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RESEARCH ARTICLE

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# Household chaos and parenting: The effect of household chaos does not depend on sensory-processing sensitivity and self-regulation

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**Abstract**

Previous studies have found evidence for a causal effect of household chaos on parenting and suggest that this effect may be stronger for parents with higher sensory-processing sensitivity (SPS) or lower self-regulation. This 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 a randomized controlled trial (RCT) design with an intervention aimed at reducing household chaos. A total of 125 parents of toddlers participated in the study. All participants were living in the Netherlands at the time of the study, 89% identified with the Dutch ethnicity and 11% with a non-Dutch ethnicity. Self-report as well as objective measures were used, including videotaped parent-child interactions and home observations. The effect of the intervention on parenting did not depend 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. However, this is a tentative finding that should be further explored in future research.

KEYWORDS
household chaos, parenting, RCT, self-regulation, sensory-processing sensitivity

## 1 | 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 et al., 1995) is related to lower parenting quality, such as more harsh or negative parenting and less positive parenting (e.g., Coldwell et al., 2006; Deater-Deckard et al., 2012; Dumas et al., 2005). As these studies were mostly correlational, results could not be interpreted causally. Two recent experimental studies showed evidence of the causal effect of household chaos on harsh discipline

and sensitivity (Andeweg et al., 2021, 2022). However, household chaos may not impact all parents equally. In order to know which parents are most at risk for a negative impact of household chaos on their parenting it is important to study factors that influence the effect of chaos. Two likely factors 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., 2021; Sprague et al., 2011). Therefore, in the current study we investigated 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. Previous research, including a systematic review, has consistently found that more (self-reported) 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; Marsh et al., 2020). Furthermore, parenting mediated the relation between more observed household chaos and child development, with more conduct and language development problems in more chaotic households (Mills-Koonce et al., 2016; Vernon-Feagans et al., 2012).

There is also evidence for the effect of experimentally manipulated chaos on parenting. In a lab setting, female young adults (non-parents) who took care of an infant simulator showed lower levels of sensitivity towards the infant simulator in a chaotic setting than in a neutral setting, showing a causal effect of chaos on sensitive caregiving (Andeweg et al., 2021). In addition, a previous examination of the data used in this study showed an effect of chaos on harsh discipline (Andeweg et al., 2022). A randomized controlled trial (RCT) was conducted testing whether an intervention aimed at reducing household chaos would improve parenting. Results showed a reduction in harsh discipline for parents in the intervention group compared to parents in the control group.

Although statistically significant, the effect of chaos on parenting is generally small. This raises the question whether some parents are more affected by household chaos than others. The answer to this question is important because parents who are more affected could benefit more from interventions aimed at reducing household chaos. Therefore, the current study investigated 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). Various studies underline the importance of SPS in general. In an experimental study, Aron et al. (2005) found that students with high SPS experienced more negative affect after a stress-inducing task than students with low SPS. In the work context, people with higher SPS experienced more work stress (Evers et al., 2008). Theoretically, SPS would be important in moderating the effect of the environment on behavior through an increased awareness of sensory input which can possibly lead to overstimulation and stronger emotional responses to environmental stimuli (Aron et al., 2012). In individuals with high levels of SPS, a chaotic environment—characterized by a large number of (strong) sensory stimuli—can lead to both overstimulation and a negative emotional response, which in turn can lead to more negative attributions of child behavior and as a result harsh and insensitive parenting, as supported by the Social Information Processing model (Beckerman et al., 2017, 2020; Milner, 1993, 2003). Parents with high SPS are expected 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). In addition, 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., 2021).

**KEY FINDINGS**

1. The intervention aimed at decreasing household chaos, reduced levels of harsh parenting, but effects on parenting were not moderated by self-regulation or sensory-processing sensitivity.
2. Explorative analyses tentatively showed that 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.
3. Sensory-processing sensitivity may not be an important moderator in low-risk families or may only moderate the effect of chaos in households with more extreme levels of household chaos.

Thus, 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 et al., 2013). Self-regulation also includes the capacity to think and behave flexibly (Burges, 1997). Low self-regulation has been linked directly to lower quality parenting (e.g., Crandall et al., 2015, Geeraerts et al., 2021). This is thought to be due to having lower inhibition and attention shifting skills, which would make it harder to refrain from harsh discipline and to maintain positive discipline strategies for parents with low self-regulation (e.g., Afifi et al., 2017). Chaotic environments may pose an additional challenge in parents with low self-regulatory skills, as they are generally more unpredictable and provide more stimulatory input and therefore require high levels of self-regulation to manage. For parents with low levels of self-regulation, navigating in a chaotic environment is more difficult and therefore, chaos may have a larger effect for these parents compared to parents with high levels of self-regulation. As a result, 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), which indeed confirms that better self-regulation might protect against the detrimental effect of household chaos on parenting. 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. Thus, it is currently not clear whether and how self-regulation moderates the effect of household chaos on sensitivity and harsh discipline.

### 1.1 | Current study

The aim of the current study was to test whether the causal effect of household chaos on parenting is stronger in parents with higher SPS or lower self-regulation. We expected that parents with higher SPS or lower self-regulation would show greater improvement in parenting quality (i.e., more sensitivity and less harsh discipline) after reducing household chaos, using an RCT design.

In Andeweg et al. (2022), we were not able to detect a significant reduction in measures of household chaos. As the focus on household chaos was the main difference between the intervention and control condition, and because we controlled for generic intervention elements, we assumed that the effect on harsh discipline was due to a reduction in household chaos. We assume that we were unable to measure this reduction because the measures we used were not sensitive enough. However, it is possible that the intervention was not effective as intended and that the effect on harsh discipline was not caused by a decrease in household chaos. Therefore, we also tested whether the relation between change in household chaos measures between pre- and posttest and parenting was moderated by SPS or self-regulation. This also allows us to test which element of household chaos affects parenting more strongly.

## 2 | METHOD

### 2.1 | Participants

This study uses the same dataset and thus the same population as in Andeweg et al. (2022). Dutch municipalities in the province of South Holland provided contact information of eligible parents. We recruited parents who spent the most time with their child of the age of around 1.5 years (i.e., primary caregivers). Exclusion criteria were: families with twins/multiples, 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, as children of this age contribute more in creating and reducing chaos than younger children. Inclusion criteria were that the child lived with the primary caregiver and that the primary caregiver was fluent in Dutch.

We sent out a screening questionnaire to 7550 families, which was completed by 2010 families. Parents who met all the above-mentioned criteria and 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 (792 families). 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 caregivers were 34.32 years old on average (standard deviation [SD] = 4.13; range between 23 and 44 years old). All participants were living in the Netherlands at the time of the study, 89% identified with the Dutch ethnicity and 11% with a non-Dutch ethnicity. The children were 19.17 months old on average (SD = 1.90; range between 14 and 28 months old; 54% boys). Our sample had a relatively

high socio-economic status, as 82% of the participants had a monthly household 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.

## 2.2 | Procedure

### 2.2.1 | 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. Both the pretest and posttest consisted of two separate visits of 1.5 and 1 h, respectively. Both the parent and child participated in the first visit, and only the parent participated in the second visit (scheduled 1 week apart). Participants gave informed consent 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, we observed the living room and child's bedroom to code clutter. In between the two visits within the pre- and posttest, a decibel meter in the living room measured 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 the two home visits.

### 2.2.2 | Intervention

After the pretest, participants were randomized to the intervention ($n$ = 60) or control group ($n$ = 65). We designed an intervention to reduce household chaos (see Andeweg et al., 2022), which consisted of four home visits and three follow-up phone calls, with 1 week in between. The intervention was based on a program aiming to change family routines in order to reduce obesity (Haines et al., 2013). During the intervention the parents set goals to decrease clutter and noise levels and to improve their family routines and week structure. Parents formulated goals to decrease clutter and noise levels and to increase family routines. No specific parenting advice was given. Each week, one topic was discussed. Parents determined the sequence of the topics after completing a Q-sort in which they rated the importance of the different aspects of household chaos for their wellbeing. 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 working towards their goal (Haines et al., 2013). At the end of the visit, the intervener and primary caregiver discussed how the other caregiver would be involved in achieving the goal. We planned 2 weeks in between home visits. One week after the home visits on a specific topic, the intervener called the participant to discuss all previous topics and sent two text messages to remind the parent of their goal. The intervention ended with a phone call to discuss all topics and to discuss how the parent would continue with the goals after the intervention. 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 intervention techniques.

### 2.2.3 | Control group

The control condition consisted of seven weekly phone calls about how the child was developing (e.g., playing, sleeping, eating). Similar to the control group in the intervention study by Van Zeijl et al. (2006), parents received a booklet with information about child development and discussed this during the weekly phone calls. Parents received two text messages per week with reminders about the discussed information. Interveners did not discuss household chaos with parents, nor did they give any specific parenting advice.

## 2.3 | Measures

### 2.3.1 | Sensitivity

We coded videos of the free play task and the naturalistic play task for sensitivity coding with the Ainsworth Sensitivity Scales for sensitivity and non-intrusiveness (Ainsworth et al., 1974). These are 9-point scales, 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, $N = 29$). Coders met regularly to prevent coder drift. As sensitivity and non-intrusiveness scores were strongly correlated ($p$s < .001 with $r$s 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.

### 2.3.2 | Harsh discipline

We coded harsh discipline from the videos of the don't touch task 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 (see Andeweg et al., 2022; Joosen et al., 2012), which are often used subscales for harsh discipline (e.g., Dumas et al., 2005). All subscales ranged from (1) to (5), with higher scores reflecting harsher 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, we regularly discussed coding 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 $r$s between .17 and .35, $p$s between < .001 and .070). A higher score reflected harsher discipline.

### 2.3.3 | Sensory-processing sensitivity

As sensory sensitivity is often seen as a two-dimensional construct consisting of esthetic or orienting sensitivity and ease of excitation/low sensory threshold to external stimuli such as noise (Evans & Rothbart, 2008), we measured two aspects of sensory-processing sensitivity: awareness and influence of stimuli in general and sensitivity to noise. 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., 2021), for example, we split "I am often aware how the color and lighting of a room affects my mood" into an item about color and an item about lighting. The questionnaire employs 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., 2021), for example, "At movies, whispering and crinkling candy wrappers disturb me." was split into an item for whispering and an item for crinkling candy wrappers. The questionnaire uses a 6-point Likert scale, 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.

### 2.3.4 | Self-regulation

The Go/No-go task, a response inhibition computer task, measured self-regulation (Braver et al., 2001). The letter "x" or "k" flashed on the screen briefly (1000–3000 ms) and participants 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. We used the number of correct rejections, that is, the number of times the participant rightfully did not press the space bar, as an indicator of self-regulation (Braver et al., 2001). A higher score reflected better self-regulation. The score was standardized.

### 2.3.5 | Household chaos

We measured household chaos in four ways during the pre- and posttest (see Andeweg et al., 2022). The CHAOS questionnaire measured 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). The CHAOS questionnaire was shown to be related to items from the Purdue Home Stimulation Inventory (PHSI; Wachs et al., 1979), the Home Observation for Measurement of the Environment (HOME; Caldwell &

Bradley, 1984), and the sound intensity level was assessed using a sound level meter (Matheny et al., 1995; Wachs, 2013). Therefore, we used a coding scheme based on the PHSI (see for predictive validity Wachs, 1986, 1989) and the Organization of the Environment subscale of the HOME resulting in 14 items to assess clutter by coding observations of the living room and the child's bedroom. 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, $N = 20$). We prevented coder drift 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). In addition, we measured noise with a decibel meter, which measured the dBA every second in the participant's living room during the 4 days when they were at home with their child. Mean dBA levels were calculated during the morning (7:00 a.m.–8:30 a.m.) and evening (5:30 p.m.–7:00 p.m.) and then averaged. Higher scores reflected more noise. During the same 4 days in which the decibel meter was used, we assessed family routines with a diary app (developed for the current study), through which parents answered at what time their family ate dinner and their child went to bed. Based on these 4 days, we calculated each parent's standard deviation for both mealtime and bedtime. The standard deviations for mealtime and bedtime were then standardized and averaged. A higher score indicated families were less consistent in at what time mealtime and bedtime occur, reflecting less stability in family routines. Change scores were calculated for each measure by subtracting the pretest from the posttest (descriptives and correlations for the change scores are presented in Table S1).

### 2.3.6 | General intervention elements

To control for general intervention elements, we measured perceived effectiveness and therapeutic alliance (Flückiger et al., 2012; Vîslă et al., 2016). All participants filled out a questionnaire about the intervention or control condition (see Andeweg et al., 2022). Perceived effectiveness consisted of 10 items, for example, "How fruitful was the intervention for your family as a whole?" from (1) Little, to (5) A lot (Cronbach's alpha = .96). Therapeutic alliance consisted of 12 items, for example, "How did you experience the contact with the intervener?" from (1) Bad cooperation, to (5) Good cooperation (Cronbach's alpha = .93). The distribution of therapeutic alliance scores was skewed, as most participants were positive about the intervener (standardized skewness = −6.93). The categorized or transformed versions of this variable correlated highly with the skewed variable (*r*s > .98) and we therefore decided to use the variable as is. Higher scores indicated more positive evaluations of perceived effectiveness and therapeutic alliance.

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

| | Intervention | | Control | |
|---|---|---|---|---|
| | Pretest | Posttest | Pretest | Posttest |
| | M (SD) | M (SD) | M (SD) | M (SD) |
| Self-reported household chaos | 2.30 (.41) | 2.20 (.42) | 2.28 (.40) | 2.24 (.48) |
| Clutter[a] | .02 (.46) | −.02 (.38) | −.01 (.41) | .02 (.50) |
| Noise | 43.63 (7.11) | 42.56 (5.71) | 43.80 (8.09) | 43.59 (5.35) |
| Family routines[a] | .00 (.64) | .02 (.69) | −.04 (.61) | −.07 (.70) |
| Harsh discipline | 4.02 (1.23) | 3.38 (1.01) | 3.61 (.98) | 3.62 (1.04) |
| Sensitivity free play | 6.63 (1.50) | 5.88 (1.78) | 6.51 (1.78) | 5.63 (1.71) |
| Sensitivity naturalistic | 6.97 (1.45) | 6.61 (1.63) | 7.35 (1.63) | 6.67 (1.62) |
| SPS: ATQ-OS[a] | .03 (1.04) | | −.03 (.96) | |
| SPS: NSS[a] | −.15 (.96) | | −.16 (1.02) | |
| Self-regulation[a] | .05 (1.01) | | −.06 (1.00) | |

*Note*: Descriptive statistics are based on observed cases.
Abbreviations: ATQ-OS, the Orienting Sensitivity Subscale from the Adult Temperament Questionnaire short form; NSS, Noise Sensitivity Scale; SD, standard deviation; SPS, sensory-processing sensitivity.
[a]Standardized scores.

## 2.4 | Analyses

Measures were normally distributed, except for therapeutic alliance. Missing data was minimal at item level and was handled by calculating adjusted means. Missing data was also minimal at measurement level, except for noise levels and the diary app to measure family routines. For these two measures, data were used if data was available for at least 2 out of the 4 intended days. 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 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 arbitrary 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 that included experimental condition first (i.e., intervention or control group) and the moderator as main effect, and then tested the interaction between

**TABLE 2** Correlations between experimental condition, SPS measures, self-regulation, household chaos, and parenting measures.

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

*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. Experimental condition is coded as 1 = dummy, 2 = intervention.

Abbreviations: ATQ-OS, the Orienting Sensitivity Subscale from the Adult Temperament Questionnaire short form; *Df*, degree of freedom; NSS, Noise Sensitivity Scale; SPS, sensory-processing sensitivity.

*$p < .05$, **$p < .01$, ***$p < .001$.

experimental condition and the moderator. For all moderators, we thus conducted a two-step stepwise multiple regression analysis for each parenting measure separately. In the first step, only main effects of predictors, moderator, and covariates were entered; in the second step, the interaction between the experimental condition and the moderator was added to the model from the first step. We included the pretest parenting score as a covariate, as the intervention group showed harsher discipline during pretest (M = 4.02, SD = 1.23) 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 we therefore included these as covariates (see Andeweg et al., 2022). Additional covariates were perceived effectiveness and therapeutic alliance, as these are known to affect treatment outcome (Flückiger et al., 2012). As we did not find effects of experimental condition—the intervention—on the household chaos variables that we measured (see Andeweg et al., 2022) but during data inspection noticed 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 (regardless of experimental condition). Although arguments against the use of difference scores have been made (De Haan et al, 2018), their reasoning relies on the different nature and magnitude of error variance in multiple observer scores. However, we obtained within-subject differences by a single rater, for which the reasoning of differential error variances does not hold. Alternatively, for Repeated Measures ANOVA, Oberfeld and Franke (2013) described clear limitations. Multilevel models with interactions and random effects are complex to estimate robustly and identifiably due to our limited sample size and having two time points. Finally, latent change models would suffer from similar stability issues due to the need of three parameters (latent associations, and latent (co)variance for each pre-post difference). Therefore, we opted for a combination of reduced complexity and interpretability over the risk of decreased reliability. By looking at patterns in all results combined, we aimed to guard against low reliability for single model results as much as possible. When testing change scores of household chaos as a predictor, we included the pretest score as a covariate because measures of household chaos are relatively stable over time (Andeweg et al., 2022) and to reduce random variance measured by the change score. A significance level of 5% was used for all model and parameter evaluations.

## 3 | RESULTS

Descriptive statistics and correlations between predictors, covariates and moderators are presented in Tables 1 and 2. There were no significant correlations between the two measures of sensory-processing sensitivity (ATQ-OS and NSS), self-regulation, and parenting measures or experimental condition (Table 2). Results reported hereafter are based on imputed data, except for $F$-statistics and adjusted $R^2$, as no multilevel combination rules exist for these measures (Table 3). Conclusions based on analyses using observed data only were equivalent, indicating robustness of our findings. In the first stepwise model, we entered the experimental condition, the moderator

**TABLE 3** Multiple regression analyses to predict posttest parenting (Harsh Discipline) by experimental condition, interaction with SPS: ATQ-OS, and covariates.

| | Harsh discipline | | | | | |
|---|---|---|---|---|---|---|
| | ***B* (SD)** | ***β*** | ***Df*** | ***t/F*** | ***p*** | **Adj. $R^2$** |
| Step 1 | | | 93 (9) | 2.11 | .037 | .09 |
| Intercept | 4.92 (1.66) | | 102.70 | 2.95 | .004 | |
| Experimental condition | −.64 (0.23) | −0.32 | 97.16 | −2.75 | .007 | |
| SPS: ATQ-OS | −.01 (0.10) | 0.02 | 99.35 | −.11 | .916 | |
| Pretest parenting | .05 (0.09) | | 101.29 | .60 | .553 | |
| Age of participant | −.02 (0.02) | | 100.42 | −.71 | .480 | |
| Age of child | −.02 (0.05) | | 105.76 | −.37 | .714 | |
| Participant education | .00 (0.09) | | 106.22 | .05 | .960 | |
| Number of children | −.09 (0.13) | | 99.55 | −.66 | .512 | |
| Perceived effectiveness | .37 (0.13) | | 85.26 | 2.91 | .005 | |
| Therapeutic alliance | −.14 (0.17) | | 87.61 | −.82 | .416 | |
| Step 2 | | | 92 (10) | 2.22 | .023 | .11 |
| Intercept | 4.75 (1.67) | | 100.27 | 2.83 | .006 | |
| Experimental condition | −.62 (0.23) | | 95.77 | −2.68 | .009 | |
| SPS: ATQ-OS | −.40 (0.34) | | 102.23 | −1.18 | .239 | |
| Condition*SPS: ATQ-OS | .25 (0.21) | -0.10 | 99.96 | 1.19 | .236 | |
| Pretest parenting | .03 (0.09) | | 100.32 | .35 | .726 | |
| Age of participant | −.01 (0.03) | | 97.83 | −.41 | .686 | |
| Age of child | −.02 (0.05) | | 104.90 | −.42 | .679 | |
| Participant education | .01 (0.09) | | 104.64 | .12 | .903 | |
| Number of children | −.07 (0.13) | | 97.33 | −.55 | .583 | |
| Perceived effectiveness | .38 (0.13) | | 83.43 | 2.92 | .005 | |
| Therapeutic alliance | −.15 (0.17) | | 83.85 | −.88 | .379 | |

*Note*: All statistics are based on multiply imputed data, except for the model statistics. Experimental condition was coded as 1 = control group, 2 = intervention. Standardized coefficients were provided for main variables only, not adjustment-only covariates.

Abbreviations: ATQ-OS, the Orienting Sensitivity Subscale from the Adult Temperament Questionnaire short form; *Df*, degree of freedom; NSS, Noise Sensitivity Scale; SD, standard deviation; SPS, sensory-processing sensitivity.

(i.e., sensory-processing sensitivity through the ATQ-OS or NSS, or self-regulation), the pretest parenting score, and covariates. In the second stepwise model, we added the interaction between experimental condition and the moderator. As the intervention group indeed reported higher therapeutic alliance (M = 4.51, SD = 0.53) and higher perceived effectiveness (M = 3.30, SD = 0.93) than the control group (M = 4.26, SD = 0.73; M = 2.18, SD = 0.78; $t$ [109] = −2.07, $p$ = .041, $d$ = −0.40, and t [109] = −6.81, $p$ < .001, $d$ = −1.30, respectively), we controlled for these variables in our analyses.

## 3.1 | Sensory-processing sensitivity

Sensory-processing sensitivity was assessed using two measures: the ATQ-OS and the NSS. Results are presented for these measures separately hereafter.

### 3.1.1 | ATQ-OS

For harsh discipline, a main effect of experimental condition was found in the first stepwise model, with lower posttest harsh discipline in the intervention group (see Table 3). No main effect of the ATQ-OS was found. In the second stepwise model, the interaction between experimental condition and ATQ-OS was not significant. For sensitivity during free play, no main effects of experimental condition or ATQ-OS were found in the first step, and no interaction between experimental condition and ATQ-OS was found in the second step (Table 4). For sensitivity in the naturalistic setting also no main effects or interaction between experimental condition or ATQ-OS were found (Table 5). Thus, effects of the chaos intervention on the different parenting outcomes did not depend on parents' ATQ-OS levels.

**TABLE 4** Multiple regression analyses to predict posttest parenting (Sensitivity—Free play) by experimental condition, interaction with SPS: ATQ-OS, and covariates.

| | Sensitivity (free play) | | | | | |
|---|---|---|---|---|---|---|
| | ***B* (SD)** | ***B*** | ***Df*** | ***t/F*** | ***p*** | **Adj. $R^2$** |
| Step 1 | | | 92 (9) | 3.01 | .003 | .15 |
| Intercept | 1.27 (2.44) | | 103.65 | .52 | .604 | |
| Experimental condition | .35 (.37) | .10 | 102.28 | .96 | .338 | |
| SPS: ATQ-OS | −.00 (.16) | .03 | 103.54 | −.01 | .992 | |
| Pretest parenting | .37 (.10) | | 109.40 | 3.86 | <.001 | |
| Age of participant | .01 (.04) | | 104.79 | .29 | .771 | |
| Age of child | .03 (.08) | | 107.14 | .39 | .696 | |
| Participant education | .19 (.15) | | 108.90 | 1.29 | .199 | |
| Number of children | .07 (.20) | | 105.90 | .36 | .721 | |
| Perceived effectiveness | −.07 (.20) | | 93.12 | −.33 | .743 | |
| Therapeutic alliance | −.18 (.26) | | 97.74 | −.68 | .501 | |
| Step 2 | | | 91 (10) | 2.70 | .006 | .14 |
| Intercept | 1.40 (2.50) | | 102.37 | .56 | .576 | |
| Experimental condition | .35 (.37) | | 101.46 | .95 | .342 | |
| SPS: ATQ-OS | .15 (.54) | | 101.28 | .28 | .777 | |
| Condition*SPS: ATQ-OS | −.10 (.33) | .09 | 100.94 | −.30 | .765 | |
| Pretest parenting | .37 (.10) | | 108.39 | 3.81 | <.001 | |
| Age of participant | .01 (.04) | | 102.47 | .20 | .843 | |
| Age of child | .03 (.08) | | 106.42 | .40 | .691 | |
| Participant education | .19 (.15) | | 107.94 | 1.26 | .210 | |
| Number of children | .07 (.21) | | 104.57 | .33 | .745 | |
| Perceived effectiveness | −.07 (.20) | | 92.51 | −.33 | .740 | |
| Therapeutic alliance | −.17 (.26) | | 97.37 | −.65 | .518 | |

*Note*: All statistics are based on multiply imputed data, except for the model statistics. Experimental condition was coded as 1 = control group, 2 = intervention. Standardized coefficients were provided for main variables only, not adjustment-only covariates.

Abbreviations: ATQ-OS, the Orienting Sensitivity Subscale from the Adult Temperament Questionnaire short form; *Df*, degree of freedom; NSS, Noise Sensitivity Scale; SD, standard deviation; SPS, sensory-processing sensitivity.

### 3.1.2 | NSS

We also tested for moderation by SPS by analyzing the NSS as the moderator (see Table 6). Again, a main effect of experimental condition on harsh discipline was found in the first stepwise model. In the second stepwise model, we found no interaction between experimental condition and the NSS. For sensitivity during free play, we found no main effects and no interaction effect between experimental condition and the NSS in the second stepwise model (Table 7). This was similar for sensitivity in the naturalistic setting (Table 8). This meant that effects of the chaos intervention on the different parenting outcomes did not depend on NSS.

## 3.2 | Self-regulation

For harsh discipline, a main effect of experimental condition was again found in the first step (see Table 9). No main effect of self-regulation was found. In the second stepwise model, the interaction between condition and self-regulation was not significant. For sensitivity during free play, no main effects of experimental condition or self-regulation were found in the first stepwise model, and no interaction between experimental condition and self-regulation was found in the second stepwise model (Table 10). For sensitivity in the naturalistic setting again no main effects were found, and in the second step, no interaction between experimental condition or self-regulation was found (Table 11). Thus, effects of the chaos intervention on the different parenting outcomes did not depend on parents' self-regulation.

## 3.3 | Change scores on household chaos

In the following analyses we did not test the effect of experimental condition but analyzed the moderation of relations between change scores in household chaos

**TABLE 5** Multiple regression analyses to predict posttest parenting (Sensitivity—Naturalistic) by experimental condition, interaction with SPS: ATQ-OS, and covariates.

| | Sensitivity (naturalistic) | | | | | |
|---|---|---|---|---|---|---|
| | B (SD) | B | *Df* | *t*/*F* | *p* | Adj. $R^2$ |
| Step 1 | | | 88 (9) | 1.93 | .058 | .08 |
| Intercept | .34 (2.42) | | 103.56 | .14 | .888 | |
| Experimental condition | .18 (.35) | .07 | 101.64 | .52 | .608 | |
| SPS: ATQ-OS | .07 (.15) | −.04 | 106.75 | .48 | .631 | |
| Pretest parenting | .26 (.10) | | 105.68 | 2.72 | .008 | |
| Age of participant | .01 (.04) | | 104.99 | .38 | .706 | |
| Age of child | .02 (.07) | | 107.59 | .29 | .774 | |
| Participant education | .31 (.14) | | 105.01 | 2.22 | .029 | |
| Number of children | .21 (.20) | | 101.52 | 1.07 | .288 | |
| Perceived effectiveness | −.14 (.19) | | 93.13 | −.73 | .469 | |
| Therapeutic alliance | .24 (.25) | | 97.30 | .97 | .334 | |
| Step 2 | | | 87 (10) | 1.71 | .090 | .07 |
| Intercept | .16 (2.48) | | 102.51 | .06 | .949 | |
| Experimental condition | .19 (.35) | | 100.71 | .53 | .596 | |
| SPS: ATQ-OS | −.11 (.51) | | 100.69 | −.22 | .823 | |
| Condition*SPS: ATQ-OS | .12 (.31) | | 101.58 | .38 | .706 | |
| Pretest parenting | .27 (.10) | | 104.78 | 2.74 | .007 | |
| Age of participant | .02 (.04) | | 103.00 | .47 | .642 | |
| Age of child | .02 (.08) | | 106.76 | .28 | .776 | |
| Participant education | .31 (.14) | | 104.37 | 2.23 | .028 | |
| Number of children | .22 (.20) | | 100.42 | 1.10 | .275 | |
| Perceived effectiveness | −.14 (.19) | | 92.45 | −.73 | .469 | |
| Therapeutic alliance | .23 (.25) | | 96.99 | .94 | .349 | |

*Note*: All statistics are based on multiply imputed data, except for the model statistics. Experimental condition was coded as 1 = control group, 2 = intervention. Standardized coefficients were provided for main variables only, not adjustment-only covariates.

Abbreviations: ATQ-OS, the Orienting Sensitivity Subscale from the Adult Temperament Questionnaire short form; *Df*, degree of freedom; SD, standard deviation; SPS, sensory-processing sensitivity.

(separately for self-reported household chaos, observed clutter, noise assessed with a decibel meter, and family routines assessed using a diary app) and parenting. 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 standardized numerical scales for either SPS (ATQ-OS or NSS) or self-regulation was added. The detailed results of these analyses can be found in Tables S2 through S13 in the supplemental materials. 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 and Table S3). 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: The effects of changes in household chaos on parenting did not depend on SPS or self-regulation.

## 4 | DISCUSSION

The aim of the current report was to study whether experimentally reducing household chaos leads to a stronger

**TABLE 6** Multiple regression analyses to predict posttest parenting (Harsh Discipline) by experimental condition, interaction with SPS: NSS, and covariates.

| | Harsh discipline | | | | | |
|---|---|---|---|---|---|---|
| | **B (SD)** | ***β*** | ***Df*** | ***t*/*F*** | ***p*** | **Adj. $R^2$** |
| Step 1 | | | 83 (9) | 3.37 | .001 | .19 |
| Intercept | 5.06 (1.69) | | 101.06 | 2.99 | .004 | |
| Experimental condition | −.65 (.23) | −.32 | 96.84 | −2.80 | .006 | |
| SPS: NSS | .04 (.19) | .02 | 67.95 | .31 | .756 | |
| Pretest parenting | .05 (.09) | | 100.84 | .57 | .571 | |
| Age of participant | −.02 (0.03) | | 99.15 | −.77 | .444 | |
| Age of child | −.02 (0.05) | | 105.02 | −.41 | .685 | |
| Participant education | .00 (0.09) | | 106.21 | .00 | .997 | |
| Number of children | −.08 (0.13) | | 94.94 | −.56 | .578 | |
| Perceived effectiveness | .37 (0.13) | | 86.01 | 2.91 | .005 | |
| Therapeutic alliance | −.14 (0.17) | | 87.64 | −.84 | .401 | |
| Step 2 | | | 82 (10) | 3.02 | .003 | .18 |
| Intercept | 5.04 (1.70) | | 100.26 | 2.97 | .004 | |
| Experimental condition | −.67 (.23) | | 96.05 | −2.86 | .005 | |
| SPS: NSS | .31 (.36) | | 73.11 | .87 | .385 | |
| Condition*SPS: NSS | −.18 (.23) | −0.10 | 71.19 | −.80 | .424 | |
| Pretest parenting | .06 (.09) | | 99.62 | .67 | .503 | |
| Age of participant | −.02 (.03) | | 97.72 | −.81 | .419 | |
| Age of child | −.02 (.05) | | 103.09 | −.42 | .677 | |
| Participant education | .01 (.09) | | 104.76 | .10 | .922 | |
| Number of children | −.06 (.14) | | 93.82 | −.44 | .662 | |
| Perceived effectiveness | .38 (.13) | | 85.00 | 2.96 | .004 | |
| Therapeutic alliance | −.15 (.17) | | 85.50 | −.88 | .379 | |

*Note*: All statistics are based on multiply imputed data, except for the model statistics. Experimental condition was coded as 1 = control group, 2 = intervention. Standardized coefficients were provided for main variables only, not adjustment-only covariates.

Abbreviations: *Df*, degree of freedom; NSS, Noise Sensitivity Scale; SD, standard deviation; SPS, sensory-processing sensitivity.

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. In addition to comparing the intervention group and control group, we also analyzed change scores of household chaos measures. This also indicated that an effect on parenting did not depend 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.

## 4.1 | SPS

Our analyses based on intervention effects as well as on the change scores of household chaos indicated that the relation with parenting did not depend on SPS. This contradicts previous findings (e.g., Andeweg et al., 2021). The difference in findings could be a result of not establishing a sufficiently large effect on household chaos in the current study, whereas in the experimental study that did find moderation by SPS, the difference in chaos between the experimental and control condition was large (see also Andeweg et al., 2021). 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 (Andeweg et al., 2022), 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 (and to a certain extent self-regulation) are not important moderators 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

**TABLE 7** Multiple regression analyses to predict posttest parenting (Sensitivity—Free play) by experimental condition, interaction with SPS: NSS, and covariates.

| | Sensitivity (free play) | | | | | |
|---|---|---|---|---|---|---|
| | ***B* (SD)** | ***β*** | ***Df*** | ***t/F*** | ***p*** | **Adj. $R^2$** |
| Step 1 | | | 82 (9) | 2.61 | .010 | .14 |
| Intercept | 1.41 (2.47) | | 103.76 | .57 | .569 | |
| Experimental condition | .34 (.37) | .10 | 101.94 | .91 | .363 | |
| SPS: NSS | .07 (.17) | .03 | 86.83 | .40 | .691 | |
| Pretest parenting | .37 (.10) | | 109.15 | 3.86 | <.001 | |
| Age of participant | .01 (.04) | | 104.36 | .23 | .819 | |
| Age of child | .03 (.08) | | 106.89 | .40 | .691 | |
| Participant education | .18 (.15) | | 108.46 | 1.25 | .213 | |
| Number of children | .09 (.21) | | 103.43 | .44 | .661 | |
| Perceived effectiveness | −.07 (.20) | | 93.93 | −.37 | .714 | |
| Therapeutic alliance | −.18 (.26) | | 97.45 | −.70 | .486 | |
| Step 2 | | | 81 (10) | 2.43 | .014 | .14 |
| Intercept | 1.38 (2.48) | | 103.13 | .56 | .579 | |
| Experimental condition | .34 (.37) | | 100.90 | .93 | .356 | |
| SPS: NSS | −.19 (.52) | | 91.73 | −.35 | .724 | |
| Condition*SPS: NSS | .17 (.33) | 0.09 | 90.76 | .51 | .610 | |
| Pretest parenting | .37 (.10) | | 108.27 | 3.84 | <.001 | |
| Age of participant | .01 (.04) | | 103.98 | .27 | .791 | |
| Age of child | .03 (.08) | | 105.09 | .41 | .680 | |
| Participant education | .18 (.15) | | 106.81 | 1.19 | .237 | |
| Number of children | .08 (.21) | | 102.42 | .37 | .711 | |
| Perceived effectiveness | −.08 (.20) | | 92.87 | −.40 | .691 | |
| Therapeutic alliance | −.17 (.26) | | 96.83 | −.67 | .502 | |

*Note*: All statistics are based on multiply imputed data, except for the model statistics. Experimental condition was coded as 1 = control group, 2 = intervention. Standardized coefficients were provided for main variables only, not adjustment-only covariates.
Abbreviations: *Df*, degree of freedom; NSS, Noise Sensitivity Scale; SD, standard deviation; SPS, sensory-processing sensitivity.

sample, even though we invited the more chaotic families to participate in the study. In the study by Andeweg et al. (2021), the chaos condition was evaluated as very chaotic.

Furthermore, the families participating in our study were relatively affluent (relatively high educational levels, high income, two-parent families). It is possible that the effect of household chaos on parenting is only stronger for parents with higher SPS in highly chaotic environments and/or environments characterized by other adverse circumstances, taxing the parents' ability to deal with stressors.

Lastly, in the study by Andeweg et al. (2021), 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.

## 4.2 | Self-regulation

Similar reasoning may hold for not finding a moderating effect of self-regulation on the effectiveness of the intervention. Nevertheless, our analyses based on change scores indicated that 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 the 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

**TABLE 8** Multiple regression analyses to predict posttest parenting (Sensitivity—Naturalistic) by experimental condition, interaction with SPS: NSS, and covariates.

| | Sensitivity (naturalistic) | | | | | |
|---|---|---|---|---|---|---|
| | B (SD) | β | *Df* | *t*/*F* | *p* | Adj. $R^2$ |
| Step 1 | | | 78 (9) | 1.48 | .169 | .05 |
| Intercept | .03 (2.45) | | 103.99 | .01 | .990 | |
| Experimental condition | .22 (.35) | 0.07 | 101.61 | .62 | .535 | |
| SPS: NSS | −.11 (.16) | −0.04 | 88.08 | −.71 | .481 | |
| Pretest parenting | .27 (.10) | | 104.97 | 2.77 | .007 | |
| Age of participant | .02 (.04) | | 104.70 | .53 | .596 | |
| Age of child | .02 (.07) | | 107.94 | .33 | .743 | |
| Participant education | .31 (.14) | | 105.23 | 2.25 | .027 | |
| Number of children | .18 (.20) | | 98.56 | .89 | .373 | |
| Perceived effectiveness | −.13 (.19) | | 93.28 | −.69 | .491 | |
| Therapeutic alliance | .23 (.24) | | 97.78 | .96 | .341 | |
| Step 2 | | | 77 (10) | 1.35 | .218 | .04 |
| Intercept | .03 (2.46) | | 103.45 | .01 | .991 | |
| Experimental condition | .21 (.35) | | 101.07 | .63 | .532 | |
| SPS: NSS | −.18 (.51) | | 88.87 | −.35 | .726 | |
| Condition*SPS: NSS | .04 (.31) | 0.10 | 91.39 | .13 | .894 | |
| Pretest parenting | .26 (.10) | | 103.77 | 2.70 | .008 | |
| Age of participant | .02 (.04) | | 103.66 | .54 | .590 | |
| Age of child | .03 (.08) | | 106.86 | .34 | .736 | |
| Participant education | .31 (.14) | | 104.37 | 2.23 | .028 | |
| Number of children | .18 (.20) | | 97.90 | .87 | .385 | |
| Perceived effectiveness | −.13 (.19) | | 92.73 | −.70 | .485 | |
| Therapeutic alliance | .23 (.25) | | 96.95 | .95 | .342 | |

*Note*: All statistics are based on multiply imputed data, except for the model statistics. Experimental condition was coded as 1 = control group, 2 = intervention. Standardized coefficients were provided for main variables only, not adjustment-only covariates.

Abbreviations: *Df*, degree of freedom; NSS, Noise Sensitivity Scale; SD, standard deviation; SPS, sensory-processing sensitivity.

from harsh parenting and to conduct positive parenting instead.

We found that a decrease in household chaos related to less harsh discipline in parents with higher self-regulation, while expecting to find this for parents with lower self-regulation (see e.g., Park & Johnston, 2020; Sprague et al., 2011). Instead, we found that for parents with lower self-regulation, a stronger decrease in household chaos 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, that is, parents with higher self-regulation, and may be challenging for parents with lower self-regulation. This is in line with the theory that self-regulation is a limited source (Baumeister et al., 1998, 2007). For parents with low self-regulation to benefit from decreasing household chaos, the new routines around household chaos may need more time to become automated and to free up cognitive capacities needed to inhibit harsh discipline. For parents with higher self-regulation this may be easier, as they are thought to be better and faster in adopting new habits (Gillebaart & De Ridder, 2015).

This result needs to be interpreted with caution for two reasons. First, we only found significant moderation for self-reported household chaos and not for other measures of household chaos, which does not provide strong evidence of moderation. However, 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 routines.

**TABLE 9** Multiple regression analyses to predict posttest parenting (Harsh Discipline) by experimental condition, interaction with self-regulation, and covariates.

| | Harsh discipline | | | | | |
|---|---|---|---|---|---|---|
| | B (SD) | β | *Df* | *t*/*F* | *p* | Adj. $R^2$ |
| Step 1 | | | 88 (9) | 1.78 | .083 | .07 |
| Intercept | 498 (1.69) | | 102.48 | 2.95 | .004 | |
| Experimental condition | −.65 (.23) | −0.31 | 97.35 | −2.78 | .007 | |
| Self-regulation | .02 (.10) | −0.02 | 107.33 | .22 | .825 | |
| Pretest | .05 (.09) | | 100.52 | .58 | .565 | |
| Age participant | −.02 (.02) | | 100.50 | −.75 | .458 | |
| Age child | −.02 (.05) | | 105.64 | −.40 | .692 | |
| Participant education | .00 (.09) | | 105.86 | .03 | .979 | |
| Number of children | −.08 (.13) | | 100.51 | −.63 | .532 | |
| Perceived effectiveness | .37 (.13) | | 85.33 | 2.91 | .005 | |
| Therapeutic alliance | −.13 (.17) | | 88.73 | −.80 | .426 | |
| Step 2 | | | 87 (10) | 1.60 | .120 | .06 |
| Intercept | 5.01 (1.70) | | 101.25 | 2.95 | .004 | |
| Experimental condition | −.65 (.23) | | 96.24 | −2.77 | .007 | |
| Self-regulation | .08 (.31) | | 102.80 | .27 | .790 | |
| Condition*Self-regulation | −.04 (.20) | 0.06 | 102.71 | −.21 | .833 | |
| Pretest | .05 (.09) | | 99.43 | .58 | .565 | |
| Age of participant | −.02 (.03) | | 97.61 | −.77 | .445 | |
| Age of child | −.02 (.05) | | 104.91 | −.40 | .689 | |
| Participant education | .00 (.09) | | 105.24 | .04 | .968 | |
| Number of children | −.08 (.13) | | 99.43 | −.64 | .526 | |
| Perceived effectiveness | .38 (.13) | | 85.07 | 2.91 | .005 | |
| Therapeutic alliance | −.13 (.17) | | 88.51 | −.79 | .434 | |

*Note*: All statistics are based on multiply imputed data, except for the model statistics. Experimental condition was coded as 1 = control group, 2 = intervention. Standardized coefficients were provided for main variables only, not adjustment-only covariates.
Abbreviations: *Df*, degree of freedom; NSS, Noise Sensitivity Scale; SD, standard deviation; SPS, sensory-processing sensitivity.

Second, we found moderation by self-regulation when testing change scores but not when testing for the effect of the intervention, meaning we cannot infer causality in these analyses. Therefore, it is possible a third variable is at play which is related to household chaos as well as harsh discipline, for instance stress (Beckerman et al., 2017; Brown et al., 2019).

## 4.3 | Limitations and strengths

Strengths of the current study include the use of multiple measures for parenting and household chaos, and the use of objective as well as self-report measures. A limitation is that, if there indeed was an effect of the intervention on chaos, this could not be detected by the measures we used to assess chaos (see Andeweg et al., 2022). 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 number of analyses on the other hand, meaning we should interpret the significant result with caution.

Another limitation is the use of only one measure of self-regulation. Using multiple measures of self-regulation, for instance our computer task combined with a self-report measure, to compute a latent variable for self-regulation is recommended to overcome the variance inherent to the used task (see Andrews et al., 2021 and Miyake & Friedman, 2012). In addition, we have argued that cognitive and behavioral flexibility may play a role in successfully navigating chaotic environments, thus a measure assessing this specific part of self-regulation may have been informative.

Lastly, our sample was fairly low-risk, consisting of parents with high levels of obtained education and income.

**TABLE 10** Multiple regression analyses to predict posttest parenting (Sensitivity—Free play) by experimental condition, interaction with self-regulation, and covariates.

| | Sensitivity (free play) | | | | | |
|---|---|---|---|---|---|---|
| | **B (SD)** | **β** | ***Df*** | ***t*/*F*** | ***P*** | **Adj. $R^2$** |
| Step 1 | | | 87 (9) | 3.00 | .004 | .16 |
| Intercept | 1.24 (2.47) | | 103.83 | .50 | .617 | |
| Experimental condition | .35 (.37) | .10 | 102.71 | .95 | .342 | |
| Self-regulation | −.01 (.16) | .01 | 96.29 | −.06 | .949 | |
| Pretest | .37 (.10) | | 109.36 | 3.85 | <.001 | |
| Age of participant | .01 (.04) | | 105.43 | .30 | .766 | |
| Age of child | .03 (.08) | | 106.87 | .40 | .688 | |
| Participant education | .19 (.15) | | 108.00 | 1.29 | .201 | |
| Number of children | .07 (.21) | | 105.72 | .35 | .725 | |
| Perceived effectiveness | −.07 (.20) | | 93.01 | −.32 | .747 | |
| Therapeutic alliance | −.17 (.26) | | 97.25 | −.68 | .498 | |
| Step 2 | | | 86 (10) | 2.70 | .006 | .15 |
| Intercept | 1.06 (2.50) | | 102.03 | .43 | .671 | |
| Experimental condition | .37 (.37) | | 101.65 | .99 | .322 | |
| Self-regulation | −.38 (.55) | | 81.61 | −.69 | .490 | |
| Condition*Self-regulation | .25 (.34) | | 85.41 | .72 | .472 | |
| Pretest | .37 (.10) | | 107.76 | 3.78 | <.001 | |
| Age of participant | .02 (.04) | | 100.79 | .44 | .658 | |
| Age of child | .04 (.08) | | 105.83 | .43 | .666 | |
| Participant education | .18 (.15) | | 107.38 | 1.25 | .215 | |
| Number of children | .09 (.21) | | 104.62 | .42 | .675 | |
| Perceived effectiveness | −.08 (.20) | | 92.65 | −.39 | .695 | |
| Therapeutic alliance | −.18 (.26) | | 97.07 | −.71 | .478 | |

*Note*: All statistics are based on multiply imputed data, except for the model statistics. Experimental condition was coded as 1 = control group, 2 = intervention. Standardized coefficients were provided for main variables only, not adjustment-only covariates.
Abbreviations: *Df*, degree of freedom; SD, standard deviation.

Studies have shown that household chaos is higher in low-SES families (e.g., Dumas et al., 2005). This could also explain why our measures of household chaos and parenting were mostly uncorrelated in our sample, in contrast to previous studies with more diverse samples in terms of SES, which found relations between high levels of household chaos and lower quality parenting (e.g. Coldwell et al., 2006; Corapci & Wachs, 2002; Dumas et al., 2005; Matheny et al., 1995). As low parental education and unemployment are known risk factors for child maltreatment (Van Berkel et al., 2020) and are related to more household chaos (e.g., Wang et al., 2013), it is desirable to study whether household chaos affects parenting in a low-SES sample and which parents benefit most in terms of parenting from reducing household chaos. Alternatively, findings of an effect of chaos under absence of an effect of SES cannot rule out a contribution of SES in a multivariate approach.

## 4.4 | Future research and implications

As societal costs of parenting problems are high, it is important to know which parents benefit most from specific interventions in order to use interventions efficiently and effectively. We found some preliminary evidence that the relation between self-reported household chaos and 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 is needed to clarify whether self-regulation is indeed a moderator of the effect of household chaos on parenting, and whether (preventive) intervention efforts should specifically target parents with high or low self-regulation. Potentially, parents with lower self-regulation may benefit from a more gradual decrease in household chaos (Gillebaart & De Ridder, 2015). Another

**TABLE 11** Multiple regression analyses to predict posttest parenting (Sensitivity—Naturalistic) by experimental condition, interaction with self-regulation, and covariates.

| | Sensitivity (naturalistic) | | | | | |
|---|---|---|---|---|---|---|
| | B (SD) | β | *Df* | *t*/*F* | *p* | Adj. $R^2$ |
| Step 1 | | | 83 (9) | 1.81 | .079 | .07 |
| Intercept | −.19 (2.45) | | 102.01 | −.08 | .937 | |
| Experimental condition | .22 (0.34) | .07 | 102.01 | .64 | .521 | |
| Self-regulation | −.20 (.15) | .13 | 103.93 | −1.38 | .169 | |
| Pretest | .27 (.10) | | 105.20 | 2.78 | .006 | |
| Age of participant | .02 (.04) | | 105.50 | .59 | .557 | |
| Age of child | .04 (.08) | | 106.41 | .48 | .632 | |
| Participant education | .33 (.14) | | 104.49 | 2.35 | .021 | |
| Number of children | .17 (.20) | | 102.17 | .90 | .373 | |
| Perceived effectiveness | −.13 (.19) | | 94.20 | −.72 | .472 | |
| Therapeutic alliance | .20 (.24) | | 98.54 | .84 | .405 | |
| Step 2 | | | 82 (10) | 1.62 | .117 | .06 |
| Intercept | −.21 (2.47) | | 101.22 | −.08 | .933 | |
| Experimental condition | .22 (.35) | | 101.09 | .65 | .520 | |
| Self-regulation | −.21 (.47) | | 104.63 | −.45 | .655 | |
| Condition*Self-regulation | .00 (.30) | −.00 | 102.11 | .01 | .988 | |
| Pretest | .27 (.10) | | 104.22 | 2.76 | .007 | |
| Age of participant | .02 (.04) | | 103.43 | .58 | .566 | |
| Age of child | .04 (.08) | | 105.61 | .48 | .630 | |
| Participant education | .33 (.14) | | 103.73 | 2.34 | .021 | |
| Number of children | .17 (.20) | | 101.33 | .89 | .378 | |
| Perceived effectiveness | −.14 (.19) | | 93.56 | −.72 | .471 | |
| Therapeutic alliance | .20 (.24) | | 97.60 | .83 | .406 | |

*Note*: All statistics are based on multiply imputed data, except for the model statistics. Experimental condition was coded as 1 = control group, 2 = intervention. Standardized coefficients were provided for main variables only, not adjustment-only covariates.
Abbreviations: *Df*, degree of freedom; SD, standard deviation.

possibility is that self-regulation functions as a mediator in the effect of household chaos on parenting (e.g., Crandall et al., 2015). As high-risk families generally have more chaotic households and lower parental self-regulation (Deater-Deckard et al., 2012; Dumas et al., 2005), it is worthwhile to further investigate whether self-regulation mediates the effect of household chaos on parenting.

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).

## 4.5 | Conclusion

In conclusion, we found no support for moderation by self-regulation or SPS in the causal effect of household chaos on parenting. For self-regulation, we found only preliminary support for moderation of the (non-causal) relation between household chaos and harsh discipline. Research needs to experimentally test other roles of self-regulation in the chaos-parenting relation, such as whether self-regulation mediates the effect of household chaos on parenting. In low-risk families, SPS may not be an important factor in how strongly household chaos affects parenting, or very high levels of household chaos may be necessary before parents with higher SPS benefit more strongly from a reduction of household chaos. 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.

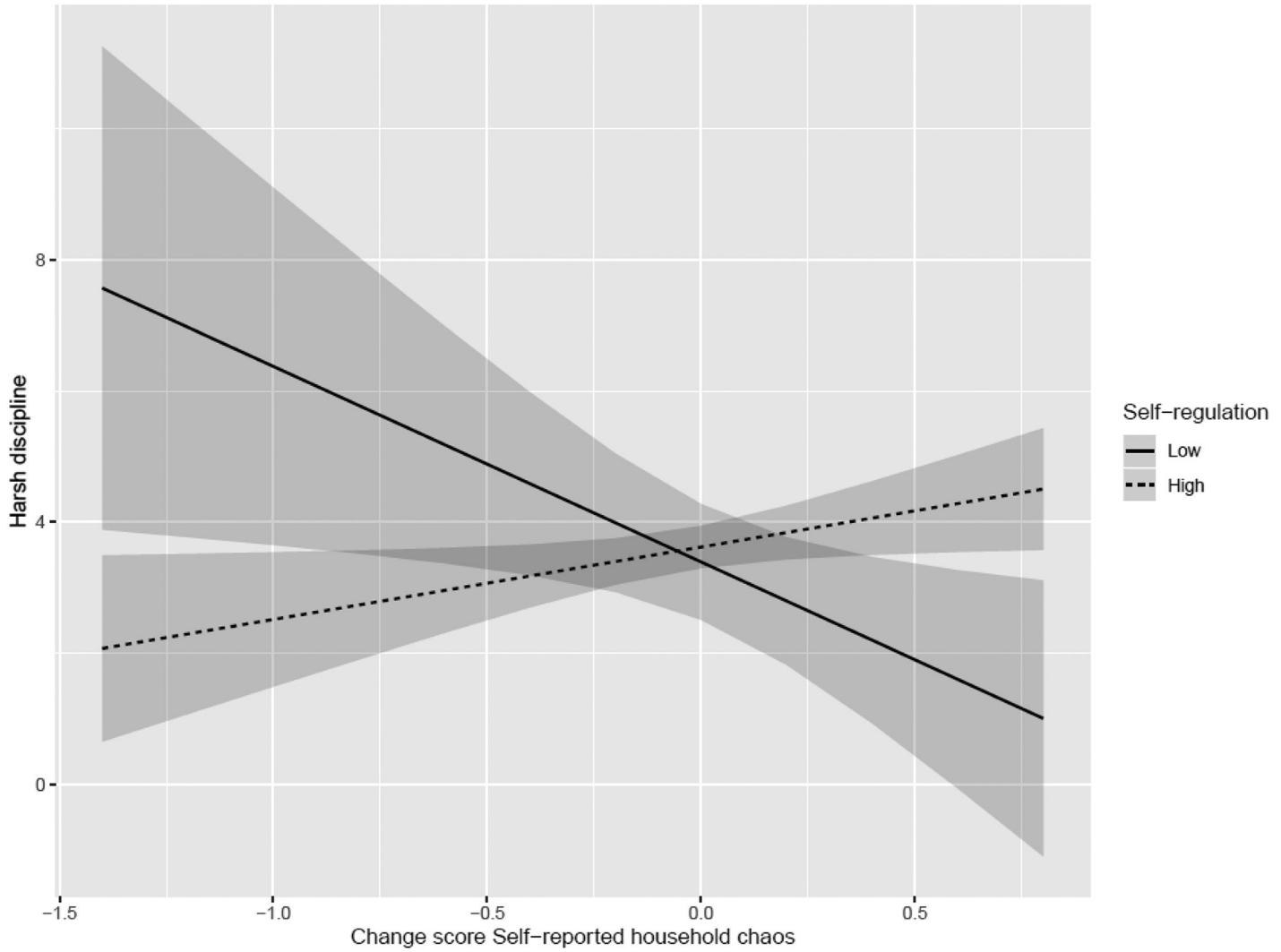


**FIGURE 1** The relation between the change score of self-reported household chaos on harsh discipline at posttest, moderated by self-regulation. *Note*: A negative change score on self-reported household chaos represents a decrease in self-reported household chaos. Highlighted areas reflect the range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

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## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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## REFERENCES

Afifi, T. O., Mota, N., Sareen, J., & MacMillan, H. L. (2017). The relationships between harsh physical punishment and child maltreatment in childhood and intimate partner violence in adulthood. *BMC Public Health*, *17*, 493. https://doi.org/10.1186/s12889-017-4359-8

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 University Press.

Andeweg, S. M., Bodrij, F. F., Prevoo, M. J. L., Rippe, R. C. A., & Alink, L. R. A. (2021). Does sensory-processing sensitivity moderate the effect of household chaos on caregiver sensitivity? An experimental design. *Journal of Family Psychology*, *35*(3), 356–365. https://doi.org/10.1037/fam0000766

Andeweg, S. M., Bodrij, F. F., Prevoo, M. J. L., Rippe, R. C. A., & Alink, L. R. A. (2022). Reducing household chaos as a way to improve parenting quality? An RCT. *Journal of Applied Developmental Psychology*, *80*, 101398. https://doi.org/10.1016/j.appdev.2022.101398

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. https://doi.org/10.1037/0022-3514.73.2.345

Aron, E. N., Aron, A., & Davies, K. M. (2005). Adult shyness: The interaction of temperamental sensitivity and an adverse childhood environment. *Personality and Social Psychology Bulletin*, *31*(2), 181–197. https://doi.org/10.1177/0146167204271419

Aron, E. N., Aron, A., & Jagiellowicz, J. (2012). Sensory processing sensitivity: A review in the light of the evolution of biological responsivity. *Personality and Social Psychology Review*, *16*, 262–282. https://doi.org/10.1177/2F1088868311434213

Andrews, K., Atkinson, L., Harris, M., & Gonzalez, A. (2021). Examining the effects of household chaos on child executive functions: A meta-analysis. *Psychological Bulletin*, *147*(1), 16–32. https://doi.org/10.1037/bul0000311

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, *74*, 1252–1265. https://doi.org/10.1037/0022-3514.74.5.1252

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*, 351–355. https://doi.org/10.1111/j.1467-8721.2007.00534.x

Beckerman, M., Van Berkel, S. R., Mesman, J., & Alink, L. R. A. (2017). The role of negative parental attributions in the associations between daily stressors, maltreatment history, and harsh and abusive parenting. *Child Abuse & Neglect*, *64*, 109–116. https://doi.org/10.1016/j.chiabu.2016.12.015

Beckerman, M., Van Berkel, S. R., Mesman, J., Huffmeijer, R., & Alink, L. R. A. (2020). Are negative parental attributions predicted by situational stress? From a theoretical assumption towards an experimental answer. *Child Maltreatment*, *25*, 352–362. https://doi.org/10.1177/1077559519879760

Berkel, S. R., Prevoo, M. J. L., Linting, M., Pannebakker, F. D., & Alink, L. R. A. (2020). Prevalence of child maltreatment in The Netherlands: An update and cross-time comparison. *Child Abuse and Neglect*, *103*, https://doi.org/10.1016/j.chiabu.2020.104439

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. https://doi.org/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. https://doi.org/10.1037/a0029536

Brown, E. D., Anderson, K. E., Garnett, M. L., & Hill, E. M. (2019). Economic instability and household chaos relate to cortisol for children in poverty. *Journal of Family Psychology*, *33*(6), 629–639. https://doi.org/10.1037/fam0000545

Burges, P. W. (1997). Theory and methodology in executive function research. In P. Rabbitt, (Ed.), *Methodology of frontal and executive function* (pp. 81–116). Taylor and Francis Group.

Caldwell, B. M., & Bradley, R. H. (1984). *Home observation for measurement of the environment*. 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. https://doi.org/10.1111/j.1469-7610.2006.01655.x

Corapci, F., & Wachs, T. D. (2002). Does parental mood or efficacy mediate the influence of environmental chaos upon parenting behavior? *Merrill-Palmer Quarterly*, *48*(2), 182–201.

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. https://doi.org/10.1016/j.dr.2015.01.004

De Haan, A., Prinzie, P., Sentse, M., & Jongerling, J. (2018). Latent difference score modeling: A flexible approach for studying informant discrepancies. *Psychological assessment*, *30*(3), 358. https://doi.org/10.1037/pas0000480

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), 1084–1091. https://doi.org/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. https://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. https://doi.org/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. https://doi.org/10.1016/j.paid.2007.07.016

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

Evers, A., Rasche, J., & Schabracq, M. J. (2008). High sensory-processing sensitivity at work. *International Journal of Stress Management*, *15*(2), 189–198. https://doi.org/10.1037/1072-5245.15.2.189

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. https://doi.org/10.1037/a0025749

Geeraerts, S. B., Endendijk, J., Deater-Deckard, K., Huijding, J., Deutz, M. H. F., van den Boomen, C., & Deković, M. (2021). The role of parental self-regulation and household chaos in parent-toddler interactions: A time-series study. *Journal of Family Psychology*, *35*(2), 236–246. https://doi.org/10.1037/fam0000814

Gillebaart, M., & de Ridder, D. T. (2015). Effortless self-control: A novel perspective on response conflict strategies in trait self-control. *Social and Personality Psychology Compass*, *9*, 88–99. https://doi.org/10.1111/spc3.12160

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), 1072–1079. https://doi.org/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 Jr., A. P., 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

Marsh, S., Dobson, R., & Maddison, R. The relationship between household chaos and child, parent, and family outcomes: A systematic scoping review. *BMC Public Health*, *20*, 513 https://doi.org/10.1186/s12889-020-08587-8

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. https://doi.org/10.1017/S0954579416000298

Milner, J. S. (1993). Social information-processing and physical child abuse. *Clinical Psychology Review*, *13*, 275–294. https://doi.org/10.1016/0272-7358(93)90024-g

Milner, J. S. (2003). Social information processing in high-risk and physically abusive parents. *Child Abuse & Neglect*, *27*, 7–20. https://doi.org/10.1016/s0145-2134(02)00506-9

Miyake, A., & Friedman, N. P. (2012). The nature and organization of individual differences in executive functions: Four general conclusions. *Current Directions in Psychological Science*, *21*(1), 8–14. https://doi.org/10.1177/0963721411429458

Netherlands Bureau for Economic Policy Analysis. CPB. (2019, September). Macro *e*conomische *v*erkenning (MEV) 2020 (Septemberraming) [Press release]. https://www.cpb.nl/macro-economische-verkenning-mev-2020#.

Oberfeld, D., & Franke, T. (2013). Evaluating the robustness of repeated measures analyses: The case of small sample sizes and nonnormal data. *Behavior research methods*, *45*(3), 792–812. https://doi.org/10.3758/s13428-012-0281-2

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. https://doi.org/10.1037/a0021788

Van Zeijl, J., Mesman, J., Van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Juffer, F., Stolk, M. N., Koot, H. M., & Alink, L. R. (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, poverty, 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. (1989). The nature of the physical microenvironment: An expanded classification system. *Merrill Palmer Quarterly*, *35*(4), 399–402.

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

Wachs, T. D., & Chan, A. (1986). Specificity of environmental action, as seen in environmental correlates of infants' communication performance. *Child Development*, *57*(6), 1464–1474. https://doi.org/10.2307/1130424

Wachs, T. D., Francis, J., & McQuiston, S. (1979). Psychological dimensions of the infant's physical environment. *Infant Behavior and Development*, *2*, 155–161. 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. https://doi.org/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

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