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Profiles of self-regulation and their association with behavior problems among sexually abused children

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Abstract

This study aimed to delineate profiles of self-regulation among sexually abused children and their association with behavior problems using a person-centered approach. A sample of 223 children aged six to 12, their parents, and teachers were recruited in specialized intervention centers. Latent profile analysis revealed four profiles: (1) *Dysregulated,* (2) *Inhibited,* (3) *Flexibly Regulated,* and (4) *Parent Perceived Self-Regulation*. Children from the *Flexibly Regulated* profile showed relatively low behavior problems, and those from the *Dysregulated* profile were characterized by high behavior problems. Children from the *Parent Perceived Self-Regulation* profile showed overall good adaptation, although teachers reported higher behavior problems than parents. Children from the *Inhibited* profile, characterized by the highest level of inhibition but low parent-rated emotion regulation competencies and executive functions, showed the highest level of internalizing behavior problems, indicating that high inhibition does not necessarily translate to better adaptation. Results also show a moderation effect of sex. Being assigned to the *Inhibited* profile was associated with decreased externalizing behaviors in boys and increased internalizing behaviors in girls. This study underscores the complexity of self-regulation in sexually abused children and supports the need to adopt a multi-method and multi-informant approach when assessing these children.

Child sexual abuse is associated with numerous psychological consequences, such as post-traumatic stress disorder and internalizing and externalizing behavior problems in children (Hailes et al., 2019). Behavior problems are a significant concern in children, as they predict later psychosocial maladaptation (Arslan et al., 2021). Internalizing behavior problems in children comprise anxiety, depression, and somatic symptoms and are associated with mental health difficulties such as depressive symptoms and self-harm in adolescence (Gutman & Codiroli McMaster, 2020). Externalizing behaviors in children, namely aggressive behaviors and rule-breaking, are linked to delinquent and at-risk behaviors in adolescence and adulthood (Petersen et al., 2015). Numerous studies have underscored the role of self-regulation in predicting psychosocial difficulties among normative children (Yan et al., 2022, for a review). However, little is known about the associations between the different emotional and cognitive components of self-regulation, namely emotion regulation and executive functioning, and behavior problems among vulnerable children, particularly sexually abused children. The present study aimed to identify profiles of self-regulation in a sample of sexually abused children and explored their possible associations with behavior problems.

Development of self-regulation and associated factors

Although there are debates on the conceptual definitions of self-regulation, it is generally agreed that self-regulation is the ability to effectively manage one's emotions, cognition, and behaviors in response to environmental demands (Bridgett et al., 2015). Calkins and Marcovitch (2010) propose that two processes are implicated in self-regulation: emotion regulation and executive functions. They define emotion regulation as automatic and deliberate behaviors, strategies, and competencies that modulate one's emotional response. This definition includes dispositional tendencies (bottom-up) and more voluntary, goal-oriented responses (top-down). Executive functions are defined as top-down cognitive processes responsible for regulating goal-directed behaviors (Friedman & Miyake, 2017). It is accepted that three main executive functions, namely working memory, inhibitory control or inhibition, and cognitive flexibility, underlie more complex functions such as metacognition, planning, and organization (Friedman & Miyake, 2017).

Self-regulation has usually been studied as a linear construct, but authors have suggested that its association with adaptive functioning might be more complex. For instance, Eisenberg and Morris (2002) have proposed that for children to function adaptatively, they should not have a too-low or too-high level of self-regulation. Stemming from the classical work of Block and Block (1980) and current neuropsychological findings, they suggested that three self-regulation profiles of children can be observed: Under-regulation, Overregulation, and Optimal

Regulation. These authors postulate that Under-regulation would be associated with more externalizing difficulties, while over-regulation would predict more internalizing difficulties. However, most studies investigating this hypothesis have focused on under-regulation aspects of emotion and executive functions (Gruhn & Compas, 2020; Lund et al., 2020). Studies on overregulation have mainly used temperamental measures of self-regulation, such as behavioral inhibition, which differs from inhibitory control by being automatic as opposed to deliberate (Nigg, 2017). However, there is emerging evidence that inhibitory control might be a mechanism through which children show overregulation patterns (Cardinale et al., 2019).

Processes involved in the development of self-regulation are partly guided by genetics and maturation (Eisenberg & Morris, 2002; Nigg, 2017). However, environmental factors will also affect children's developmental trajectories. Early life adversity, notably child maltreatment, has also been found to be associated with self-regulation. For instance, exposure to chronic or extreme stress, such as sexual abuse during childhood, has been associated with a dysregulation of the hypothalamic–pituitary–adrenal (HPA) axis responsible for regulating stress hormones (Wesarg et al., 2020). The dysregulation will affect the brain both structurally and functionally, particularly in parts of the brain responsible for self-regulation, namely the hippocampus, the amygdala, and the prefrontal cortex (Jedd et al., 2015; McLaughlin et al., 2015; Riem et al., 2015). Studies investigating the effects of maltreatment, including child sexual abuse, on self-regulation have found that maltreated children show poorer emotion regulation and executive functions than their non-abused peers (Gruhn & Compas, 2020; Lund et al., 2020). A recent study conducted among school-aged children found that child sexual abuse was associated with difficulties in executive functioning (Amédée et al., 2024). More specifically, compared to their normative peers, sexually abused children showed more executive functioning difficulties, according to parental reports, and poorer performance on cognitive flexibility tasks. This study also found that child sexual abuse was associated with poorer inhibition in boys but not in girls, suggesting that sex could be an important factor to consider when investigating executive functions in this population of children. Although this study represents a first step in understanding executive functions in sexually abused children, it did not investigate the possible effect of abuse characteristics. Yet, studies suggest that abuse characteristics, such as the identity of the abuser and the severity of the abuse, could predict psychological outcomes among sexually abused children (see Noll, 2021 for a review).

Furthermore, studies have found that contextual rearing factors, such as parental level of education and neighborhood deprivation, are associated with both emotion regulation and executive functioning (Palacios-Barrios & Hanson, 2019; Taylor et al., 2020). For example, one study found structural and functional brain changes in children exposed to poverty (Palacios-Barrios & Hanson, 2019). Another study found that youth living in underprivileged neighborhoods performed lower on executive functioning tasks even after controlling for individual socioeconomic status (Taylor et al., 2020). However, little is known about how these factors are associated with self-regulation among sexually abused children. This is particularly important because economic deprivation and child maltreatment often co-occur (van IJzendoorn et al., 2020). Consequently, understanding how abuse characteristics, victimization history, and contextual rearing factors are associated

with self-regulation will allow for a broader understanding of the development of sexually abused children.

There is theoretical and empirical justification that child sexual abuse represents a specific form of child maltreatment that deserves individual consideration (Finkelhor & Browne, 1985). First, child sexual abuse differs from other forms of maltreatment regarding the identity of the perpetrator. Although child sexual abuse is often perpetrated by someone known to the child, it is not always perpetrated by a caregiver. A recent study conducted in Australia found that less than ten percent of individuals reporting a history of child sexual abuse were sexually abused by a caregiver (Gewirtz-Meydan & Finkelhor, 2020). This is especially important because parents play an essential role in the development of children's self-regulation. Consequently, contrary to children exposed to other forms of maltreatment, sexually abused children could benefit from parental support in terms of self-regulation. Second, there is evidence that cortisol concentration among sexually abused children differs from children exposed to other forms of maltreatment, such as neglect, suggesting that sexual abuse could affect the HPA axis differently (for a review: Bernard et al., 2017; Fogelman & Canli, 2018). As HPA axis dysregulation is a predictor of later self-regulation difficulties, it is plausible that sexually abused children present specific self-regulation profiles (Wesarg et al., 2020). Third, child sexual abuse involves four dynamics (powerlessness, traumatic sexualization, stigmatization, and betrayal) that can hinder children's functioning (Finkelhor & Browne, 1985). For instance, the dynamics of powerlessness, stigmatization, and betrayal could lead children to overregulate their emotions and behaviors to protect themselves, which, in turn, could lead to more internalizing behavior problems (Cantón-Cortés et al., 2012; Langevin et al., 2020). Interestingly, traumatic sexualization, which is a dynamic unique to sexually abused children, could be associated with both overregulation and dysregulation. Studies conducted among adult victims of child sexual abuse have reported the presence of disorders associated with both overregulation (sexual dysfunction) and dysregulation (sexual compulsion) (Noll, 2021).

Because of these unique dynamics, specialized intervention programs have been developed to help alleviate the deleterious consequences of child sexual abuse. However, they have mainly focused on targeting emotion dysregulation (Cloitre, 2013; Cohen et al., 2017). Yet, there is preliminary evidence that suggests that sexually abused children experience more overregulation compared to their normative peers (Boisjoli & Hébert, 2020; Langevin et al., 2020). Thus, it is essential to further investigate sexually abused children's self-regulation to inform more tailored and effective interventions.

Child sexual abuse, self-regulation, and behavior problems

Studies among sexually abused children have focused on emotion dysregulation. Results of these studies have found that emotion dysregulation predicted internalizing and externalizing behavior problems among school-aged children exposed to child sexual abuse (Choi & Oh, 2014; Hébert et al., 2018). A study among sexually abused preschoolers suggests that the association between emotion regulation and behavior problems might vary according to sex. More specifically, authors found a stronger association between emotion regulation and behavior problems in boys than girls (Langevin et al., 2015). However, these studies combined two facets of emotion regulation: emotion regulation competencies and emotional lability. Emotion regulation competencies reflect the use

of strategies and skills to effectively manage emotions. Emotional lability taps into dispositional and bottom-up processes that guide children's reactivity to the environment. A study using a sample of 46 maltreated children (Mean age = 9.59) found emotion regulation competencies to only predict internalizing symptoms, while emotion lability predicted both internalizing and externalizing behaviors (Muller et al., 2013). Another study found that emotional lability at age eight predicted internalizing behaviors a year later (Kim-Spoon et al., 2013). This suggests that these facets of emotion regulation could have independent or additive effects on the development of behavior problems among sexually abused children.

The association between executive functions and behavior problems in maltreated children, including child sexual abuse, remains unclear. One study found that emotion regulation and executive functions mediated the association between child maltreatment and aggressive behavior in a sample of 50 school-aged children (Dileo et al., 2017). Another study among maltreated preschoolers ($n = 84$) found no association between performance in executive function tasks and externalizing behaviors. However, results revealed that children with low executive functions were at a higher risk of presenting clinical levels of externalizing behaviors (Horn et al., 2018). Alternatively, one study found that executive functions did not mediate the association between maltreatment and disruptive behaviors among school-aged children (Bernardes et al., 2020). These inconsistent findings could be explained by individual differences in the effect of child maltreatment on executive functions. For instance, a neuropsychological study found a sex difference in neural pathways underlying inhibition among maltreated adults (Elton et al., 2014). More precisely, increased maltreatment was associated with poorer inhibition in men. Conversely, elevated exposure to child maltreatment in women was associated with greater inhibition. There is also preliminary evidence that inhibition could have a curvilinear association with internalizing behaviors. A recent study conducted among a normative sample found that anxious children performed better in inhibition tasks (Cardinale et al., 2019). This suggests that some children might indeed show profiles of overregulation. In the case of maltreated children, they may have to use their self-regulatory abilities as a strategy to prevent further harm (Demers et al., 2022). While these strategies can be adaptive in the long term, this could lead to a pattern of overregulation, which could be associated with maladaptive behaviors.

The present study

This study stems from a developmental psychopathology approach, which stresses the importance of considering different risk and protective factors in understanding children's development (Cicchetti, 1984). More precisely, the transactional socio-ecological model of maltreatment posits that there are multiple developmental trajectories for maltreated children, depending on the interaction of risk and protective factors (Cicchetti & Valentino, 2006). The transactional socioecological model of maltreatment also proposes that factors related to children's proximal environment will have a strong influence on their adaptation. The most proximal is the ontogenetic system, which encompasses genetic and biological processes. Consequently, children's self-regulation, situated on the ontogenetic system, is likely to predict the development of behavior problems.

The first objective of this study was to delineate the self-regulation profiles of sexually abused children. To respond to the limitations of previous studies, we used both parent reports and child tasks to assess self-regulation in children. We hypothesized that there would be at least three profiles: Optimally regulated, Dysregulated, and Overregulated. Our second objective was to examine the association between socioeconomic characteristics and abuse history with self-regulation profiles. We postulated that (1) higher socioeconomic status will be associated with more adaptative self-regulation profiles, and (2) severe abuse, intra-familial abuse, and cumulative maltreatment will be associated with less adaptative self-regulation profiles. The third objective was to examine the association between self-regulation profiles and behavior problems while considering the effect of sex. Because of the generally low agreement between parents and teachers, we used both respondents in this study (De Los Reyes et al., 2015). Considering that there is evidence that behavior problems can be concomitant to executive functioning difficulties, and to assess the stability of our findings, we also examined behavior problems at two assessment times in a six-month interval. Our hypotheses are that: (1) A Dysregulated profile will be associated with higher levels of internalizing and externalizing behavior problems; (2) The Overregulated profile will be associated with more internalizing behavior problems; (3) The Optimally regulated profile will be associated with lower levels of behavior problems; and (4) Gender will moderate the association between being classified in the Dysregulated or Overregulated profile and behavior problems.

Method

Participants

This study included 223 sexually abused children (76.9% girls) aged six to 12 years old ($M = 8.94$; $SD = 1.88$), their non-offending parents, and teachers. Parents and children were invited to participate twice at a six-month interval. The mean age at the first assessment was $M = 8.94$, $SD = 1.88$, and $M = 9.69$; $SD = 1.93$ at the second assessment. More than half of the sample (59.6%) had a familial income superior to 40,000 Canadian dollars and an education level higher than a high school diploma (54.7%). Less than a quarter of children lived with both biological parents (22.3%), and 15.4% of children had at least one parent born outside of Canada.

This study is part of a broader research project on the developmental trajectories of sexually abused children and was approved by the Institutional Review Board of CHU Sainte-Justine and of the Université du Québec à Montréal. Participants were recruited in specialized sexual abuse intervention centers in the province of Québec, Canada. Before receiving services, research assistants presented the project to parents and children. Prior to their participation, parents were informed that a refusal to participate would not affect the services received. Parents gave their written consent, and children their verbal assent. At the first assessment (T1), children completed questionnaires and computerized tasks with the assistance of a research assistant, and parents completed the questionnaires assessing children's executive functions and behavior problems. Parents also signed a consent form to send a questionnaire to the child's teachers at the first assessment. Teachers were not informed that children had sustained child sexual abuse. They received a five-dollar gift card for their time. At the second assessment (T2), parents completed questionnaires assessing children's behavior problems.

Latent class indicators

Cognitive flexibility was measured by a computerized version of the *Dimensional Change Card Sort* task (Zelazo, 2006). Children were asked to match images corresponding to the rule (color or shape) mentioned by the research assistant. Children practiced each dimension four times using yellow or green, representing a car or a truck. The task begins after successfully completing three out of four trials. Target images were fish and leaves in blue or red. Younger children (6–7 years old) had to match four out of five trials for each dimension before moving to the mixed trial of 30 randomly shuffled cards. Older children started at the mixed trial stage. A score is computed by adding the reaction time from the mixed trial and the accuracy rate (0–10).

Children aged six to seven must first match the cards consecutively along a single dimension, namely color. The test stops if the child does not correctly associate four of the five trials. If this step is successful, they must then match the pictures according to shape. If four of the five trials are successful, the child can complete the 30-picture task with both dimensions randomly shuffled. Children eight years and older begin the task at the shuffled card stage. Prior studies have demonstrated adequate psychometric properties for computerized versions of the DCCS (Ahmed et al., 2022; Zelazo et al., 2013).

Inhibition and visual attention were measured by a computerized version of the *Flanker Task* (Eriksen & Eriksen, 1974). Children are asked to show the direction in which the central target points. They must be successful in three out of four practice trials to start the task. Younger children (6-7 years old) used fish as the target, and older children used arrows to complete 20 trials. Reaction time and accuracy score were calculated. A total score was then computed by adding the reaction time score and accuracy score. Prior studies have demonstrated adequate psychometric properties for computerized versions of the Flanker (McDermott et al., 2007; Zelazo et al., 2013).

Parents' ratings of children's executive functions were measured using a short version of the *Behavior Rating Inventory of Executive Function* (BRIEF; Gioia et al., 2015). Parents were asked to respond on a 3-point Likert scale (1 = Never to 3 = Always) to the 12-item questionnaire. Examples of items are "Gets stuck on one topic or activity" and "Resists or has trouble accepting a different way to solve a problem with schoolwork, friends, tasks, etc.". To facilitate class interpretation, the scale was reversed, with a higher score representing higher executive functioning. Cronbach's α in this study was α .85.

Emotion regulation was measured by two subscales of the *Emotion Regulation Checklist* (Shields & Cicchetti, 1997; French version by Langevin et al., 2010). This questionnaire is well validated across normative and at-risk samples. Parents were asked to respond using a 4-point Likert scale (0 = *never* to 3 = *almost always*) to assess emotion regulation competencies (15 items) and dysregulation (8 items). Examples of items for the emotion regulation subscale are: "is a cheerful child" and "shows appropriate negative emotions when reacting to hostile, aggressive or intrusive behaviors from other children." Examples of the lability/negativity subscale include: "is easily frustrated or "manifest enthusiasm that others find intrusive or disruptive." The lability/negativity scale was reversed to facilitate class interpretation, with a higher score representing lower emotional lability. The emotion regulation competencies subscale had a Cronbach's α of .84 and the lability/negativity a Cronbach's α of .73.

Covariates and outcomes

Sociodemographic

A sociodemographic questionnaire was completed by the parent. Two neighborhood deprivation indexes were derived from families' postal codes using the *Material and Social Deprivation Index* (Pampalon et al., 2012). The social deprivation index measure is derived from the proportion of single-parent families and the proportion of individuals separated, widowed, divorced, or living alone. The material deprivation index is obtained using level of education, employment, and income data. The scores range from zero to four, with a high score indicating higher deprivation.

Adverse childhood events

Clinicians completed an adaptation (Hébert & Cyr, 2010) of the *History of Victimisation Form* (Wolfe et al., 1987) to collect the children's history of abuse. This questionnaire documents the severity of the abuse: 0 = severe (unclothed touching) or 1 = very severe abuse (penetration or attempted penetration), the identity of the abuser (extrafamilial = 0; intrafamilial = 1), intrafamilial includes a person in the child's immediate family (parent, stepparent, sibling, and stepsibling) or extended family (cousin, grandparent, aunt, or uncle). A composite score ranging from zero to four was also created to assess the number of forms of trauma sustained by the child (physical abuse, exposure to interparental violence, neglect, and emotional abuse).

Internalizing and externalizing behavior problems

Parents completed the *Child Behavior Checklist* (CBCL; Achenbach & Rescorla, 2001) at the first and second assessments. Teachers completed the *Teacher Report Form* (TRF; Achenbach & Rescorla, 2001) at the first assessment. Informants answered on a 3-point scale ranging from 0 = *never* to 2 = *often* if the child displayed the behavior. In the study, we used T-scores from the internalizing and externalizing behavior problems subscales. Both the CBCL and TRF versions are compatible. Children with scores between 60 and 63 are considered subclinical, and those higher than 63 are considered clinical. The Cronbach's α for the internalizing behaviors was .90 for parents and .85 for teachers. The Cronbach's α for externalizing behaviors was .92 for parents and α = .96 for teachers. Interrater agreement was fair Kappa = .22 (p < .001), 95% CI (0.16, 0.29) for internalizing behaviors, and Kappa = .33 (p < .001), 95% CI (0.28, 0.39).

Data analytic plan

Missing data analyses showed that data were missing completely at random as shown by the Little's Missing Completely at random test which was not significant (χ^2 = 44.12, df = 35, p = .14).

Preliminary analyses were conducted with SPSS 25. Main analyses were conducted using Mplus 8 (Muthén & Muthén, 1998–2023). Missing data was handled using full information likelihood (FIML) with the maximum likelihood robust (MLR) estimator. This method allows all participants to remain in the analysis while producing robust estimators for non-normal data (Lanza & Cooper, 2016).

Five indicators were used to derive self-regulation profiles: Cognitive flexibility (DCCS), inhibition and attention (Flanker), parent's rating of executive functions (BRIEF), emotion regulation competencies (ERC), and emotional lability/negativity (ERC). Indicators were first standardized, then successive Latent class analyses were tested (1–5 solutions). Age was added as a control

variable in the model, given that child task performance is highly correlated with age (DCCS: $r = .61$, $p < .001$; Flanker: $r = .57$, $p < .001$). Multiple indices were used to estimate the ultimate class solution. First, a lower Akaike information criterion (AIC; Akaike, 1987), Bayesian information criterion (BIC; Schwarz, 1978), and adjusted Bayesian information criterion (aBIC; Sclove, 1987) indicated a better fit. An entropy value closer to one indicates better class differentiation. To ensure the parsimony of the model, the bootstrapped likelihood ratio test (BLRT) and the Lo–Mendell–Rubin (LMR) adjusted likelihood ratio test were used. For these tests, a significant p-value indicated that an n was better than the $n - 1$ model. The best class solution was chosen in light of these indices as well as interpretability (Lanza & Cooper, 2016).

Once the optimal class solution was chosen, we conducted analyses using the Bolck et al. (2004) method in Mplus (BCH). The BCH method, similar to analysis of variance (ANOVA), allows the comparison of means across profiles for covariates and outcomes. This method accounts for the uncertainty of profile assignment and minimizes potential class change. All outcomes were entered simultaneously under the AUXILIARY command on Mplus. This analysis provides an omnibus chi-square test if significant, pairwise comparisons can be examined. Finally, we conducted a series of moderation analyses using profile assignment (dummy-coded) as the independent variable, sex as moderator, and behavior problems (internalizing, externalizing) as the dependent variable.

Results

Descriptive statistics

The majority of children in the sample (90.1%) experienced severe (unclothed touching) or very severe abuse (penetration or attempted penetration). A large proportion of participants (77.6%) experienced intrafamilial abuse. Almost a third of the sample (27.7%) was abused by a biological parent or a stepparent, and almost two-thirds of the sample (62.9%) experienced more than one episode of sexual abuse. For most children (56.2%), the first reported episode of sexual abuse was after the age of six years old.

Fifty-eight percent of the sample experienced at least one other traumatic experience (physical abuse, exposure to intrafamilial violence, psychological abuse, neglect). In our sample, 30% of children experienced physical abuse, 39.6% psychological maltreatment, 28.6% neglect, 51.7% exposure to interparental violence. Correlation analyses were also conducted between indicators and outcome variables. Results are reported in Tables 1 and 2.

LCA model selection

Successive latent class models were tested (1–5). Table 3 shows the fit indices for each model. The three-profile solution showed the highest entropy value, and the aLMR was significant. The fourth-profile solution showed a lower AIC and aBIC. However, the aLMR and the BLRT were discordant. This solution also showed high classification probabilities (.85–.95), and the entropy value was satisfactory. The four-profile solution, yielding a discordant profile, was retained because the fourth profile added valuable insights into child self-regulation. Based on the model fit, theoretical considerations, and results from prior studies investigating profiles of self-regulation in children, we estimated that the four-profile model was the most appropriate.

The four-class solution

The largest profile, *Dysregulated*, comprised 38.82% of the children. They showed the lowest performance in executive function tasks and received the lowest parent-rated evaluations. Parents reported high emotion lability but slightly higher than average emotion regulation skills. The second profile, *Inhibited*, regrouped 18.61% of the children. These children had higher than average scores on the DCCS (cognitive flexibility) and the highest score on the Flanker task (inhibition). However, parents reported very low executive functions and extremely low emotion regulation competencies. The third profile, *Flexibly Regulated*, represented 28.39% of the children. Children within this profile performed the best on the cognitive flexibility task and had slightly higher than average inhibition. Their parents evaluated emotion regulation and executive functions as being above average. Lastly, children assigned to the fourth profile, *Parent Perceived Self-Regulation*, included 14.18% of the children. These children had slightly lower than average task performance, but parents evaluated their executive function and emotion regulation as very high. Profiles are presented in Figure 1.

Profile membership and socioeconomic characteristics

Analyses were conducted to compare profiles as a function of socioeconomic characteristics and abuse history. For dichotomous variables, mean scores represent a proportion. No differences were found among profiles on variables of child sex, $\chi^2 = 6.90$, $p = .08$, parent immigrant status $\chi^2 = 2.68$, $p = .44$, family income $\chi^2 = 0.37$, $p = .95$, and social neighborhood deprivation $\chi^2 = 3.16$, $p = .37$. Results indicate that children from the *Parent Perceived Self-Regulation* profile lived in more materially advantaged neighborhoods than children for the *Dysregulated* and *Inhibited* profiles. A lower proportion (26%) of caregivers from the *Parent Perceived Self-Regulation* profile had a high-school diploma or lower, compared to caregivers from the *Dysregulated* (48%) and *Inhibited* profiles (62%), $\chi^2 = 8.86$, $p = .03$. No significant difference was found between the *Parent Perceived Self-Regulation* and *Flexibly Regulated* profiles.

Profile membership and abuse history

No differences were found between profiles regarding abuse severity (severe vs very severe abuse) $\chi^2 = 4.17$, $p = .24$, duration $\chi^2 = 3.45$, $p = .33$ or parent as a perpetrator $\chi^2 = 2.65$, $p = .45$. The *Parent Perceived Self-Regulation* (97.8%) and *Inhibited* (84.4%) profiles had the highest proportions of children who sustained intrafamilial CSA, compared to the *Dysregulated* (79.6%) and the *Flexibly Regulated* (73.4%) profiles. Overall, relative to children in the other profiles, children from the *Dysregulated* and *Inhibited* profiles sustained the highest number of other forms of abuse. Detailed results are reported in Table 4.

Profile membership and behavior problems

Analyses were conducted to compare profiles as a function of behavior problems. Detailed results are reported in Table 4.

Internalizing behaviors - first assessment (T1)
According to parents, children from the *Dysregulated* and *Inhibited* had significantly higher levels of internalizing behaviors than those in the *Flexibly Regulated* and *Parent Perceived Self-Regulation* profiles. No significant differences were found between
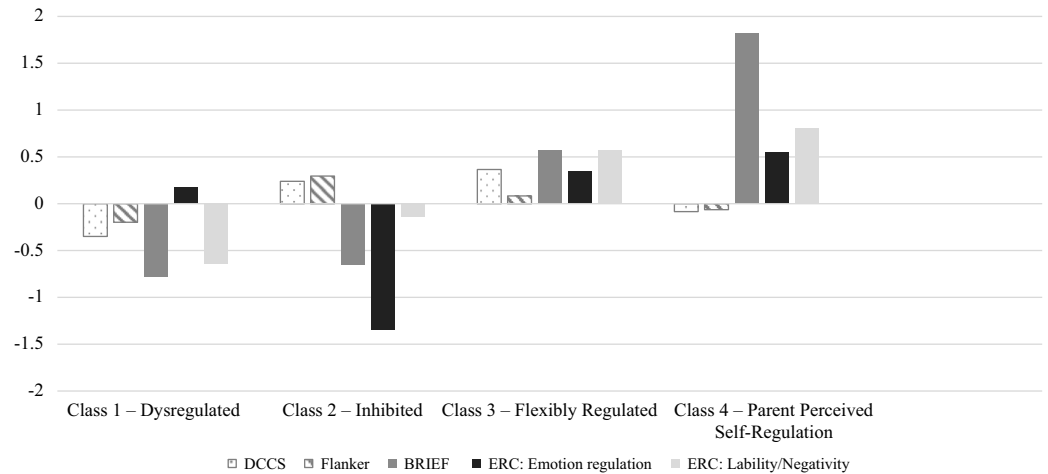
Figure 1. Self-regulation profiles. DCCS = Dimensional Change Card Sort; BRIEF = Behavior Rating Inventory of Executive Function; ERC: Emotion Regulation Checklist. Mean scores are standardized.

Table 1. Descriptive statistics and correlations between latent profile indicators and behavior problems

Variables	M	SD	1	2	3	4	5	6	7	8	9	10
1. Cognitive flexibility (0–10)	5.48	1.17	—									
2. Inhibition (0–10)	6.17	1.29	.58***	—								
3. Parent-rated EF (8–99)	37.76	24.66	.12	-.00	—							
4. ER competencies (0–24)	17.90	3.56	−.05	−.17*	.30***	—						
5. Lability\negativity (0–45)	29.15	7.75	.19*	-.01	.60***	.36***	—					
6. T1 – Internalizing – Parent (33–100)	60.25	12.40	−.00	.10	−.43***	−.35***	−.42***	—				
7. T1 – Internalizing – Teacher (37–100)	60.07	9.83	−.07	.21	-.28**	−.57***	−.33**	.27**	—			
8. T1 – Externalizing – Parent (33–100)	60.08	11.24	−.18*	−.02	−.64***	−.32***	−.76**	.60***	.23*	—		
9. T1 – Externalizing – Teacher (41–100)	58.67	10.25	−.08	.01	−.27**	−.22*	−.44***	.20	.39***	.41***	—	
10. T2 – Internalizing – Parent (33–100)	57.36	12.44	.01	.09	−.36***	−.38***	−.36***	.74***	.23	.49***	.03	—
11. T2 – Externalizing – Parent (33–100)	58.12	10.35	−.21*	−.10	−.43***	−.29***	−.57***	.52***	.24	.72***	.44***	.64***

Note. EF = executive functions; ER = emotion regulation. T1 = first assessment; T2 = second assessment. *p < .05. **p < .01, ***p < .001.
Parent-rated EF and lability/negativity scores were reversed, with a higher score reflecting better functioning.

Table 2. Correlations between SES, abuse characteristics, and latent profile indicators

Variables	Cognitive flexibility	Inhibition	Parent-rated EF	ER competencies	Lability/ negativity
Familial income less than 40 000 CAD	−.25**	−.17*	.01	−.16*	−.15*
High school diploma or lower	−.11	−.08	−.14*	−.20**	−.13
Living with both biological parents	.05	.09	−.05	−.19**	−.14*
Material deprivation	.07	.01	−.20**	−.13	−.21**
Social deprivation	−.00	−.10	.14	.08	.12
First episode of CSA before 6 years old	−.31**	−.40**	−.11	.16*	−.13
Parent perpetrator	−.02	.01	−.12	−.10	−.14*
Intrafamilial abuse	.08	.01	.18*	.02	.23**
Penetration or attempted penetration	.03	.09	−.06	.10	−.00
More than one episode	.18*	.07	.03	−.02	−.05
Cumulative trauma	.08	.13	−.33**	−.24**	−.29**

Note. EF = executive functions; ER = emotion regulation. *p < .05. **p < .01. ***p < .001.
Parent-rated EF and lability/negativity scores were reversed, with a higher score reflecting better functioning.

Table 3. Fit indices for latent profile models with 1 to 5 profiles

Number of profiles	Log likelihood	AIC	BIC	aBIC	Entropy	aLMR (p)	BLRT (p)	Profile distribution
1 profile	−1574.87	3185.75	3247.07	3190.03				
2 profiles	−1546.36	3142.72	3227.90	3148.67	0.81	0.05	0.00	17.48%	82.52%
3 profiles	−1515.51	3095.01	3204.04	3102.63	0.88	0.00	0.00	57.91%	13.97%	28.12%
4 profiles	−1496.70	3071.40	3204.28	3080.68	0.82	0.07	0.00	38.82%	18.61%	28.39%	14.18%
5 profiles	−1481.61	3055.22	3211.95	3066.17	0.81	0.22	0.00	7.28%	33.28%| 16.94%| 14.50%	28.00%

Table 4. 4-profiles solution means of outcomes

	Whole sample		Dysregulated 38.82%		Inhibited 18.61%		Flexibly Regulated 28.39%		Parent Perceived Self-Regulation 14.18%			
	M	SE	M	SE	M	SE	M	SE	M	SE	χ^2	p
SES												
Material deprivation	3.30	1.31	2.12[a]	0.09	2.37[a]	0.13	2.03[ab]	0.12	1.78[b]	0.11	13.40**	.00
Social deprivation	3.22	1.39	1.95	0.09	2.18	0.14	2.18	0.11	2.22	0.17	3.31	.35
Abuse history												
CSA severity	2.43	0.67	2.36	0.08	2.52	0.14	2.56	0.08	2.25	0.16	4.17	.24
Intrafamilial	0.78	0.42	0.70[a]	0.06	0.85[ab]	0.07	0.73[a]	0.06	0.98[b]	0.04	25.00***	.00
Nb. of types	1.37	1.51	1.79[a]	0.20	1.65[a]	0.28	0.89[b]	0.18	0.80[b]	0.22	19.23***	.00
Internalizing												
Teacher (T1)	60.07	9.83	59.50[a]	1.42	70.59[b]	1.81	52.97[cd]	2.23	55.97[d]	2.69	45.14***	.00
Parent (T1)	60.25	12.40	64.39[a]	1.26	65.91[a]	2.37	55.63[b]	1.72	52.27[b]	2.37	37.84***	.00
Parent (T2)	57.36	12.43	59.12[ab]	1.42	63.53[a]	1.83	56.64[b]	2.55	46.71[c]	2.37	34.25***	.00
Externalizing												
Teacher (T1)	58.67	10.25	61.34[ad]	1.89	62.23[a]	1.57	53.02[b]	2.60	55.00[db]	2.93	13.34***	.00
Parent (T1)	60.08	11.24	68.24[a]	1.12	61.29[b]	1.94	55.11[c]	1.20	47.46[d]	1.67	131.52***	.00
Parent (T2)	58.12	10.35	63.23[a]	1.16	57.11[b]	2.00	55.01[bc]	1.86	49.37[c]	2.06	39.83***	.00

Note. *p < .05; ** p < .01; *** p < .001; different subscript letters denote subgroups whose means differ significantly (p < .05). SES = socioeconomic characteristics. CSA = child sexual abuse. Nb.= number. Low income: familial income lower than 40,000 CAD. Material deprivation and social deprivation refer to neighborhood deprivation.

the *Dysregulated* and *Inhibited* profiles, nor between the *Flexibly Regulated* and *Parent Perceived Self-Regulation* profiles.

According to teachers, children from the *Inhibited* profile showed higher internalizing behaviors than children from the three other profiles. Children from the *Dysregulated* profile displayed significantly more internalizing behaviors than those from the *Flexibly Regulated* profile. However, their levels were similar to those of children from the *Parent Perceived Self-Regulation* profile. No significant differences were found between the *Flexibly Regulated* and the *Parent Perceived Self-Regulation* profiles.
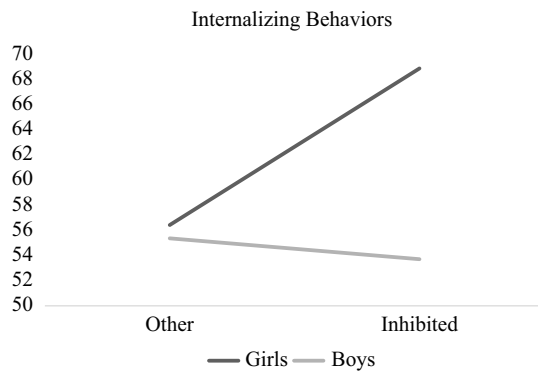
Internalizing behaviors - second assessment (T2)
Parents reported no significant differences in levels of internalizing behaviors between children from the *Dysregulated* and *Inhibited* profiles. Children from the *Dysregulated* profile showed similar levels of internalizing behaviors than children from the *Flexibly*

Regulated profile, but they showed higher levels than those in the *Parent Perceived Self-Regulation* profile. Children in the *Inhibited* profile showed significantly higher levels of internalizing behaviors than children from the *Flexibly Regulated* and *Parent Perceived Self-Regulation* profiles. A significant difference was also found between *Flexibly Regulated* and *Parent Perceived Self-Regulation* profiles, with children from the *Parent Perceived Self-Regulation* profile showing the lowest levels of internalizing behaviors.

Externalizing behaviors - first assessment (T1)
Parents reported that children from the *Dysregulated* profile showed significantly higher externalizing behaviors than children from the three other profiles. Children from the *Inhibited* profile showed significantly higher levels of externalizing behaviors than children from the *Flexibly Regulated* and the *Parent Perceived Self-Regulation* profiles. There was also a significant difference between children from the *Flexibly Regulated* and the *Parent Perceived Self-*

Figure 2. Sex as a moderator between being assigned to the inhibited profile and internalizing behaviors. The *y*-axis represents T-scores on the CBCL.

Figure 3. Sex as a moderator between being assigned to the inhibited profile and externalizing behaviors. The *y*-axis represents T-scores on the CBCL.

Regulation profiles, with parents of children from the *Parent Perceived Self-Regulation* profile reporting the lowest levels of externalizing behaviors.

According to teachers, children from the *Dysregulated* profile showed more externalizing behaviors at school than children from the *Flexibly Regulated* profile. No significant differences were found between the *Dysregulated* and *Inhibited* profiles for teachers' rating of externalizing behaviors. The difference between *Dysregulated* and *Parent Perceived Self-Regulation* was also not significant. Teachers reported more externalizing symptoms for children from the *Inhibited* profile than those from the *Flexibly Regulated* or the *Parent Perceived Self-Regulation* profiles. No significant differences were found between the *Flexibly Regulated* and the *Parent Perceived Self-Regulation* profiles.

Externalizing behaviors - second assessment (T2)

Regarding externalizing behaviors, parents of children from the *Dysregulated* reported significantly higher scores than those from the three other profiles. Children from the *Inhibited* profile showed similar levels of externalizing behaviors than children from the *Flexibly Regulated* profile. A significant difference was also found between children of the *Flexibly Regulated* and *Parent Perceived Self-Regulation* profiles. Parents of children from the *Parent Perceived Self-Regulation* reported significantly less externalizing behaviors than parents of children in the other profiles.

Moderation analyses

A series of moderation analyses was conducted to examine whether the association between profile classification and behavior problems varied by child's sex. Figures 2 and 3 illustrate the results. Results revealed that interactions were not significant for parent and teacher-rated behavior problems assessed at Time 1. At the second assessment, interactions were only significant for the *Inhibited* profile.

Being assigned to the *Inhibited* profile predicted parents' assessment of children's internalizing behaviors, $\beta = .28$, $p < .001$. Sex did not predict internalizing behaviors $\beta = -.04$, $p = .66$. The profile by sex interaction was significant, $\beta = -.18$, $p = .002$. For girls, being assigned to the *Inhibited* profile was associated with more internalizing behaviors, $\beta = .26$, $p < .001$, 95% CI [0.15 ~ 0.37], while for boys, profile assignment was not associated with internalizing behaviors $\beta = -.07$, $p = .51$, 95% CI [−0.32 ~ 0.13].
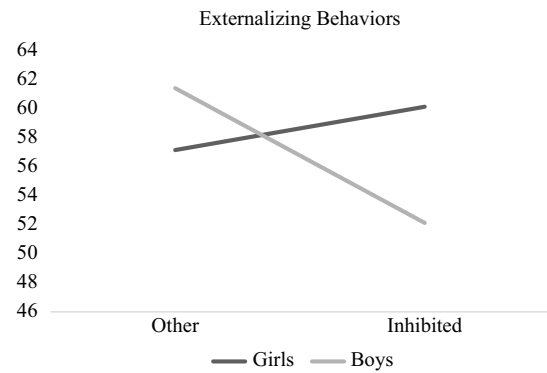
The main effect of being assigned to the *Inhibited* profile on externalizing behavior was not significant $\beta = .11$, $p = .14$. The effect of sex on externalizing behaviors was significant $\beta = .17$, $p = .05$. The profile by sex interaction was also significant $\beta = -.24$, $p = .003$. For boys, being assigned to the *Inhibited* profile was associated with less externalizing behaviors, $\beta = -.37$, $p = .002$, 95% CI [−0.58 ~ -0.12], while for girls, profile assignment was not associated with externalizing behaviors $\beta = .10$, $p = .16$, 95% CI [−0.05 ~ 0.24].

Discussion

The purpose of this study was to delineate profiles of self-regulation in sexually abused children and explore their associations with rearing context, maltreatment history, and behavior problems. Although self-regulation is a known predictor of psychosocial functioning among normative samples of children, research among sexually abused children is limited. By examining the interplay between executive function and emotion regulation among sexually abused children, this study allows for a more nuanced understanding of children's cognitive, emotional, and behavioral functioning.

Profiles of self-regulation

Results from the latent profile analysis showed four profiles: *Dysregulated* and *Inhibited*, *Regulated* and *Parent Perceived Self-Regulation* profiles. First, the largest profile, named *Dysregulated*, was composed of more than a third of our sample (38.82%). These children performed poorly in the tasks, and parents rated them as having the lowest level of executive function and the highest emotion lability. Second, the *Inhibited* profile was characterized by 18.61% of the sample. These children exhibited higher-than-average cognitive flexibility and the highest level of inhibition. However, parents reported very low emotion regulation competencies, low executive functions, and average emotional lability. Third, the *Flexibly Regulated* profile, regrouping 28.39% of children, reflected concordance between questionnaires and task performance. Children in this profile performed the best on cognitive flexibility, had higher than average scores in the inhibition task, and parents reported high levels of executive functions and emotion regulation. Fourth, the *Parent Perceived self-regulation*, representing 14.18% of the sample, was characterized by lower-than-average task performance and very high parent ratings of executive functions and emotion regulation. This profile is deemed discrepant because of the disparity

between parents' ratings of executive function and task performance.

Socioeconomic context and self-regulation profiles

Our study examined the association between sociodemographic and abuse characteristics and profiles. Results show that families of children in the *Parent perceived self-regulation* profile included a higher proportion of parents who completed post-secondary education and lived in the most economically advantaged neighborhoods compared to children from the *Dysregulated* and *Inhibited* profiles. Families of children from *Parent Perceived Self-Regulation* were similar to those of children in the *Flexibly Regulated* profile regarding parental level of education and neighborhood disadvantage. These results are partly supported by several studies that found an association between higher socioeconomic status and self-regulation (Johnson et al., 2016; Lawson et al., 2018; Vrantsidis et al., 2020). A generally accepted explanation for this association is that children with highly educated parents have more access to resources, which allows them to provide an environment that facilitates the development of self-regulation. This can be achieved through access to experiences (e.g., visiting libraries), learning opportunities (e.g., books), and positive parental interactions (Rosen et al., 2020). However, results from our study demonstrate that this association is more complex than previously assumed. For instance, children from the *Inhibited* profile performed well in the tasks despite having lower socioeconomic status. Nonetheless, they also displayed poor executive functions and emotion regulation at home, which concur with results from previous studies. This highlights the importance of examining children's overall self-regulation profile using multiple assessment methods.

Maltreatment history and self-regulation profiles

The present study also found that children in the *Dysregulated* and *Inhibited* profiles sustained more abuse and interpersonal trauma (i.e., neglect, physical abuse, psychological abuse, exposure to interparental violence) than children in the *Parent Perceived Self-Regulation* and *Flexibly Regulated* profiles. These results align with findings from studies showing associations between child maltreatment and self-regulation (Gruhn & Compas, 2020; Lund et al., 2020). However, it is important to note that the findings of our study indicate that children in the *Inhibited* profile showed high performance in the executive functioning tasks, indicating that the association between cumulative maltreatment and task performance is not necessarily linear. One explanation could be that some children having sustained child maltreatment develop better executive functioning skills as a means to adapt to their environment. For example, children exposed to family violence can be more effective at paying attention to danger cues and responding quickly and accurately to instructions to prevent further harm (Mueller & Tronick, 2020; Savopoulos et al., 2023). A recent study among adult victims of child maltreatment found that they performed better in an inhibition task than their non-abused peers, suggesting that the increased inhibitory ability could be an adaptive process in response to maltreatment (Demers et al., 2022). However, these abilities can be taxing, as they are susceptible to being paired with increased attention to danger cues (hypervigilance), which may lead to more internalizing problems.

One unexpected finding was that the *Parent Perceived Self-Regulation* profile was composed almost entirely of children who

had sustained intra-familial CSA (97.5%). This could represent a potential explanation for the discrepancy between parent reports and child task performance. In the context of intra-familial abuse, parents may be more likely to underestimate the child's difficulties as a means to protect the family's image (Tener, 2018). For instance, parents may minimize these difficulties due to the fear that acknowledging them could result in the child being removed from their care by Child Protective Services.

Self-regulation profiles and behavior problems

Another objective of our study was to examine the association between self-regulation profiles and behavior problems. Compared to children from the other profiles, those from the *Dysregulated* profile showed the highest levels of externalizing behaviors at home at both assessment points. At school, they showed similarly high levels of externalizing behaviors as children in the *Inhibited* profile but more externalizing behaviors than the two adaptive profiles. Parents and teachers of children in the *Dyregulated* profile also reported higher internalizing symptoms than children from the *Flexibly Regulated* and *Parent Perceived Self-Regulation* profiles. At the second assessment, children from this profile showed the highest level of externalizing behaviors. This suggests that children showing dysregulation are more at risk of displaying externalizing behavior problems over time. These results are in line with our hypothesis and consistent with the current literature on the association between low emotion regulation and behavior problems among sexually abused children (Hébert et al., 2018; Langevin et al., 2015). Although the association between executive functions and behavior problems has not been previously investigated among sexually abused children, results concur with studies among polyvictimized preschoolers and adolescents, which found an association between poor executive functions and behavior problems (Horn et al., 2018; Wei & Lü, 2023).

As for the children from the *Inhibited* profile, they showed the highest levels of internalizing behavior problems at school and an average score of parent-reported internalizing behaviors that reached the clinical threshold ($T > 63$). They also displayed similarly high levels of externalizing behaviors at school than children in the *Dysregulated* profile, but not at home. As these children show the highest levels of inhibitory skills alongside very low levels of emotion regulation skills, it could be inferred that they may be overly inhibited, which may be translated into more internalizing problems. The moderation analyses also indicated a sex by profile interaction. More precisely, for girls, being in the *Inhibited* profile was associated with more internalizing behaviors, while for boys, it was associated with less externalizing behaviors. This supports the idea that inhibition is susceptible to interact with other variables, such as sex, in the development of adaptative or maladaptive behaviors. These results could be explained by the difference in gender socialization. Indeed, parental expectations for self-regulation tend to be higher in girls, which could lead to more prosocial behaviors and adaptative functioning during normal development (Meland & Kaltvedt, 2019). However, in the context of child sexual abuse or when living in a family where maltreatment occurs, girls might engage in overly effortful regulation, which could lead to more internalizing behaviors. Although it might appear that being in the *Inhibited* profile might be a protective factor for boys, it is possible that these children are better at hiding their behaviors from their parents. This is further supported by the fact that children from the *Inhibited* profile showed subclinical levels of externalizing behaviors at school. Studies have found that

parents tend to use harsher parenting practices, such as corporal punishment, in boys compared to girls (Finkelhor et al., 2019; Mehlhausen-Hassoen, 2021). Consequently, lower displays of externalizing behaviors at home could protect them from further harm.

The third group of children, the *Flexibly Regulated*, showed consistently low levels of behavior problems across settings and time points. This suggests that these children are able to use their self-regulation skills flexibly in different contexts. It could be argued that these children are resilient despite having sustained child sexual abuse. These results are in line with a recent study using latent class analysis, which found that 25% of sexually abused children showed overall low symptomatology following the abuse (Hébert & Amédée, 2020).

Finally, children from the *Parent Perceived Self-Regulation* showed the lowest levels of internalizing and externalizing behavior problems at home. According to teachers, the levels of behavior problems in these children are similar to those observed in children from the *Flexibly Regulated* profile. These results concur with studies that found a negative association between emotion regulation and behavior problems among sexually abused children (Hébert et al., 2018; Langevin et al., 2015). This result also aligns with a study that found that adolescents with a profile characterized by lower performance on executive function tasks but higher performance on affective tasks displayed similar levels of adaptation to adolescents with an overall high self-regulation profile (Chaku et al., 2021). One explanation could be that having high emotion regulation allows children to compensate for having lower-than-average raw executive functions.

Strengths and limitations

This study relied on a relatively large sample of sexually abused children to delineate profiles of self-regulation. Most studies relying on task assessments to measure self-regulation among maltreated children have used small samples (Lund et al., 2020). Using a person-centered approach provided a nuanced under-standing of self-regulation among these children. However, some limitations should be noted. Firstly, more than half of our sample had sustained other forms of maltreatment. Therefore, we could not infer that these results are only attributable to child sexual abuse. We also were not able to assess if the profiles differed from those of normative children. Additionally, we did not directly measure working memory, a key executive function, although the DCSS tasks required children to retain the rules in their working memory. Emotion regulation was also only measured with questionnaires, which solely reflected parents' assessment of children's emotion regulation and not their raw abilities. Moreover, we only measured behavior problems six months after the first assessment, thus reducing the predictive value of our profiles. Finally, our analyses only included teachers' ratings of behavior problems at the first assessment. Nonetheless, by using parents' reports, we were able to show that self-regulation difficulties not only co-occurred with behavior problems but also predicted later adaptation.

Implication for research and practice

Results from this study highlight the heterogeneity found in sexually abused children's self-regulation. As shown by our results, a large portion of our sample (38.82%) showed very low self-regulation, suggesting that sexually abused children could benefit from intervention targeting self-regulation. However, our results

also show that task performance alone is insufficient to predict psychosocial adaptation. Therefore, when evaluating children's self-regulation among sexually abused children, using multiple methods and multiple informants to gain a more complete picture of children's abilities is warranted. In particular, our results support the use of specialized intervention programs like Trauma-Focused Cognitive Behavior Therapy, which includes modules targeting emotion regulation (TF-CBT; Cohen et al., 2017). TF-CBT has also been shown to improve executive functioning and emotion regulation. However, more research is needed to understand how this therapeutic approach affects children's performance in executive function tasks (Lee & Brown, 2022; Thornback & Muller, 2015).

This study also suggests that the one-size-fits-all intervention on executive function might not work for all children. For example, the *Inhibited* profile, characterized by more internalizing behaviors, showed the highest level of inhibition and attention. It could be inferred that these children show too much inhibition; therefore, inhibition training might be ineffective or even counterproductive. Future studies using larger samples and longitudinal designs should investigate the processes through which inhibition is associated with adaptation in sexually abused children. Children from the *Flexibly Regulated* profile may not benefit from executive function intervention, given that their self-regulation skills are already predictive of adaptive functioning. Researchers and clinicians should be attentive to the *Parent-Percieved Self-Regulation* profile, as parents seem to overestimate some of their children's abilities and underestimate some of their difficulties.

Conclusion

To our knowledge, this study is the first to assess self-regulation profiles among sexually abused children. By using a person-centered analysis, we were able to highlight the heterogeneity of self-regulation among these children. Four profiles were identified; two profiles showed poor self-regulation, and two showed medium to high self-regulation. Our results suggest that children who sustain the most forms of abuse or trauma will present more self-regulation difficulties. As expected, our findings show that difficulty in self-regulation is associated with more behavior problems, while medium to high self-regulation is associated with better adaptation in sexually abused children. More research is needed to understand if these results persist over time and how familial factors can act as potential protective factors.

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