

1

2 Title: On the complex and dimensional relationship of maternal PTSD during early childhood and
3 child outcomes at school-age.

4 Authors:

5 Dominik Andreas Moser PhD^{1,2*}, Shannen Graf MS¹, Jennifer Glaus PhD¹, Sébastien Urben PhD¹,
6 Sondes Jouabli MS^{1,3}, Virginie Pointet Perrizolo PhD³, Francesca Suardi PhD⁴, JoAnn Robinson PhD⁵,
7 Sandra Rusconi Serpa MS⁴, Kerstin Jessica Plessen PhD^{1,6}, Daniel Scott Schechter PhD^{1,3,6,7}

8

9 1 Lausanne University Hospital, Child and Adolescent Psychiatry Service, Lausanne Switzerland

10 2 University of Bern Institute of Psychology, Bern, Switzerland

11 3 University of Geneva Faculty of Medicine, Geneva, Switzerland

12 4 University of Geneva Faculty of Psychology and Educational Sciences, Geneva, Switzerland

13 5 Department of Human Development and Family Sciences, University of Connecticut-Storrs, USA

14 6 Faculty of Biology and Medicine, University of Lausanne

15 7 Department of Child and Adolescent Psychiatry, New York University Grossman School of
16 Medicine, USA

17 ***Corresponding Author:** Dominik Moser, Child and Adolescent Psychiatry Service of CHUV, Avenue
18 d'Echhalens 9, 1004 Lausanne, Switzerland, email: domamoser@gmail.com

19 **Keywords**

20 Post-Traumatic Stress Disorder, Intergenerational psychopathology, Violence, Parenting

21 **Abbreviations**

22 ADHD: Attention-Deficit/Hyperactivity Disorder, BDI: Beck Depression Inventory, CBCL: Child

23 Behavior Checklist, CAPS: Clinician Administered PTSD, IPV: Interpersonal Violence, PTSD: Post

24 Traumatic Stress Disorder, PSI: Parenting Stress Index, sCCA: sparse canonical correlation analysis,

25 SES: socio-economic status, PRF: parental reflective functioning, MSSB: MacArthur Story Stem

26 Battery, PCL-S: Posttraumatic stress disorder Checklist Scale, TAS20: Toronto Alexithymia Scale.

This peer-reviewed article has been accepted for publication but not yet copyedited or typeset, and so may be subject to change during the production process. The article is considered published and may be cited using its DOI.

This is an Open Access article, distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives licence (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is unaltered and is properly cited. The written permission of Cambridge University Press must be obtained for commercial re-use or in order to create a derivative work.

27

28 **Abstract**

29 **Background:** Several studies have shown associations between maternal interpersonal violence-
30 related posttraumatic stress disorder (PTSD), child mental health problems and impaired
31 socioemotional development. However, the existing literature lacks evidence linking constellations
32 of risk-factors such as maternal interpersonal-violence related PTSD, psychopathology, and
33 interactive behavior with toddlers and outcome measures at school-age. **Methods:** The present
34 study involved a prospective, longitudinal investigation of 62 mothers and examined the relationship
35 between maternal variables measured when children were in early childhood (mean age 27
36 months), and child outcomes when children were school-age (age mean = 83.2 months), while
37 retaining a focus on the context of maternal PTSD. To identify and weigh associated dimensions
38 comparatively, we employed sparse canonical correlation analysis (sCCA) aimed at associating
39 dimensions of a dataset of 20 maternal variables in early childhood with that of more than 20 child
40 outcome variables (i.e., child psychopathology, life-events, and socio-emotional skills) at school-age.
41 **Results:** Phase 1 variables with the highest weights were those of maternal psychopathology: PTSD,
42 depressive and dissociative symptoms, and self-report of parental stress. The highest weighted
43 Phase 2 child outcome measures were those of child psychopathology: PTSD, anxiety and depressive
44 symptoms as well as peer bullying and victimization. **Conclusions:** sCCA revealed that trauma related
45 concepts in mothers were significantly and reliably associated with child psychopathology and other
46 indicators of risk for intergenerational transmission of violence and victimization. The results
47 highlight the dimensional and multi-faceted nature - both for mothers as well as children - of the
48 inter-generational transmission of violence and associated psychopathology.

49

50

51 **Introduction**

52 Parenting is a complex task, with many challenges along the way that necessitate self-regulation of
53 emotion and arousal to assist the child with his development of self-regulation, social
54 communication, and to limit and redirect normative hostile aggression during this sensitive
55 developmental period in early childhood (i.e., mutual regulation, 1). This parental function relies in
56 part on the ability to infer mental states in self and in one's child (i.e., mentalization, 2). A multitude
57 of factors, such as parents' psychopathology, a history of exposure to interpersonal violence (IPV),
58 including child physical and/or sexual abuse, not to mention daily life stresses may interfere with a
59 parent's capacity to participate in the mutual regulation of emotion and arousal. Outcomes for
60 children of parents, whose psychological impairment and/or distress preclude(s) their effective
61 participation in mutual regulation during this early period, can include various forms of behavioral
62 difficulties and psychopathology, which in turn may interfere with learning and socialization,
63 impaired development of social cognition, as well as altered mental representations of human
64 relationships, both for themselves and their caregivers (3-5).

65 The link between PTSD and commonly comorbid conditions has been thoroughly studied in recent
66 decades. About 80% of women and almost 90% of men with PTSD have at least one other psychiatric
67 diagnosis, about half of them (44% of women and 59% of men) having three or more(6). The most
68 common forms of other psychopathology associated with PTSD are substance abuse and affective
69 disorders (e.g., depression, dysthymia, 6, 7). Parental PTSD has been shown to increase parenting
70 stress and reduce maternal sensitivity (i.e., the capacity to understand and respond appropriately to
71 the child's attachment signals, 8). Additionally, PTSD in the context of increased childhood adversity
72 (i.e., early abuse and violence exposure) is also associated with lower parental reflective functioning,
73 i.e., as a measure of mentalization which is the parent's ability to infer the child's thoughts, feelings
74 and mental states (8). PTSD resulting from childhood adversity associates also with symptoms of
75 alexithymia (i.e., the difficulty in identifying and naming one's own and others' emotions, 9, 10).

76 These relationships are complicated by the fact that many of these factors are associated with one
77 another, such as the various forms of trauma-related psychopathology, as well as measures of
78 alexithymia, socio-economic status (SES), parental reflective functioning (PRF) and maternal
79 sensitivity (6, 11-14) which have multiple interrelations. The same is true for child outcomes:
80 different factors show a complex pattern of univariate associations with each other. Different forms
81 of child psychopathology are associated with each other (15), can be linked to child mental
82 representations of relationships (16, 17), social behaviors and aggression (18) and child
83 temperament (19). While examining each of these factors individually is undoubtedly useful, this
84 complex pattern of relationships suggests that a multivariate dimensional approach may be
85 necessary to capture and then interpret the overall data and to quantify the individual impact of
86 different measures.

87 The aim of the present study was therefore to investigate the prospective longitudinal associations
88 of maternal measures when children were toddlers, with child outcomes when children were 5-9
89 years old. The sample consisted of about 2/3 mothers with a history of PTSD in the context of a
90 history of childhood physical abuse, domestic violence exposure, and adult domestic and other
91 violent victimization. Apart from violence-related measures, maternal measures also focused on
92 mothers' capacity to interact with and understand their child. For children, we wanted to examine
93 potentially less debilitating but generally applicable outcomes, such as emotional comprehension,
94 children's representations of their parent(s) and relationship with their parent(s), as well as maternal
95 report of child temperament, and bullying and victimization by bullies. Finally, we were also
96 particularly interested in continuous measures of child psychopathology as marked by number of
97 symptoms on a structured clinical interview of the child and parent. In order to incorporate such
98 diverse outcomes, we used a multi-variate analysis approach called sparse Canonical Correlation
99 Analysis (sCCA, see methods). sCCA investigates associations of entire datasets (as opposed to - for
100 example - multiple regression analysis which investigates associations of multiple variables with only
101 one outcome variable). In this case we used it to associate maternal and demographic measures

102 when children were 1-3.5 years old with a dataset of child outcomes when children were school-age
103 (5-9 years old). Importantly sCCA allows for quantification of the importance of different variables in
104 concert (i.e. variables of the same dataset are not necessarily weighed down because they explain
105 overlapping variance as is the case in multiple regression). This was partially because while negative
106 outcomes for children of mothers with pathology seem likely, how their weights affect different
107 developmental stages (such as school-age here) is largely unknown. A central reason for using sCCA
108 was to allow a theory agnostic statistical approach, that does not force a focus on a single
109 relationship between the datasets but rather allows the algorithm to drive how the datasets are best
110 associated.

111 We hypothesized that maternal psychopathology, and the quality of maternal interactive behavior
112 would be related to child psychopathological symptoms and maladaptive behaviors.

113 More specifically among these behaviors, we hypothesized that maternal IPV-PTSD affecting the
114 mother-child relationship as manifested by decreased maternal sensitivity during formative
115 development of emotion regulation at ages 1-3,5 years would predict child peer-directed bullying
116 and being bullied at school-ages 5-9 years as possibly a further predictor of intergenerational risk for
117 perpetration of IVP vs IVP victimization.

118 **Methods**

119 Study procedure and sample

120 We obtained approval from the Geneva University Hospitals' institutional ethics committee (14-271).
121 The study was conducted in accordance with the Helsinki Declaration. Mothers gave informed
122 consent for themselves and their children. The project is longitudinal in nature, wherefore this study
123 refers to Phase 1, at which children (56% boys) were 1 to 3.5 years of age (mean = 27 months, SD =
124 8.6), and Phase 2, at which children were 5 to 9 years old (mean = 84 months, SD = 12.9). This period
125 is associated with the formation of self-regulation of emotion and the acquisition of rudimentary
126 mentalization (i.e. reflective functioning) (20-22).

127 Mother-child dyads were excluded: (1) If mothers self-reported actively abusing substances; (2)
128 suffered from a psychotic disorder; or (3) if mother or child were otherwise physically and/or
129 mentally unable to participate in the tasks.

130 At Phase 2, participants were included when children were ages 5-9 years-old. After collecting
131 informed consent, 64 mother-child dyads participated in Phase 2 of the Geneva Early Childhood
132 Stress Study (76% retention). Two dyads were excluded due to more than 20% of data missing.
133 Among the remaining 62 dyads, 40 mothers had experienced significant PTSD symptoms during their
134 lifetime (CAPS score ≥ 40 ; age mean = 39.3, SD = 5.8; 55% boys; children's age mean = 83.2 months,
135 SD = 13.7). Twenty-two mothers had not (age mean = 40.5, SD = 5.3; 59% boys; children's age mean
136 = 85.4 months, SD = 11.5, see Table 1). For more on recruitment, exclusion criteria and additional
137 sample information, see Supplement.

138 Data collection and measures

139 **Phase 1.** Twenty-one measures from Phase 1 were included in the analysis (see table 2A for
140 description of measures). Nineteen of them included data on maternal psychopathology (5
141 measures), experienced abuse during childhood (3 measures) as well as parental behaviors, skills
142 and tendencies (11 measures).

143 Additionally, SES and child sex were included, using the Geneva Sociodemographic
144 Questionnaire(23). While these were not predictors of interest, this approach allowed us to quantify
145 their impact on results compared to other measures rather than having to regress out their effect
146 and thereby altering the data set. We wanted to avoid the latter, as these factors are known to be
147 related to some of the other input or outcome measures.

148 **Phase 2.** Twenty-five measures were included (19 in analysis 1), as shown in Table 2B. These
149 included number of child psychopathology symptoms (5 measures),as well as measures of child
150 exposure to criminal and traumatic events, bullying (2 measures), emotion comprehension (3

151 measures) and MacArthur Story Stem Battery (MSSB, 24) assessed children's representations of their
152 parents and their emotions (8 measures).

153 Furthermore, for analysis 2, maternal report on internalizing and externalizing symptoms in children
154 and 4 measures concerned with child temperament were added. All measures were validated and
155 possess good to very good psychometrics (Table 2).

156 Data analysis

157 To incorporate the diverse outcomes and measures described above, we used (sparse) canonical
158 correlation analysis (sCCA, 25, 26), which allows for data-driven quantification of the importance of
159 included variables and a better understanding of the inter-association of complex datasets in a
160 dimensional way beyond what is possible with usual univariate approaches.

161 We then performed sCCAs to investigate the association of Phase 1 data on mothers (and potential
162 confounders) with child relevant data from Phase 2. Briefly, the sCCA algorithm assigns weights to
163 each variable such that when multiplied with participant scores on those variables, a variate for each
164 dataset is created, which represents this dataset. These variates are then correlated. Using an L1-
165 norm penalty sCCA also allows to reduce the weights of variables to 0 with the goal to reduce the
166 impact of potentially spurious associations. Within the given parameters, sCCA is designed to assign
167 weights in such a way that the correlation of such variates is maximized. The weights of the variables
168 could be interpreted as representing their importance to the model and usually indicate that the
169 variable is associated with the variate of the other dataset. More specifically, a high weight for a
170 variable of the phase 1 dataset indicates that the model assigns it high importance for predicting the
171 selected outcomes of the phase 2 dataset (as represented in the variate of that data set). The P-
172 value represents the fraction of the 10'000 permutations of the data that showed a higher
173 correlation than the original data. For further information on how sCCA was applied here -including
174 L1-norm- penalties see the supplement.

175 Because maternal report of their children's psychopathology could potentially be affected by
176 mothers' own biases linked to her psychopathology, personality, and interpersonal skills, we first
177 performed an analysis in which maternal factors at Phase 1 were associated exclusively with child
178 outcome measures that were self-reported by children or administered by clinicians. However,
179 because parents often provide insights into their children's symptoms and behaviors that their
180 children may not otherwise report(27), we decided in a second step to include maternal reports of
181 child symptoms, behaviors and temperament.

182 Both sCCA analyses included the Phase 1 dataset with 19 maternal psychopathology and behavior
183 variables and 2 variables that were included to quantify potential confounders (see Table 2A).

184 The first sCCA analysis (Analysis 1) included the Phase 2 dataset with 19 child behavior and
185 pathology measures, all of which were measured during experiments or reported by the child
186 himself or a clinician (see Table 2B). The second sCCA (Analysis 2) included 6 additional measures in
187 the Phase 2 dataset, which were maternally reported observations concerning the child (see Table
188 2B). The reason we did not include these 6 variables in the first analysis was to be sure that results
189 would not depend on potential maternal reporting biases in our analysis of the associations between
190 Phase 1 and Phase 2 data.

191 *Reliability and Power analysis*

192 To assess whether our results were robust and reliable, we proceeded in five steps of reliability
193 analyses: (1) leave-one out analysis, (2) Moser's RR-score (28), (3) a cross validation, (4) repeating
194 sCCA with regressing out age, (5) repeating sCCA transforming each variable into ranks. In order to
195 assess statistical power, we performed Monte Carlo style power analysis (see Supplement for
196 details).

197 **Results**

198 Groups did not differ on maternal or child-age at either time point, however, as expected, they did
199 differ on PTSD symptom severity ($p < 0.001$ for both lifetime and current PTSD). See Table 1 for
200 characteristics and group differences of demographic and other selected measures.

201 The initial sCCA (analysis 1, using Phase 1 maternal variables and Phase 2 child and clinician reported
202 variables) showed a significant first mode ($r = 0.63$, $p = 0.030$). For analysis 1, the biggest
203 contributions to the variate of phase 1 came from current and lifetime PTSD symptoms (weight =
204 0.39 and 0.35 respectively), depression (weight = 0.35), report of parental distress on the PSI (weight
205 = 0.33), as well as dissociation symptoms (weight = 0.31). Additionally, maternal report of the child
206 being exposed to violence already at Phase 1 (weight = 0.33), also contributed with a weight above
207 0.2 to the variate of phase 1. Additionally, SES also contributed with a weight of 0.23 (see Figure 1
208 and Table 3A). The number of child symptoms for PTSD (weight = 0.55), anxiety disorders (weight =
209 0.38), ADHD (weight = 0.28) and depression (weight = 0.25), as well as bullying perpetration (weight
210 = 0.38) and victimization (weight = 0.27) contributed to the variate representing Phase 2. Child
211 attributions of parents being harsh as rated via the MSSB also had a positive weight (0.22, see Figure
212 1 and Table 3B).

213 The sCCA of analysis 2 (additionally using maternally reported child variables for Phase 2) was more
214 significant ($r = 0.69$, $p = 0.003$) than the analysis 1. The weights defining the variate of Phase 1 were
215 again led by psychopathology measures, with PTSD (lifetime weight = 0.36, current PTSD weight =
216 0.35), dissociation (weight = 0.34) and depression symptoms (weight = 0.32) contributing the most.
217 Other variables contributing with a weight above 0.2 included all PSI subscales (weights = 0.30, 0.26
218 and 0.25 respectively), and the alexithymia subscale for identification of feelings (weight = 0.22).
219 Additionally, potential confounder variables of child sex (weight for girls = 0.24) and maternal report
220 of child exposure to violence at Phase 1 (weight = 0.23) also contributed (see Figure 2 and Table 3A).
221 The variate representing Phase 2 was contributed with weights >0.20 by the number of child
222 symptoms for PTSD (weight = 0.41) and anxiety disorders (weight = 0.27), as well as bullying

223 perpetration (weight = 0.27) and victimization (weight = 0.20). Several of the maternally reported
224 variables added for analysis 2 also had weights >0.20, including internalizing (weight = 0.35) and
225 externalizing symptoms (weight = 0.22), as well as school life temperament measures for negative
226 reactivity (weight = 0.39) and task persistence (weight = 0.32, see Figure 2 and Table 3B).

227 Reliability analysis indicated that mode 1 (but no other modes) of analysis 1 and 2 was reliable (see
228 Supplement). We calculated that power was more than adequate to find an existing significant effect
229 (see Supplement).

230 **Discussion**

231 We found - a dimensional relationship between 1) a maternal dataset from when children were
232 toddlers that reflects maternal lifetime experience of IPV and related psychopathology (i.e., PTSD,
233 depression, dissociation), parenting stress and the quality of maternal interactive behavior (i.e.,
234 maternal sensitivity) and 2) a follow-up dataset with a focus on child outcome measures from when
235 the same children were school-aged that reflects child symptoms, behaviors including peer-
236 aggression (i.e., bullying) and victimization. This relationship between maternal data and subsequent
237 child outcomes was multivariate and dimensional in nature concerning both maternal predictors and
238 child outcomes.

239 PTSD and comorbid psychopathology most strongly influenced the model among both maternal and
240 child measures. However, among maternal predictors of child outcome, maternal psychopathology
241 was accompanied by other measures related to stress, alexithymia, and atypical behavior, some of
242 which reached almost the same weights. For the subsequent child dataset, it is important to note
243 that the child's PTSD-like symptoms were most influential again, accompanied by other
244 psychopathology symptoms (i.e., ADHD, depression, anxiety). However, other variables were also
245 important. The fact that bullying and being bullied, carried notable weight, underscores the long-
246 term effects of the family environment on children's social interaction and how their behavior can in
247 turn affect their peer-interactions and therefore affect society in a broader perspective.

248 These latter results support our hypothesis that, during early childhood, maternal PTSD symptom
249 severity along with decreased maternal sensitivity with which PTSD severity is also associated (8, 10),
250 predict increased peer-aggression and -victimization at school-age. This finding to our knowledge is a
251 novel finding that contributes to our understanding of the influence of maternal IVP-PTSD as it can
252 affect caregiving during the early sensitive period for the development of emotion regulation, on
253 child school-age outcomes and subsequent risk. Further research is needed to explore this potential
254 marker of intergenerational transmission of IVP and related psychopathology and to determine
255 which individual child characteristics would render a child more likely at risk to perpetrate IVP vs be
256 victimized.

257 An additional, novel and surprising finding was that maternal PTSD severity during early childhood
258 predicted school-age child attributions of parents as being harsh on the story-stem completion task
259 (MSSB). To our knowledge, no previously published study has studied this aspect of child mental
260 representation or perception of parents during childhood. One published study of adults using
261 retrospective measures had reported the association of offspring representations of parents as
262 harsh and dysfunctional during childhood with family violence and maltreatment and subsequent
263 disturbance in emotion regulation (29). This finding indicates that during clinical examination of
264 children via observation of play narrative, harsh representations of parental figures might lead the
265 clinician to inquire as to intergenerational IPV and associated psychopathology (i.e. IVP-PTSD).

266 Initial analyses were performed without including maternally reported measures of child
267 psychopathology and temperament to ensure that associations transcended maternal response
268 biases or an otherwise distorted vision of her child (for further discussion on differences between
269 Model 1 and 2 see Supplement). Our findings echo and extend those of several prior studies on
270 parental psychopathology and child outcomes (8, 30-33). Our findings are also in line with another
271 study on maternal intimate partner violence and child experience (34). That study was more focused
272 on PTSD symptoms, considering direct physical abuse alone. This latter study did not examine

273 comorbidities and other explicative factors; yet, similar to the present study, it reported that both
274 mothers' experience of domestic violence, together with mothers' related PTSD, and those mothers'
275 children's history of physical abuse and/or exposure to domestic violence were important predictors
276 of all subscales of the children's PTSD, when they were between 8 and 17 years of age.

277 The dimensional nature and breadth of measures studied here - both those pertaining to maternal
278 factors and child outcomes - underscore the complexity of factors to be considered when mothers
279 have a history of violence and abuse. Early intervention targeting mother-child interactive behavior
280 as well as maternal psychopathology, and thus several factors simultaneously, may therefore have
281 long-term benefits for many at-risk individuals, given the prevalence of IPV and related
282 psychopathology (35, 36). Moreover, the large number of child outcomes reflects the complexity
283 and multi-dimensional (as opposed to a univariate categorical yes or no) nature, of the
284 consequences of growing up during a sensitive period for the development of emotion regulation, in
285 an environment with maternal IPV-related PTSD.

286 The complexity identified in this study supports and extends pre-existing literature on parental PTSD
287 and its potential effects on caregiving. PTSD is indeed associated with a number of comorbid
288 psychiatric disorders, such as major depressive disorder, which can also affect parenting skills(3).
289 PTSD and comorbid depressive and dissociative symptoms, and their combined consequences on
290 parenting skills can have an influence on a variety of child outcome measures and put children at
291 greater risk for psychopathology, deficient socioemotional skills and propensity for aggressive
292 behavior, such as bullying as well as victimization (4, 5).

293 Given the complexity and number of involved factors, the present study highlights important
294 challenges that clinicians face when attempting to prevent the intergenerational transmission of IPV
295 and related psychopathology. It is not only maternal psychopathology, such as PTSD that affects
296 child outcomes, but also the co-occurring problems that often accompany PTSD, generally increased
297 parenting stress (37) and decreased parental sensitive responsiveness in parent-child interactions(8,

298 10). Simply treating maternal PTSD symptoms can be an important start, yet such individual
299 treatment is unlikely to be sufficient to address all accompanying problems in the parent-child
300 relationship, such as low parental reflective functioning as a marker of the quality of the parent's
301 attachment (i.e., attachment security and organization, 2, 38-40), as well as proneness to additional
302 traumatization in the context of low SES (41-44) and a tendency to misappraise interpersonal cues
303 that would alert a mother to a risk for violence in a new romantic relationship according to a nested
304 study of a subset of the same mothers that participated in the present larger study (45, 46). The
305 consequences of the combination of co-occurring risk factors for young children encompass a range
306 of factors themselves. These include different kinds of psychopathology and behavioral difficulties,
307 among which are increased likelihood of the perpetration of aggression and victimization. It is thus
308 important to keep an open mind in family situations with histories of IPV and to monitor different
309 kinds of symptoms and potentially ensuing difficulties for the children of parents with IPV-PTSD.

310 Limitations of this study are, however, those of the sample and the chosen measures. The focus of
311 the sample on dyads in which the majority of mothers had experienced PTSD symptoms and
312 childhood exposure to IPV permitted a good understanding of the intergenerational consequences
313 of IPV. However, this focus on an important but very specific clinical population may make
314 generalization to the larger population more difficult. While the extensive reliability and power
315 analysis conducted for this study indicate the findings as reliable (see Supplement), It is possible that
316 with more statistical power, a secondary sCCA mode focusing more on externalizing and aggression
317 symptoms could have become significant and reliable. Further, while we believe that the chosen
318 measures make sense within these datasets, they are by no means the only ones that might relate to
319 the intergenerational cycle of violence, and future studies may want to widen the scope even
320 further.

321 In conclusion, this is the first study to our knowledge to report prospective, longitudinal findings of a
322 sample of children of mothers who suffered from IVP-PTSD during early childhood and who were

323 later studied using a range of different measures—both observed, child-reported, and maternal
324 reported at school-age. Our study shows the complex dimensionality with which a multitude of
325 factors around IPV related PTSD affect mother-child dyads prospectively and longitudinally. We
326 argue that this points to the importance of understanding the transgenerational transmission of
327 violence-related psychopathology as a multifactor phenomenon, both in origin and outcome, that is
328 best described dimensionally rather than categorically (such as the presence of disorder yes/no).
329 Children’s social-emotional skills, not just symptoms, are reflected in the outcome measures
330 selected, thereby providing an opportunity to observe distortions in children’s understanding of
331 relational meanings emerging in middle childhood. A particularly novel finding of this study involves
332 the demonstration that maternal severity of PTSD and the quality (i.e. sensitivity) of related mother-
333 child interactive behavior during early childhood, predicts peer-aggression (i.e. bullying) and -
334 victimization at school-age. The results, in sum, imply the importance of focusing on traumatized
335 parents’ behavioral response to their young children’s distress during clinical intervention. This plus
336 attention to the inner worlds of parents and children—the latter, which the study characterized via
337 the MacArthur Story Stem Battery as an observed behavioral and narrative measure, are propitious
338 targets for restoring a healthier social-emotional developmental trajectory by school-age.

339 **Financial Support**

340 This study was funded by a Swiss National Science Foundation NCCR-SYNAPSY grant (n°
341 51AU40_125759).

342 **Conflicts of Interest**

343 The authors report no conflict of interest financial or otherwise.

344 **Data availability**

345 The data used for the analysis is available as a supplemental file of this paper
346
347

- 348 1. Tremblay RE, Nagin DS, Seguin JR, Zoccolillo M, Zelazo PD, Boivin M, et al. Physical
349 aggression during early childhood: trajectories and predictors. *Pediatrics*. 2004;114(1):e43-50.
- 350 2. Slade A, Grienenberger J, Bernbach E, Levy D, Locker A. Maternal reflective functioning,
351 attachment, and the transmission gap: a preliminary study. *Attach Hum Dev*. 2005;7(3):283-98.

- 352 3. Berg-Nielsen TS, Vikan A, Dahl AA. Parenting related to child and parental psychopathology:
353 A descriptive review of the literature. *Clinical child psychology and psychiatry*. 2002;7(4):529-52.
- 354 4. Morelen D, Shaffer A, Suveg C. Maternal emotion regulation: Links to emotion parenting and
355 child emotion regulation. *Journal of Family Issues*. 2016;37(13):1891-916.
- 356 5. Ladd GW, Pettit GS. Parenting and the development of children's peer relationships. 2002.
- 357 6. Brady KT, Killeen TK, Brewerton T, Lucerini S. Comorbidity of psychiatric disorders and
358 posttraumatic stress disorder. *Journal of clinical psychiatry*. 2000;61:22-32.
- 359 7. Keane TM, Kaloupek DG. Comorbid psychiatric disorders in PTSD: Implications for research.
360 *Annals of the New York Academy of Sciences*. 1997;821(1):24-34.
- 361 8. Suardi F, Moser DA, Sancho Rossignol A, Manini A, Vital M, Merminod G, et al. Maternal
362 reflective functioning, interpersonal violence-related posttraumatic stress disorder, and risk for
363 psychopathology in early childhood. *Attach Hum Dev*. 2020;22(2):225-45.
- 364 9. Frewen PA, Dozois DJ, Neufeld RW, Lanius RA. Meta-analysis of alexithymia in posttraumatic
365 stress disorder. *Journal of Traumatic Stress: Official Publication of The International Society for*
366 *Traumatic Stress Studies*. 2008;21(2):243-6.
- 367 10. Schechter DS, Suardi F, Manini A, Cordero MI, Rossignol AS, Merminod G, et al. How do
368 maternal PTSD and alexithymia interact to impact maternal behavior? *Child psychiatry and human*
369 *development*. 2015;46(3):406-17.
- 370 11. Nobre-Trindade C, Caçador MI, Canavarro MC, Moreira H. Mothers' psychopathology
371 symptoms and mindful parenting in the postpartum period: The role of parental reflective
372 functioning. *Infant Mental Health Journal*. 2021.
- 373 12. Grabe HJ, Spitzer C, Freyberger HJ. Alexithymia and personality in relation to dimensions of
374 psychopathology. *The American journal of psychiatry*. 2004;161(7):1299-301.
- 375 13. Krink S, Muehlhan C, Luyten P, Romer G, Ramsauer B. Parental Reflective Functioning Affects
376 Sensitivity to Distress in Mothers with Postpartum Depression. *Journal of Child and Family Studies*.
377 2018;27(5):1671-81.
- 378 14. Lane RD, Sechrest L, Riedel R. Sociodemographic correlates of alexithymia. *Comprehensive*
379 *psychiatry*. 1998;39(6):377-85.
- 380 15. Caron C, Rutter M. Comorbidity in child psychopathology: Concepts, issues and research
381 strategies. *Journal of child Psychology and Psychiatry*. 1991;32(7):1063-80.
- 382 16. Belden AC, Sullivan JP, Luby JL. Depressed and healthy preschoolers' internal representations
383 of their mothers' caregiving: associations with observed caregiving behaviors one year later. *Attach*
384 *Hum Dev*. 2007;9(3):239-54.
- 385 17. Warren SL, Emde RN, Sroufe LA. Internal representations: predicting anxiety from children's
386 play narratives. *Journal of the American Academy of Child and Adolescent Psychiatry*.
387 2000;39(1):100-7.
- 388 18. Kim JW, Lee K, Lee YS, Han DH, Min KJ, Song SH, et al. Factors associated with group bullying
389 and psychopathology in elementary school students using child-welfare facilities. *Neuropsychiatric*
390 *disease and treatment*. 2015;11:991.
- 391 19. Nigg JT. Temperament and developmental psychopathology. *Journal of Child Psychology and*
392 *Psychiatry*. 2006;47(3-4):395-422.
- 393 20. Schipper M, Petermann F. Relating empathy and emotion regulation: do deficits in empathy
394 trigger emotion dysregulation? *Soc Neurosci*. 2013;8(1):101-7.
- 395 21. Alvarez N, Lazaro MH, Gordo L, Elejalde LI, Pampliega AM. Maternal mentalization and child
396 emotion regulation: A comparison of different phases of early childhood. *Infant Behav Dev*.
397 2022;66:101681.
- 398 22. Engel ML, Gunnar MR. The development of stress reactivity and regulation during human
399 development. *Int Rev Neurobiol*. 2020;150:41-76.
- 400 23. Sancho Rossignol A, Lütthi Faivre F, Suardi F, Moser DA, I. CM, Rusconi Serpa S, et al. Geneva
401 Socio-demographic Questionnaire (GSQ). 2010.

- 402 24. Bretherton I, Oppenheim D, Buchsbaum H, Emde R, Group TMN. MacArthur Story Stem
403 Battery coding manual. 1990.
- 404 25. Witten DM, Tibshirani R, Hastie T. A penalized matrix decomposition, with applications to
405 sparse principal components and canonical correlation analysis. *Biostatistics*. 2009;10(3):515-34.
- 406 26. Ing A, Samann PG, Chu C, Tay N, Biondo F, Robert G, et al. Identification of neurobehavioural
407 symptom groups based on shared brain mechanisms. *Nat Hum Behav*. 2019;3(12):1306-18.
- 408 27. Miragoli S, Balzarotti S, Camisasca E, Di Blasio P. Parents' perception of child behavior,
409 parenting stress, and child abuse potential: Individual and partner influences. *Child abuse & neglect*.
410 2018;84:146-56.
- 411 28. Moser DA, Doucet GE, Lee WH, Rasgon A, Krinsky H, Leibu E, et al. Multivariate Associations
412 Among Behavioral, Clinical, and Multimodal Imaging Phenotypes in Patients With Psychosis. *JAMA*
413 *Psychiatry*. 2018;75(4):386-95.
- 414 29. Talevi D, Imburgia L, Luperini C, Zancla A, Collazzoni A, Rossi R, et al. Interpersonal violence:
415 identification of associated features in a clinical sample. *Child Abuse Negl*. 2018;86:349-57.
- 416 30. Zaslow MJ, Weinfield NS, Gallagher M, Hair EC, Ogawa JR, Egeland B, et al. Longitudinal
417 prediction of child outcomes from differing measures of parenting in a low-income sample.
418 *Developmental psychology*. 2006;42(1):27.
- 419 31. Scheeringa MS, Zeanah CH. A relational perspective on PTSD in early childhood. *Journal of*
420 *Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies*.
421 2001;14(4):799-815.
- 422 32. Schechter DS, Zygmunt A, Coates SW, Davies M, Trabka K, McCaw J, et al. Caregiver
423 traumatization adversely impacts young children's mental representations on the MacArthur Story
424 Stem Battery. *Attach Hum Dev*. 2007;9(3):187-205.
- 425 33. Ehrensaft MK, Cohen P, Brown J, Smailes E, Chen H, Johnson JG. Intergenerational
426 transmission of partner violence: a 20-year prospective study. *Journal of consulting and clinical*
427 *psychology*. 2003;71(4):741.
- 428 34. Castro M, Alcantara-Lopez M, Martinez A, Fernandez V, Sanchez-Meca J, Lopez-Soler C.
429 Mother's IPV, Child Maltreatment Type and the Presence of PTSD in Children and Adolescents. *Int J*
430 *Environ Res Public Health*. 2017;14(9).
- 431 35. Lieberman AF, Ghosh Ippen C, Van Horn P. Child-parent psychotherapy: 6-month follow-up
432 of a randomized controlled trial. *Journal of the American Academy of Child and Adolescent*
433 *Psychiatry*. 2006;45(8):913-8.
- 434 36. Miller TR. Projected Outcomes of Nurse-Family Partnership Home Visitation During 1996-
435 2013, USA. *Prev Sci*. 2015;16(6):765-77.
- 436 37. McDonald S, Slade P, Spiby H, Iles J. Post-traumatic stress symptoms, parenting stress and
437 mother-child relationships following childbirth and at 2 years postpartum. *Journal of Psychosomatic*
438 *Obstetrics & Gynecology*. 2011;32(3):141-6.
- 439 38. Grienberger JF, Kelly K, Slade A. Maternal reflective functioning, mother-infant affective
440 communication, and infant attachment: exploring the link between mental states and observed
441 caregiving behavior in the intergenerational transmission of attachment. *Attach Hum Dev*.
442 2005;7(3):299-311.
- 443 39. Schechter DS, Myers MM, Brunelli SA, Coates SW, Zeanah CH, Davies M, et al. Traumatized
444 mothers can change their minds about their toddlers: Understanding how a novel use of
445 videofeedback supports positive change of maternal attributions. *Infant Ment Health J*.
446 2006;27(5):429-47.
- 447 40. Moser DA, Suardi F, Rossignol AS, Vital M, Manini A, Serpa SR, et al. Parental Reflective
448 Functioning correlates to brain activation in response to video-stimuli of mother-child dyads: Links to
449 maternal trauma history and PTSD. *Psychiatry Res Neuroimaging*. 2019;293:110985.
- 450 41. Burns PA, Zunt JR, Hernandez B, Wagenaar BH, Kumar M, Omolo D, et al. Intimate Partner
451 Violence, Poverty, and Maternal Health Care-Seeking Among Young Women in Kenya: a Cross-

- 452 Sectional Analysis Informing the New Sustainable Development Goals. *Glob Soc Welf.* 2020;7(1):1-
453 13.
- 454 42. Yakubovich AR, Heron J, Feder G, Fraser A, Humphreys DK. Long-term Exposure to
455 Neighborhood Deprivation and Intimate Partner Violence Among Women: A UK Birth Cohort Study.
456 *Epidemiology.* 2020;31(2):272-81.
- 457 43. Lowe SR, Galea S, Uddin M, Koenen KC. Trajectories of posttraumatic stress among urban
458 residents. *Am J Community Psychol.* 2014;53(1-2):159-72.
- 459 44. White SF, Voss JL, Chiang JJ, Wang L, McLaughlin KA, Miller GE. Exposure to violence and low
460 family income are associated with heightened amygdala responsiveness to threat among
461 adolescents. *Dev Cogn Neurosci.* 2019;40:100709.
- 462 45. Berthelot N, Lemieux R, Garon-Bissonnette J, Lacharité C, Muzik M. The protective role of
463 mentalizing: Reflective functioning as a mediator between child maltreatment, psychopathology and
464 parental attitude in expecting parents. *Child Abuse Neglect.* 2019;95:104065.
- 465 46. Perizollo Pointet VC, Moser DA, Vital M, Serpa SR, Todorov A, Schechter DS. Violence
466 Exposure Is Associated With Atypical Appraisal of Threat Among Women: An EEG Study. *Frontiers in*
467 *psychology.* 2021;11.
- 468 47. Abidin RR. *Parenting Stress Index (3rd ed.)*. Odessa, FL: Psychological Assessment Resources;
469 1995.
- 470 48. Toucheque M, Etienne A-M, Stassart C, Catale C. Validation of the French version of the
471 parenting stress index—short form. *Journal of Community Psychology.* 2016;44(4):419-25.
- 472 49. Briere J, Runtz M. Augmenting Hopkins SCL scales to measure dissociative symptoms: data
473 from two nonclinical samples. *J Pers Assess.* 1990;55(1-2):376-9.
- 474 50. Kubany ES, Haynes SN, Leisen MB, Owens JA, Kaplan AS, Watson SB, et al. Development and
475 preliminary validation of a brief broad-spectrum measure of trauma exposure: the Traumatic Life
476 Events Questionnaire. *Psychol Assess.* 2000;12(2):210-24.
- 477 51. Cordero MI, Moser DA, Suardi F, Rusconi Serpa S, S. SD. The Geneva Child Exposure to
478 Violence Questionnaire (CETV). . 2010.
- 479 52. Beck AT, Steer RA, Brown GK. *Beck depression inventory (BDI-II)*: Pearson; 1996.
- 480 53. Wagener A, Blairy S. Validation and psychometric properties of the French versions of the
481 environmental reward observation scale and of the reward probability index. *Psychologica Belgica.*
482 2015;55(2):71.
- 483 54. Slade A. Parental reflective functioning: An introduction. *Attachment & human*
484 *development.* 2005;7(3):269-81.
- 485 55. Zeanah CH, Benoit D. Clinical applications of a parent perception interview in infant mental
486 health. *Child and Adolescent Psychiatric Clinics of North America.* 1995;4(3):539-54.
- 487 56. Schechter DS, Coots T, Zeanah CH, Davies M, Coates SW, Trabka KA, et al. Maternal mental
488 representations of the child in an inner-city clinical sample: violence-related posttraumatic stress
489 and reflective functioning. *Attach Hum Dev.* 2005;7(3):313-31.
- 490 57. Weathers FW, Keane TM, Davidson JR. Clinician-administered PTSD scale: a review of the
491 first ten years of research. *Depress Anxiety.* 2001;13(3):132-56.
- 492 58. Pupo MC, Jorge MR, Schoedl AF, Bressan RA, Andreoli SB, Mello MF, et al. The accuracy of
493 the Clinician-Administered PTSD Scale (CAPS) to identify PTSD cases in victims of urban violence.
494 *Psychiatry Res.* 2011;185(1-2):157-60.
- 495 59. Crittenden PM. *CARE-index toddlers coding manual.* 2006.
- 496 60. Lima EdP, Barreto SM, Assunção AÁ. Factor structure, internal consistency and reliability of
497 the Posttraumatic Stress Disorder Checklist (PCL): an exploratory study. *Trends in psychiatry and*
498 *psychotherapy.* 2012;34(4):215-22.
- 499 61. Wilkins KC, Lang AJ, Norman SB. Synthesis of the psychometric properties of the PTSD
500 checklist (PCL) military, civilian, and specific versions. *Depression and anxiety.* 2011;28(7):596-606.
- 501 62. Bagby RM, Parker JDA, Taylor GJ. The 20-Item Toronto-Alexithymia-Scale .1. Item Selection
502 and Cross-Validation of the Factor Structure. *J Psychosom Res.* 1994;38(1):23-32.

- 503 63. Bagby RM, Taylor GJ, Parker JDA. The twenty-item Toronto Alexithymia Scale—II.
504 Convergent, discriminant, and concurrent validity. *J Psychosom Res.* 1994;38(1):33-40.
505 64. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th
506 ed. Arlington, VA: American psychiatric Publishing; 2013.
- 507 65. Dealy J, Mudrick H, Robinson J. Children's narrative story stem responses: Contributions of
508 executive functioning and language proficiency to relationship representations. *Soc Dev.*
509 2019;28(1):168-85.
- 510 66. Chan JHF, Myron R, Crawshaw M. The efficacy of non-anonymous measures of bullying.
511 *School Psychol Int.* 2005;26(4):443-58.
- 512 67. Achenbach T, Achenbach T, Achenbach T. *Integrative Guide to the 1991 CBCL/4-18, YSR, and*
513 *TRF Profiles*. 1991.
- 514 68. Bied A, Biederman J, Faraone S. Parent-based diagnosis of ADHD is as accurate as a teacher-
515 based diagnosis of ADHD. *Postgrad Med.* 2017;129(3):375-81.
- 516 69. Pons F, Harris P. *Test of emotion comprehension: TEC*: University of Oxford; 2000.
- 517 70. McClowry SG. *The development of the School-Age Temperament Inventory*. Merrill-Palmer
518 *Quarterly.* 1995;41: 271–85.
- 519 71. McClowry SG, Halverson CF, Sanson A. A re-examination of the validity and reliability of the
520 *School-Age Temperament Inventory*. *Nurs Res.* 2003;52(3):176-82.
- 521 72. Fox N, Leavitt L. *The Violence Exposure Scale for Children-Revised (VEX-R)*. College Park, MD:
522 University of Maryland. 1995.
- 523 73. Macfie J, Toth SL, Rogosch FA, Robinson J, Emde RN, Cicchetti D. Effect of maltreatment on
524 preschoolers' narrative representations of responses to relieve distress and of role reversal. *Dev*
525 *Psychol.* 1999;35(2):460-5.

526

527

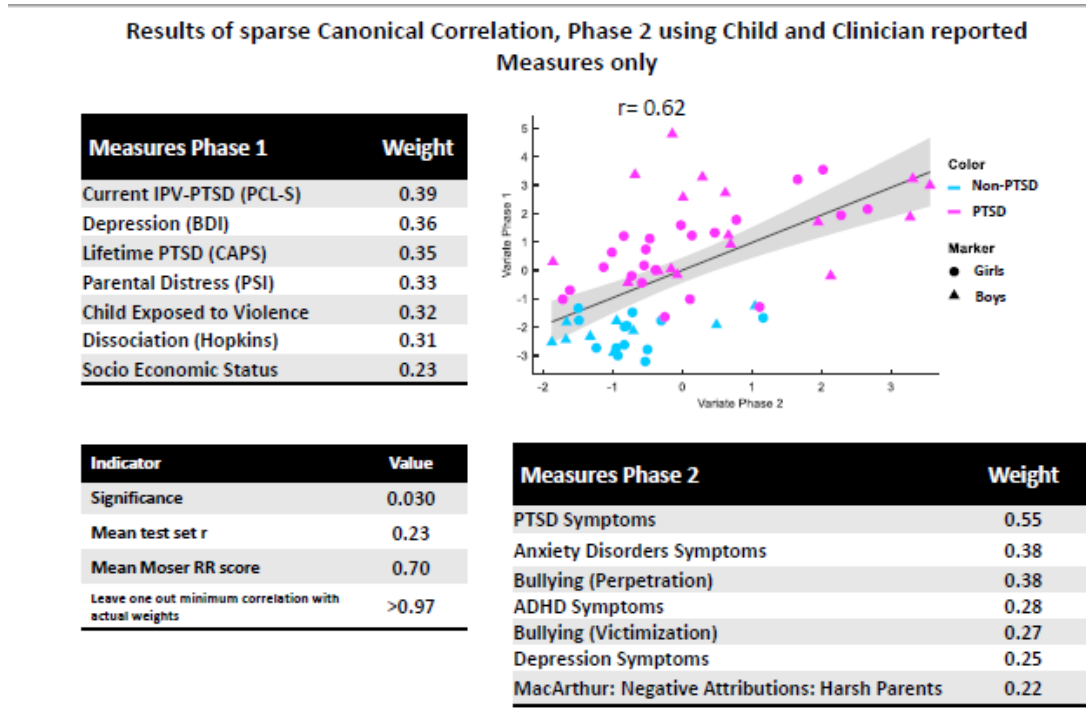
528

529 **Figure 1.**

530 **Title: Results of the first sCCA analysis.**

531 Caption: Top left assigned weights (>0.2) of Mode 1 for the Phase 1 variate, Top right scatter plot of
 532 mode 1, stratified by maternal PTSD status and child sex for illustrative purposes. Bottom left:
 533 significance and reliability measures, bottom right weights (>0.2) for the phase 2 variate.

534 Abbreviations: PTSD: Post traumatic Stress Disorder, BDI: Beck Depression Inventory, CBCL: Child
 535 Behavior Checklist, IPV: Interpersonal Violence, PCL-S: Posttraumatic stress disorder Checklist Scale,
 536 PSI: Parenting Stress Index, PTSD: Post traumatic Stress Disorder, TAS20: Toronto Alexithymia Scale.



537

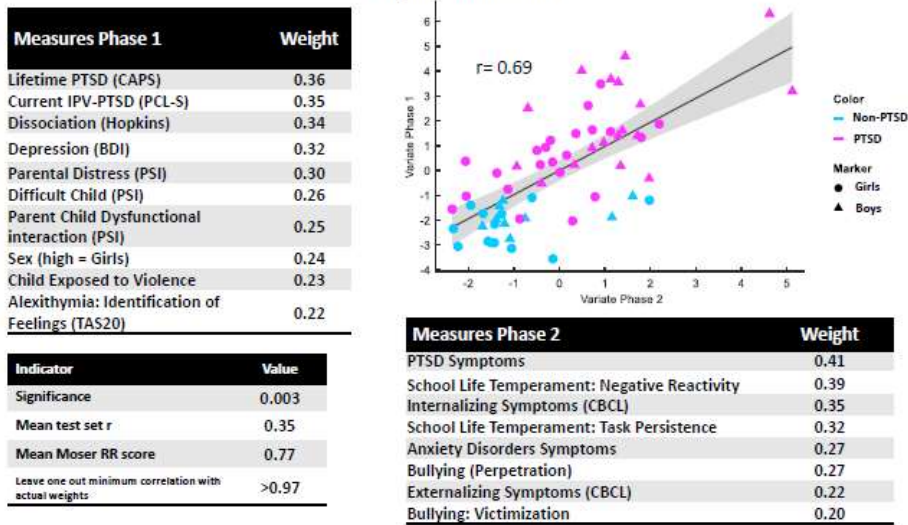
538 **Figure 2.**

539 **Title: Results of the second sCCA analysis**

540 Caption: Top left assigned weights (>0.2) of Mode 1 for the Phase 1 variate, Top right scatter plot of
 541 mode 1 stratified by maternal PTSD status and child sex for illustrative purposes. Bottom left:
 542 significance and reliability measures, bottom right weights (>0.2) for the phase 2 variate.

543 Abbreviations: BDI: Beck Depression Inventory, CBCL: Child Behavior Checklist, PCL-S : Posttraumatic
 544 stress disorder Checklist Scale, PSI: Parenting Stress Index, PTSD: Post traumatic Stress Disorder, IPV:
 545 Interpersonal Violence, TAS20: Toronto Alexithymia Scale.

Results of sparse Canonical Correlation, Phase 2 using Child, Clinician and Maternal reported Measures



546

547

548 **Table 1: Sample characteristics and selected measures compared by group.**

	Overall (n=62) Mean (SD) / Percentage	PTSD (n=40) Mean (SD) / Percentage	Non-PTSD (n=22) Mean (SD) / Percentage	p-value for significance of difference (t-test or Mann- Whitney test)
Phase 1 Demographics				
Maternal Age (Years)	35.1 (5.7)	34.5 (5.9)	35.6 (5.5)	0.51
Child Age (Months)	27.0 (8.6)	29.4 (8.4)	27.7 (8.4)	0.45
Socio Economic Status (high status = low value)	5.0 (1.9)	5.3 (1.8)	4.4 (1.9)	0.07
Child Sex (% Boys)	56%	55%	59%	0.76
Phase 1 Maternal Measures				
Lifetime PTSD score (CAPS)	60.0 (35.5)	82.6 (21.6)	18.8 (5.9)	<0.001
Current PTSD score (PCL-S)	32.4 (14.8)	40.9 (11.3)	16.9 (2.0)	<0.001
Depression Symptoms	9.2 (7.7)	12.3 (10.5)	3.6 (3)	<0.001
Psychological Dissociation	14.8 (11.1)	19.1 (11.3)	6.8 (6.5)	<0.001
Maternal Sensitivity	5.2 (1.3)	4.7 (1.1)	6.0 (1.2)	<0.001
Experience trauma during adulthood	31%	41%	13%	0.03
Physical abuse during childhood	53%	55%	50%	0.71
Sexual abuse during childhood	21%	27%	9%	0.09
Phase 2 Child Measures				
Maternal Age (Years)	39.7 (5.6)	39.3 (5.8)	40.5 (5.3)	0.41
Child Age (Months)	84.0 (12.9)	83.2 (13.7)	85.4 (11.5)	0.52

<i>Bullying (Perpetrator)</i>	0.8 (1.0)	1.0 (1.0)	0.4 (0.9)	0.06
<i>Bullying (Victim)</i>	4.3 (8.0)	5.1 (9.4)	2.8 (3.9)	0.32
<i>PTSD symptoms</i>	2.2 (3.1)	3.0 (3.7)	0.9 (1.3)	0.01
<i>Anxiety Disorder Symptoms</i>	3.5 (3.3)	4.1 (3.6)	2.6 (2.6)	0.10
<i>Depression Symptoms</i>	1.5 (1.5)	1.6 (1.5)	1.4 (1.6)	0.50
<i>Behavioral Disorder Symptoms</i>	1.4 (1.9)	1.4 (1.8)	1.4 (2.0)	0.90
<i>ADHD Symptoms</i>	1.1 (1.4)	1.3 (1.5)	0.7 (1.2)	0.09

549 Abbreviations: ADHD, Attention Deficit/Hyperactivity Disorder; CAPS, Clinician Administered PTSD
550 Scale; PCL-S, Posttraumatic stress disorder Checklist Scale; PTSD, Post-Traumatic Stress Disorder; SD,
551 Standard Deviation.

552

553 **Table 2A: Measures of maternal dataset including maternal variables during Phase 1 as well as**
 554 **selected potential confounders.**

Measure	Description	Measure	Description
Socio Economic Status	Socioeconomic status as measured by the Geneva Sociodemographic Questionnaire (GSQ) (23)	PSI subscale Parent Child Dysfunctional interaction	Subscale of the Parenting stress index short form (47). Measures degree to which parent perceives child as not meeting expectations / rendering role of parent difficult. Subscale Cronbach's alpha: 0.79 (48)
Sex of the child	Question part of the GSQ	PSI subscale Difficult Child	Subscale of the Parenting stress index short form (47). Measures degree parent perceives child as difficult to manage. Subscale Cronbach's alpha: 0.79 (48)
Dissociation (Hopkins)	Dissociate Symptoms as measured by the Hopkins dissociative symptoms checklist (49), Cronbach's alpha: between 0.85 and 0.90 (49)	PSI subscale Parental Distress	Subscale of the Parenting stress index short form (47). Measures stress as a function directly related to parenting. Subscale Cronbach's alpha: 0.81 (48)
BPSAQ	Yes or no, did the participant experience traumatic events during adulthood. This was used along with the TLEQ (50)	Child exposure to violence at Phase 1	Maternally reported questionnaire (51) on violence experienced or witnessed by the child, scored with importance of relationship with perpetrator and frequency included
BPSAQ PA	Yes or no, did the participant experience physical abuse during childhood. This was used along with the TLEQ (50)	Depression	Current symptoms of depression as measured with the Becks Depression Inventory (52). Cronbach's alpha: 0.94 (53)
BPSAQ SA	Yes or no, did the participant experience sexual abuse during childhood. This was used along with the TLEQ (50)	Narrative coding: Parental Reflective Functioning	Coding of the Working Model of the Child Interview, (54-56) Measures parents' capacity to recognize mental states in oneself and one's child and to appropriately relate them to each other's behavior. Coding of mother-child interaction following Crittenden (59). Measures maternal tendency to sense and react appropriately to child's needs. Intra-class correlation (ICC) for the CARE-Index general: $r = .925$, $p < .001$. Coder agreement regarding the attachment-related classifications: $c2 =$
CAPS	Lifetime symptoms of interpersonal violence related PTSD symptoms using the clinician administered PTSD Scale (57, 58), Cronbach's alpha: 0.97 (58)	CARE-Index video coding: Maternal Sensitive behavior	

24.167, $p = .004$; kappa = .841

PCL-S	Symptoms of interpersonal violence related PTSD symptoms in the last 6 months using the PTSD check-list short form (60), Cronbach's alpha: 0.94 (61)	CARE-Index video coding: Maternal Controlling Behavior	Coding of mother-child interaction following Crittenden (59). Measures maternal tendency to behave intrusively with the child. Intra-class correlation (ICC) for the CARE-Index general: $r = .925$, $p < .001$. Coder agreement regarding the attachment-related classifications: $c2 = 24.167$, $p = .004$; kappa = .841
Alexithymia: Difficulty Identifying Feelings	Symptoms of alexithymia, subscale trouble with identification of feelings, as measured with the Toronto Alexithymia Scale (TAS-20; 62). Cronbach's alpha: 0.81, test-retest reliability: 0.77 (63)	CARE-Index video coding: Maternal unresponsive behavior	Coding of mother-child interaction following Crittenden (59). Measures maternal tendency to be avoidant or withdrawn in interactions with the child. Intra-class correlation (ICC) for the CARE-Index in general: $r = .925$, $p < .001$. Coder agreement regarding the attachment-related classifications: $c2 = 24.167$, $p = .004$; kappa = .841
Alexithymia: Difficulty Describing Feelings	Symptoms of alexithymia, subscale trouble with description of feelings, as measured with the TAS-20. Cronbach's alpha: 0.81, test-retest reliability: 0.77 (63)	Parental drug/alcohol use disorder	Yes / No Has a parent of the child had a substance use disorder during the life of the child
Alexithymia: Externally-Oriented Thinking	Symptoms of alexithymia, subscale externally oriented thinking, as measured with the TAS-20. Cronbach's alpha: 0.81, test-retest reliability: 0.77 (63)		

555 Table 2A: Abbreviations: BPSAQ: Brief Physical and Sexual Abuse Questionnaire; CAPS: Clinician
 556 Administered PTSD Scale, GSQ: Geneva Sociodemographic Questionnaire, PA: Physical Abuse, PCL-S:
 557 Posttraumatic stress disorder Checklist Scale, PSI: Parenting Stress Index, PTSD: Posttraumatic Stress
 558 Disorder, SA: Sexual Abuse, TAS-20: Toronto Alexithymia Scale.

559 **Table 2B: Measures of child outcome dataset at Phase 2.**

Measure	Description	Measure	Description
ADHD	Number of ADHD symptoms Child	MacArthur:	Child represents parents

Symptoms	symptoms originally reported by child and judged by clinician in accordance with DSM-V (64). Combined number of child	Negative Parent: ineffectual	as ineffectual to address story stem challenges (65).
Behavioral disorders Symptoms	symptoms originally reported by child and judged by clinician of oppositional defiant disorder and conduct disorders symptoms in accordance with DSM-V (64). Number of depression symptoms	MacArthur: Negative Parent: harsh	Child represents parents as harsh as they address story challenges (65).
Depression symptoms	Child symptoms originally reported by child and judged by clinician in accordance with DSM-V (64). Combined number of child	MacArthur: Negative story endings	Number of stories that have emotionally negative endings (65)
Anxiety Disorders Symptoms	symptoms originally reported by child and judged by clinician for generalized anxiety disorder and separation anxiety disorder in accordance with DSM-V (64). Number of child PTSD symptoms	MacArthur: Aggression overall sum	Overall sum of aggressions incorporated in stories (65)
PTSD symptoms	originally reported by child and judged by clinician in accordance with DSM-5 (64).	MacArthur: Atypical negative	Percent stories with atypical, often bizarre, representation with negative connotation (65)
Bullying (Perpetration)	Experiences of bullying, measured with the school life survey (66)	MacArthur: Danger	Sum of diverse danger situations child includes in stories (65)
Bullying: Victimization	Experiences of being the victim of bullying, measured with the school life survey (66)	CBCL internalizing*	Internalizing symptoms according to the child Behavior Checklist (67, 68)
Emotion Comprehension: External emotions understanding	Test of emotion comprehension (69), subscale to measure understanding of facial emotions and external causes of emotion	CBCL: Externalizing symptoms*	Externalizing symptoms according to the Child Behavior Checklist.
Emotion Comprehension: Mental understanding	Test of emotion comprehension (69), subscale to measure understanding of belief based emotions, and possibility of hidden emotions	School Life: temperament: negative reactivity*	Negative reactivity, i.e. strong reactions emotional / behavioral reactions to experiencing negative events as measured in the SATI (70). Cronbach's alpha (English version) >0.89 (71)
Emotion Comprehension: Reflective capacities	Test of emotion comprehension (69), subscale to measure understanding of mixed emotions, emotion regulation and self-reflection	School Life: Temperament: Task Persistence*	Task persistence, i.e. Failure to persist or self-direct with tasks and chores, as measured by the SATI. Cronbach's alpha (English version) >0.89 (71)

VEX Total physical and nonphysical	Reported exposure to violence and criminal activity according to the clinician-administered Violent Experiences Scale (VEX-R) (72). Cronbach's alpha (English version): between 0.72 and 0.86 (72)	School Life: Temperament: approach/withdrawal*	Tendency to be shy, withdraw or not approach others as measured by SATI. Cronbach's alpha (English version) >0.84 (71) High and potentially hyper or impulsive activity as measured by the SATI. Cronbach's alpha (English version) >0.80 (71)
MacArthur: Avoidant Strategies	Number of behaviors and strategies by child that keep a story from moving forward (65)	School Life: Temperament: Activity*	
MacArthur: Dissociative Strategies	Number of dissociative behaviors by child during stories (73)		

560 Table 2B. * As reported by the mother, only part of Analysis 2, but not of Analysis 1 analysis.
 561 Abbreviations: ADHD: Attention Deficit Hyperactivity Disorder, CBCL: Child Behavior Checklist, K-
 562 SADS: Schedule for Affective Disorders and Schizophrenia for School-Aged Children, MSSB:
 563 MacArthur Story Stem Battery, PTSD: Posttraumatic Stress Disorder, SATI: School-Age Temperament
 564 Inventory, VEX-R: Violence Exposure Scale – Revised.

565

566

567 **Table 3: Weight contributions of the first modes of sparse canonical analysis 1 and 2. A) For Phase**
 568 **1 maternal dataset; B) for Phase 2 Child dataset.**

569 Table 3A

<i>Measure Phase 1</i>	Weight Analysis 1	Weight Analysis 2
<i>Current PTSD (PCLS)</i>	0.39	0.35
<i>Lifetime PTSD (CAPS)</i>	0.35	0.36
<i>Depression (BDI)</i>	0.36	0.32
<i>Dissociation (Hopkins)</i>	0.31	0.34
<i>Parenting Stress Index: Parental Distress</i>	0.33	0.30
<i>Child Witness of Violence</i>	0.32	0.23
<i>Alexithymia: Difficulty Identifying Feeling</i>	0.23	0.22
<i>Parenting Stress Index: Parent Child Dysfunctional interaction</i>	0.17	0.25
<i>Socio Economic Status</i>	0.18	0.13
<i>Parenting Stress Index: Difficult Child</i>	0.16	0.26
<i>Controlling Maternal Behavior (Crittenden)</i>	0.16	0.18
<i>Childhood Sexual Abuse (BPSAQ)</i>	0.14	0.17
<i>Adult Partner Violence (BPSAQ)</i>	0.11	0.16
<i>Alexithymia: Difficulty Describing Feelings</i>	0.10	0.13
<i>Parental Reflective Functioning</i>	0.11	0.05
<i>Parent is Drug/Alcohol Abuser</i>	0.08	0.06
<i>Alexithymia: Externally-Oriented Thinking</i>	0.03	0.08
<i>Unresponsive Maternal Behavior (Crittenden)</i>	-0.04	-0.06
<i>Childhood Physical Abuse (BPSAQ)</i>	-0.12	0.00
<i>Sensitive Maternal behavior (Crittenden)</i>	-0.13	-0.09
<i>Sex Child (higher = more boys)</i>	-0.14	-0.24

570

571 Table 3B

<i>Measure Phase 2</i>	Weight Analysis 1	Weight Analysis 2
<i>PTSD Symptoms</i>	0.55	0.41
<i>School Life: temperament: Negative Reactivity</i>		0.39
<i>Internalizing Symptoms (CBCL)</i>		0.35
<i>Anxiety Disorders Symptoms</i>	0.38	0.27
<i>Bullying: Perpetration</i>	0.38	0.27
<i>School Life: Temperament: Task Persistence</i>		0.32
<i>ADHD Symptoms</i>	0.28	0.19
<i>Bullying: Victimization</i>	0.27	0.20
<i>Externalizing Symptoms (CBCL)</i>		0.22
<i>Depression Symptoms</i>	0.25	0.19
<i>MacArthur: Negative Parent Representation- Harsh</i>	0.22	0.16
<i>Emotion Comprehension: Mental Understanding</i>	0.11	0.09
<i>School Life: Temperament: Approach/Withdrawal</i>		0.08
<i>School Life: Temperament: Activity</i>		0.05
<i>MacArthur: Dissociative Strategies</i>	0.01	0.00

<i>Behavioral disorders Symptoms</i>	0.02	-0.02
<i>MacArthur: Aggression</i>	0.00	-0.01
<i>MacArthur: Atypical Negative Behaviors</i>	0.00	-0.02
<i>Report of Physical and Nonphysical Exposure to Violence and Crime (VEX)</i>	-0.04	-0.05
<i>Emotion Comprehension: Reflective Capacities</i>	-0.11	-0.05
<i>Emotion Comprehension: External Emotions Understanding</i>	-0.12	-0.10
<i>MacArthur: Avoidance</i>	-0.15	-0.12
<i>MacArthur: Negative Endings</i>	-0.15	-0.15
<i>MacArthur: Danger</i>	-0.16	-0.15
<i>MacArthur: Negative : Parents Ineffectual</i>	-0.19	-0.16

572

573 Table 3 weights of sCCA analyses. Analysis 1 includes only child measures given by clinician,
 574 experiment or children themselves, while analysis 2 also includes maternally reported child
 575 measures as outcomes. Abbreviations: ADHD: Attention Deficit Hyperactivity Disorder, CBCL: Child
 576 Behavior Checklist, MacArthur: MacArthur Story Stem Battery, PTSD: Posttraumatic Stress Disorder,
 577 VEX: Violence Exposure Scale – Revised.

578