.724		-0.18 (0.51)		88.87	-0.35	.726	
Condition*SPS: NSS	-0.18 (0.23)	-0.10	71.19	-0.80	.424		0.17 (0.33)	0.09	90.76	0.51	.610		0.04 (0.31)	0.10	91.39	0.13	.894	
Pretest parenting	0.06 (0.09)		99.62	0.67	.503		0.37 (0.10)		108.27	3.84	<.001		0.26 (0.10)		103.77	2.70	.008	
Age participant	-0.02 (0.03)		97.72	-0.81	.419		0.01 (0.04)		103.98	0.27	.791		0.02 (0.04)		103.66	0.54	.590	
Age child	-0.02 (0.05)		103.09	-0.42	.677		0.03 (0.08)		105.09	0.41	.680		0.03 (0.08)		106.86	0.34	.736	
Participant education	0.01 (0.09)		104.76	0.10	.922		0.18 (0.15)		106.81	1.19	.237		0.31 (0.14)		104.37	2.23	.028	
Number of children	-0.06 (0.14)		93.82	-0.44	.662		0.08 (0.21)		102.42	0.37	.711		0.18 (0.20)		97.90	0.87	.385	
Perceived effectiveness	0.38 (0.13)		85.00	2.96	.004		-0.08 (0.20)		92.87	-0.40	.691		-0.13 (0.19)		92.73	-0.70	.485	
Therapeutic alliance	-0.15 (0.17)		85.50	-0.88	.379		-0.17 (0.26)		96.83	-0.67	.502		0.23 (0.25)		96.95	0.95	.342	

Note. All statistics are based on imputed data, with the exception of the model statistics. Condition was coded as 1 = control group, 2 = intervention.

Table 5

Multiple regression analyses to predict posttest parenting by condition, interaction with self-regulation, and covariates.

	Harsh discipline						Sensitivity – free play						Sensitivity – naturalistic					
	B (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2
Step 1			88 (9)	1.78	.083	.07			87 (9)	3.00	.004	.16			83 (9)	1.81	.079	.07
Intercept	498 (1.69)		102.48	2.95	.004		1.24 (2.47)		103.83	0.50	.617		-0.19 (2.45)		102.01	-0.08	.937	
Condition	-0.65 (0.23)	-0.31	97.35	-2.78	.007		0.35 (0.37)	0.10	102.71	0.95	.342		0.22 (0.34)	0.07	102.01	0.64	.521	
Self-regulation	0.02 (0.10)	-0.02	107.33	0.22	.825		-0.01 (0.16)	0.01	96.29	-0.06	.949		-0.20 (0.15)	0.13	103.93	-1.38	.169	
Pretest	0.05 (0.09)		100.52	0.58	.565		0.37 (0.10)		109.36	3.85	<.001		0.27 (0.10)		105.20	2.78	.006	
Age participant	-0.02 (0.02)		100.50	-0.75	.458		0.01 (0.04)		105.43	0.30	.766		0.02 (0.04)		105.50	0.59	.557	
Age child	-0.02 (0.05)		105.64	-0.40	.692		0.03 (0.08)		106.87	0.40	.688		0.04 (0.08)		106.41	0.48	.632	
Participant education	0.00 (0.09)		105.86	0.03	.979		0.19 (0.15)		108.00	1.29	.201		0.33 (0.14)		104.49	2.35	.021	
Number of children	-0.08 (0.13)		100.51	-0.63	.532		0.07 (0.21)		105.72	0.35	.725		0.17 (0.20)		102.17	0.90	.373	
Perceived effectiveness	0.37 (0.13)		85.33	2.91	.005		-0.07 (0.20)		93.01	-0.32	.747		-0.13 (0.19)		94.20	-0.72	.472	
Therapeutic alliance	-0.13 (0.17)		88.73	-0.80	.426		-0.17 (0.26)		97.25	-0.68	.498		0.20 (0.24)		98.54	0.84	.405	
Step 2			87 (10)	1.60	.120	.06			86 (10)	2.70	.006	.15			82 (10)	1.62	.117	.06

Table 5

Continued.

	Harsh discipline						Sensitivity – free play						Sensitivity – naturalistic					
	B (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2	*B* (*sd*)	β	Df	*t*/*F*	*p*	Adj. R^2
Intercept	5.01 (1.70)		101.25	2.95	.004		1.06 (2.50)		102.03	0.43	.671		-0.21 (2.47)		101.22	-0.08	.933	
Condition	-0.65 (0.23)		96.24	-2.77	.007		0.37 (0.37)		101.65	0.99	.322		0.22 (0.35)		101.09	0.65	.520	
Self-regulation	0.08 (0.31)		102.80	0.27	.790		-0.38 (0.55)		81.61	-0.69	.490		-0.21 (0.47)		104.63	-0.45	.655	
Condition*Self-regulation	-0.04 (0.20)	0.06	102.71	-0.21	.833		0.25 (0.34)		85.41	0.72	.472		0.00 (0.30)	-0.00	102.11	0.01	.988	
Pretest	0.05 (0.09)		99.43	0.58	.565		0.37 (0.10)		107.76	3.78	<.001		0.27 (0.10)		104.22	2.76	.007	
Age participant	-0.02 (0.03)		97.61	-0.77	.445		0.02 (0.04)		100.79	0.44	.658		0.02 (0.04)		103.43	0.58	.566	
Age child	-0.02 (0.05)		104.91	-0.40	.689		0.04 (0.08)		105.83	0.43	.666		0.04 (0.08)		105.61	0.48	.630	
Participant education	0.00 (0.09)		105.24	0.04	.968		0.18 (0.15)		107.38	1.25	.215		0.33 (0.14)		103.73	2.34	.021	
Number of children	-0.08 (0.13)		99.43	-0.64	.526		0.09 (0.21)		104.62	0.42	.675		0.17 (0.20)		101.33	0.89	.378	
Perceived effectiveness	0.38 (0.13)		85.07	2.91	.005		-0.08 (0.20)		92.65	-0.39	.695		-0.14 (0.19)		93.56	-0.72	.471	
Therapeutic alliance	-0.13 (0.17)		88.51	-0.79	.434		-0.18 (0.26)		97.07	-0.71	.478		0.20 (0.24)		97.60	0.83	.406	

Note. All statistics are based on imputed data, with the exception of the model statistics. Condition was coded as 1 = control group, 2 = intervention.

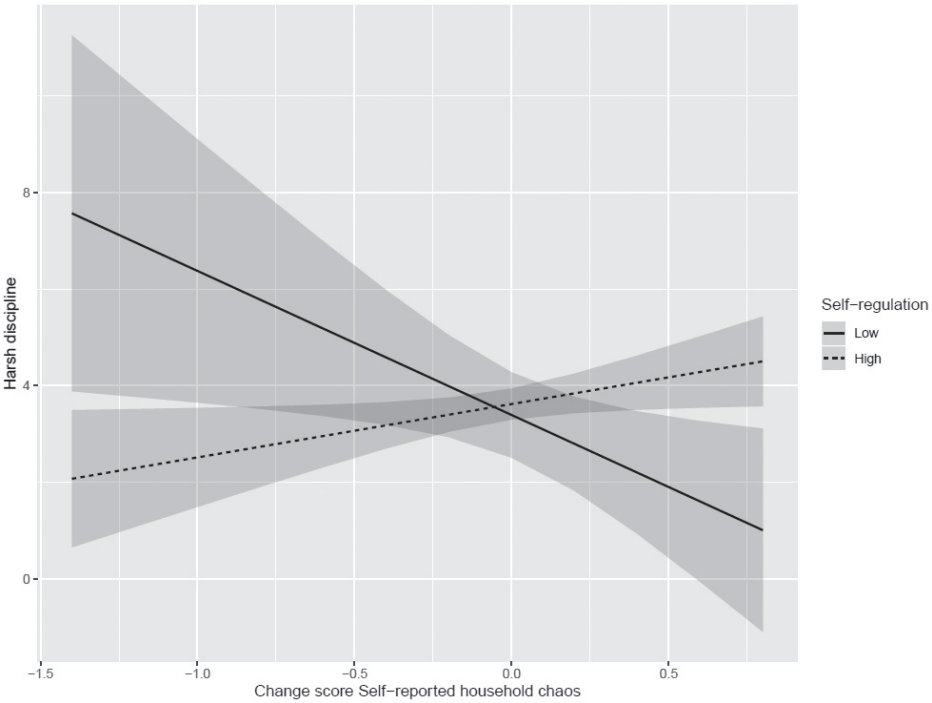

Figure 1. The relation between the change score of self-reported household chaos on harsh discipline at posttest, moderated by self-regulation.
Note. A negative change score on self-reported household chaos represents a decrease in self-reported household chaos. Highlighted areas reflect the range of 1 *SD* above or below average.

Change scores on household chaos

Multiple regression analyses were conducted separately for each of the parenting measures, household chaos measures, and moderators, resulting in 36 analyses. These were conducted in two steps. In step 1, the change score in household chaos, the pretest parenting score, pretest household chaos score, and covariates were added. In step 2, the interaction between the change score in household chaos and SPS or self-regulation was added. The results of these analyses can be found in Tables A1 through A12 in the Supplemental material Chapter 5. For self-regulation, we found one significant interaction, which was between change in self-reported household chaos and self-regulation on posttest harsh discipline ($F(11; 80) = 1.34$, $\beta = -.25$, $p = .018$, $R^2 = .04$; see Figure 1). Among parents with higher self-regulation, there was a positive association between change in household chaos and harsh discipline at posttest, while there was a negative association among parents with lower self-regulation. All other analyses with self-regulation did not indicate significant moderation. For SPS, we found no moderation by the

NSS. For the ATQ-OS, no significant moderation was found, although moderation of decreased self-reported household chaos by the ATQ-OS on posttest harsh discipline was in the expected direction ($F(11; 84) = 1.35$, $\beta = -.09$, $p = .077$, $R^2 = .04$). Overall, no significant moderation by SPS was found and most of the analyses with self-regulation indicated no moderation.

Discussion

The aim of the current report was to study whether experimentally reducing household chaos leads to a stronger improvement in parenting in parents with higher SPS or lower self-regulation. We found no evidence that effects of our chaos-intervention on parenting were dependent on SPS or self-regulation. Analyses on change scores of household chaos measures also indicated that an effect on parenting was not dependent on SPS. Self-regulation was only a significant moderator for the relation between change in self-reported household chaos and harsh parenting, but not for other household chaos or parenting measures.

For parents with higher self-regulation, a decrease in self-reported household chaos was significantly related to lower harsh discipline at posttest. As we did not find significant moderation by self-regulation for parental sensitivity during free play or the naturalistic setting, the effect of household chaos and self-regulation on parenting may be dependent on the parenting context. The task to measure harsh discipline, where the parent needs to keep their child from playing with attractive toys, can be considered as more demanding compared to the tasks measuring sensitivity, in which the parent plays with the child for 5 min. Especially in difficult parenting settings, self-regulation processes may be necessary to refrain from harsh parenting and to conduct positive parenting instead. We found that a decrease in household chaos was related to less harsh discipline in parents with higher self-regulation, while expecting to find this for parents with lower self-regulation. Instead, we found that for parents with lower self-regulation, a stronger decrease in household chaos was related to a higher score on harsh discipline at posttest. An explanation may lie in the cognitive processes required to establish a decrease in household chaos. To decrease household chaos, parents need to shift their attention and activate or inhibit behavior towards for instance tidying up or adhering to a routine. Thus, decreasing household chaos may be easier for parents with better attention shifting and inhibition skills and working memory, i.e. parents with higher self-regulation, and may be challenging for parents with lower self-regulation. Decreasing household chaos may be so taxing for parents with lower self-regulation that it may result in a lack of cognitive processes needed to refrain from harsh discipline. This may explain why in our study the benefit of decreasing household chaos on harsh discipline was only visible in parents with higher self-regulation. Parents with lower self-regulation may not be able to simultaneously

decrease household chaos and inhibit harsh discipline. For these parents to benefit from decreasing household chaos, the new routines around household chaos may first need to be automated, thereby freeing up cognitive capacities needed to inhibit harsh discipline. This would imply that parents with lower self-regulation may benefit more from a gradual decrease in household chaos, thereby allowing enough room for their self-regulation skills to inhibit harsh discipline while establishing a new routine around household chaos. In parents with lower self-regulation, increased self-reported household chaos was related to lower harsh discipline at posttest. A stronger increase in chaos may be more overwhelming for these parents, who may respond by blocking out the environment, including the child's behavior, leading to less responses in general and thus to less harsh discipline.

Our results need to be interpreted with caution, as we only found significant moderation for self-reported household chaos and not for other measures of household chaos. This could indicate that individual elements of household chaos are less important and that it is the combination of these elements, as measured in the self-report questionnaire (Matheny et al., 1995), that is related to parenting. It could also indicate that the perception of household chaos is more important than the actual level of clutter, noise, or family and week routines, as the self-report questionnaire taps into the perception of household chaos whereas the separate measures of household chaos were more objective. As there is little research to date on whether self-regulation moderates the effect of household chaos on parenting, and as these studies do not consistently find significant moderation by self-regulation (e.g., Deater-Deckard et al., 2012; Chapter 3), more research on this topic is needed to determine whether special attention to parents with low self-regulation is necessary in the context of household chaos and parenting.

Our analyses based on intervention effects as well as on the change scores of household chaos indicated that the relation with parenting was not dependent on SPS. This contradicts previous findings, such as the experimental study by Andeweg et al. (2020), in which participants' caregiver sensitivity was more strongly affected by household chaos over time in participants with higher SPS than in participants with lower SPS. The difference in findings could be a result of not establishing a sufficiently large effect on household chaos in the current study (see also Chapter 4). We may not have been able to accomplish a difference in household chaos that is large enough so that parents with higher SPS are more affected than parents low in SPS. Perhaps only large shifts of household chaos have a stronger effect on parenting in parents with higher SPS than with lower SPS. As household chaos is fairly stable over time (Chapter 4), these larger shifts may only occur around larger changes in family life, for instance moving or the addition of a new family member. This would imply that SPS is not an important moderator for the effect of household chaos and parenting in everyday life. Another explanation is that only high levels

of household chaos affect parenting more strongly in parents with higher SPS. In the current study, only 6% of the parents had a mean score of self-reported household chaos of 3 or higher, while the scale ranged from 1 to 5. This means that the level of household chaos was not very high in our sample, even though we invited the more chaotic families to participate in the study. In the study by Andeweg et al. (2020), the chaos condition was evaluated as very chaotic. Thus, the effect of household chaos on parenting may only by stronger for parents with higher SPS in highly chaotic environments. Lastly, in the study by Andeweg et al. (2020), household chaos was created by someone else, whereas the household chaos in the current study was created, at least to some extent, by the participant. SPS may only moderate the effect of chaotic environments on parenting in environments that are uncontrollable or that are new to parents.

Limitations and strengths

A limitation of the current study is that the intervention was not successful in producing a measurable decrease in household chaos (see also Chapter 4). We therefore also tested moderation by SPS or self-regulation in analyses with change scores of measures of household chaos. This ensured thorough investigation of these data for our research questions on the one hand, and led to a large amount of analyses on the other hand, meaning interpretations of the few significant results should be done with caution. Strengths include the use of multiple measures for parenting and household chaos, and the use of objective as well as self-report measures. Lastly, our sample was fairly low-risk, as parents reported relatively high education and income levels. This means our results are less generalizable to families with a lower socio-economic status. As families with low socio-economic status show more household chaos (e.g. Wang, Deater-Deckard, & Bell, 2013), these families may be more of interest for studying the current research question.

Future research and implications

Using an experimental study design, we found that the effect of self-reported household chaos on harsh discipline was moderated by self-regulation. As we did not find a moderation effect for other measures of household chaos or for sensitivity, and as previous studies are inconsistent in their findings, more research on this topic is needed to clarify whether self-regulation is indeed a moderator of the effect of household chaos on parenting before prevention and whether intervention efforts should be specifically targeted at parents with high or low self-regulation. Potentially, parents with lower self-regulation may benefit from a more gradual decrease in household chaos. As high-risk families generally have more chaotic households and lower parental self-regulation (Dumas et al., 2005; Deater-Deckard et al., 2012), it is worthwhile to further investigate this research question. Furthermore, we found no evidence that the effect of household chaos on parenting depended on SPS. More research is needed to establish whether SPS is

only relevant in highly chaotic households or high-risk families. This could indicate that reducing household chaos could more effectively reduce negative parenting practices in parents with high SPS. Finally, as our results indicate that the effect of household chaos may only be present in more demanding situations, such as disciplinary situations, studying the role of child behavior may be important as well (Dumas et al., 2005).

Conclusion

In conclusion, we found some support for moderation by self-regulation and no support for moderation by SPS of the effect of household chaos on parenting. In our sample of low-risk families with normative to relatively high levels of household chaos, a decrease in self-reported household chaos was related to less harsh discipline for parents with higher self-regulation, and to more harsh discipline for parents with lower self-regulation. For parents with lower self-regulation, creating a new routine around household chaos may tax their cognitive capacities, thereby leaving no room to inhibit harsh discipline. Parents with lower self-regulation may thus benefit from more gradually introducing routines to decrease household chaos. In low-risk families, SPS may not be an important factor in how strongly household chaos affects parenting. Future studies should expand the current findings to more chaotic or at-risk families to test whether reducing household chaos may improve parenting, especially in parents with lower self-regulation or higher SPS.

References

Ainsworth, M. D. S., Bell, S. M., & Stayton, D. J. (1974). Infant mother attachment and social development; Socialization as a product of reciprocal responsiveness to signals. In M. P. M. Richards (Ed.), The integration of a child into a social world (pp 99-135). Cambridge: Cambridge University Press.

Andeweg, S. M., Bodrij, F. F., Prevoo, M. J. L., Rippe, R. A. C., & Alink, L. R. A. (2020). Does sensory-processing sensitivity moderate the effect of household chaos on caregiver sensitivity? An experimental design. *Journal of Family Psychology*, advanced online publication. https://doi.org/10.1037/fam0000766

Aron, E. N., & Aron, A. (1997). Sensory-processing sensitivity and its relation to introversion and emotionality. *Journal of Personality and Social Psychology*, *73*(2), 345-368. http: // dx.doi.org/10.1037/0022-3514.73.2.345

Braver, T. S., Barch, D. M., Gray, J. R., Molfese, D. L., & Snyder, A. (2001). Anterior cingulate cortex and response conflict: Effects of frequency, inhibition and errors. *Cerebral Cortex*, *11*(9), 825-836. DOI: 10.1093/cercor/11.9.825

Bridgett, D. J., Oddi, K. B., Laake, L. M., Murdock, K. W., & Bachmann, M. N. (2013). Integrating and differentiating aspects of self-regulation: Effortful control, executive functioning, and links to negative affectivity. *Emotion*, *13*(1), 47-63. DOI: 10.1037/ a0029536

Caldwell, B. M., & Bradley, R. H. (1984). Home Ohservation for Measurement of the Environment. Little Rock: University of Arkansas.

Coldwell, J., Pike, A., & Dunn, J. (2006). Household chaos – links with parenting and child behaviour. *Journal of Child Psychology and Psychiatry*, *47*(11), 1116-1122. doi: 10.1111/j.1469-7610.2006.01655.x

Crandall, A., Deater-Deckard, K., & Riley, A. W. (2015). Maternal emotion and cognitive control capacities and parenting: A conceptual framework. *Developmental Review*, *36*, 105-126. http://dx.doi.org/10.1016/j.dr.2015.01.004

Deater-Deckard, K., Wang, Z., Chen, N., & Bell, M. A. (2012). Maternal executive function, harsh parenting, and child conduct problems. *Journal of Child Psychology and Psychiatry*, *53*(10), doi:10.1111/j.1469-7610.2012.02582.x

Dumas, J. E., Nissley, J., Nordstrom, A., Philips Smith, E., Prinz, R. J., & Levine, D. W. (2005). Home chaos: Sociodemographic, parenting, interactional and child correlates. *Journal of Clinical Child and Adolescent Psychology*, *34*(1), 93-104. http://dx.doi.org/ 10.1207/ s15374424jccp3401_9

Emmons, K. M., & Rollnick, S. (2001). Motivational interviewing in health care settings: Opportunities and limitations. *American Journal of Preventive Medicine*, *20*(1), 68- 74. https://doi.org/10.1016/S0749-3797(00)00254-3

Evans, D. E., & Rothbart, M. K. (2007). Developing a model for adult temperament. *Journal of Research in Personality*, *41*(4), 868-888. doi:10.1016/j.jrp.2006.11.002

Evans, D. E., & Rothbart, M. K. (2008). Temperamental sensitivity: Two constructs or one? *Personality and Individual Differences*, *44*, 108-118. doi:10.1016/j.paid.2007.07.016

Evans, G.W., & Wachs, T.D. (2010). *Chaos and its influence on children's development*. Washington, DC: American Psychological Association.

Flückiger, C., Del Re, A. C., Wampold, B. E., Symonds, D., & Horvath, A. O. (2012). How central is the alliance in psychotherapy? A multilevel longitudinal meta-analysis. *Journal of Counseling Psychology*, *59*(1), 10-17. DOI: 10.1037/a0025749

Haines, J., McDonald, J., O'Brien, A., Sherry, B., Bottino, C. J., Evans Schmidt, M., Taveras, E. M. (2013). Healthy habits, happy homes: Randomized trial to improve household routines for obesity prevention among preschool-aged children. *JAMA Pediatrics*, *167*(11), 1072-9. d oi:10.1001/jamapediatrics.2013.2356

Joosen, K. J., Mesman, J., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (2012). Maternal sensitivity to infants in various settings predicts harsh discipline in toddlerhood. *Attachment & Human Development*, *14*(2), 101-117. https://doi.org/10.1080/14616734.2012.661217

Matheny, A. P. Jr., Wachs, T. D., Ludwig, J. L., & Phillips, K. (1995). Bringing order out of chaos: Psychometric characteristics of the Confusion, Hubbub, and Order Scale. *Journal of Applied Developmental Psychology, 16*, 429-444. https://doi.org/10. 1016/0193-3973(95)90028-4

Mills-Koonce, W. R., Willoughby, M. T., Garret-Peters, P., Wagner, N., Vernon-Feagans, L., & The Family Life Project Key Investigators (2016). The interplay among socio- economic status, household chaos, and parenting in the prediction of child conduct problems and callous-unemotional behaviors. *Development and Psychopathology*, *28*, 751-771. doi:10.1017/S0954579416000298

Netherlands Bureau for Economic Policy Analysis (CPB; 2019, September 17). *Macro Economische Verkenning (MEV) 2020 (Septemberraming)*[Press release]. Retreived from https://www.cpb.nl/macro-economische-verkenning-mev-2020#

Park, J. L., & Johnston, C. (2020). The relations among stress, executive functions, and harsh parenting in mothers. *Journal of Abnormal Child Psychology*. https://doi.org/10.1007/s10802-020-00622-x

Prevoo, M. J. L., Bodrij, F. F., Andeweg, S. M., & Alink, L. R. A. (2020). Changing chaos: The causal role of household chaos in child maltreatment - study 2 [preregistration]. https://doi.org/10.17605/OSF.IO/CUV6X

Sprague, J., Verona, E., Kalkhoff, W. & Kilmer, A. (2011). Moderators and mediators of the stress- aggression relationship: Executive function and state anger. *Emotion*, *11*(1), 61-73. doi: 10.1037/a0021788

Van Zeijl, J., Mesman, J., Van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Juffer, F., Stolk, M. N., et al. (2006). Attachment-based intervention for enhancing sensitive discipline in mothers of 1-to 3-year-old children at risk for externalizing behavior problems: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *74*(6), 994-1005. https://doi.org/10.1037/0022-006X.74.6.994

Vernon-Feagans, L., Garrett-Peters, P., Willoughby, M., Mills-Koonce, R., & The FLP Key Investigators (2012). Chaos, povery, and parenting: Predictors of early language development. *Early Childhood Research Quarterly*, *27*(3), 339-351. https://doi.org/10.1016/j.ecresq.2011.11.001

Vîslă, A., Constantino, M. J., Newkirk, K., Ogrodniczuk, J. S., & Söchting, I. (2016). The relation between outcome expectation, therapeutic alliance, and outcome among depressed patients in group cognitive-behavioral therapy. *Psychotherapy Research*, *28*(3), 446-456. https://doi.org/10.1080/10503307.2016.1218089

Wachs, T. D. (2013). Relation of maternal personality to perceptions of environmental chaos in the home. *Journal of Environmental Psychology*, *34*, 1-9. http://dx.doi.org/10.1016/j.jenvp.2012.11.003

Wachs, T. D., Francis, J., & McQuiston, S. (1979). Psychological dimensions of the infant's physical environment. *Infant Behav Dev.*, *2*, 155-61. https://doi.org/10.1016/S0163-6383(79)80017-X

Wang, Z., Deater-Deckard, K., & Bell, M. A. (2013). Household chaos moderates the link between maternal attribution bias and parenting. *Parenting*, *13*(4), 233-252. DOI: 10.1080/15295192.2013.832569

Weinstein, N. D. (1978). Individual differences in reactions to noise: a longitudinal study in a college dormitory. *Journal of Applied Psychology*, *63*(4), 458-466. https://doi.org/10.1037/0021-9010.63.4.458