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Objective and subjective experiences of child maltreatment and their relationships with psychopathology

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Does psychopathology develop as a function of the objective or subjective experience of childhood maltreatment? To address this question, we studied a unique cohort of 1,196 children with both objective, court-documented evidence of maltreatment and subjective reports of their childhood maltreatment histories made once they reached adulthood, along with extensive psychiatric assessment. We found that, even for severe cases of childhood maltreatment identified through court records, risk of psychopathology linked to objective measures was minimal in the absence of subjective reports. In contrast, risk of psychopathology linked to subjective reports of childhood maltreatment was high, whether or not the reports were consistent with objective measures. These findings have important implications for how we study the mechanisms through which child maltreatment affects mental health and how we prevent or treat maltreatment-related psychopathology. Interventions for psychopathology associated with childhood maltreatment can benefit from deeper understanding of the subjective experience.

Childhood maltreatment is an established risk factor for psychopathology. Despite the century-old debate on the origins of this risk[1,2], it is still unclear if psychopathology emerges as a function of an individual's objective or subjective experience of childhood maltreatment[3,4]. This basic phenomenological question has recently re-emerged because of meta-analytical evidence that prospective measures used to capture objective experience of childhood maltreatment and retrospective measures used to capture subjective experience of childhood maltreatment identify largely distinct groups of individuals[4]. It is, therefore, important to characterize the relative contribution of objective and subjective measures to the risk for psychopathology to inform research and clinical practice. The question is central to the selection of the most appropriate samples for studies investigating the mechanisms through which maltreatment affects mental health: should aetiological studies focus on individuals who were identified as being maltreated in childhood and were followed-up over their life-course; or should the studies focus on young people and adults who provide their own personal account of childhood maltreatment experiences? It is also central to the development of more effective interventions for child maltreatment-related psychopathology: should treatment aim to remediate damages/abnormalities caused by childhood exposure to experiences of abuse or neglect; or should treatment aim to correct unhelpful cognitions/memories about the self and the environment?

Research in this area has been hampered by the shortage of human cohorts with both objective and subjective measures of child maltreatment along with comprehensive assessment of psychopathology. It is relatively simple to collect subjective measures of maltreatment, for example, by asking research participants to self-report their childhood experiences through interviews or questionnaires. In contrast, it has proved very challenging to collect objective measures of maltreatment in research studies. A few studies have collected prospective measures of childhood maltreatment through reports by parents, teachers, research workers or, more rarely, self-reports by the children[4]. While these prospective measures importantly provide near-contemporaneous accounts, they still often rely on reports by single sources with partial and/or biased understanding of the child's actual experience. The strongest evidence that actual maltreatment took place is the legal standard, a case substantiated (adjudicated) by the court after a judge makes a decision based on evidence provided by child protection services, law enforcement officers, witnesses and experts[5]. While objective measures, such as court records, are not very sensitive—they are likely to miss cases of childhood maltreatment in the population—they are highly specific in that they identify cases of actual childhood maltreatment with high a degree of confidence. As such, they are the basis for legal actions to protect children and prosecute perpetrators. However, it has been very challenging to integrate official court records into research studies for several reasons: because of concerns and barriers related to confidentiality; because the prevalence of court-substantiated cases is comparatively low and it is often impossible to identify enough cases within general population samples to enable adequate statistical testing; because court-substantiated cases are not randomly distributed in the population but rather cluster in socially and racially disadvantaged groups and, thus, it is often difficult to find suitable control groups in general population samples; and because court-substantiated cases need to be followed-up prospectively over their life-course to study the consequences of their childhood experiences.

We have studied one such unique sample[6,7]. Maltreated participants ($n=908$) were identified as victims of child abuse or neglect based on official records from juvenile (family) and adult criminal courts in a metropolitan area in the Midwest United States during 1967–1971. A comparison group was painstakingly drawn of

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children without official records of abuse or neglect matched on the basis of age, sex, race/ethnicity and approximate family social class at the time of the child maltreatment ($n=667$). During a follow-up assessment between 1989 and 1995 (mean age 28.7 years), 1,196 study participants underwent a 2-h in-person interview, which included assessment of retrospective reports of childhood physical abuse, sexual abuse and neglect, as well as assessment of current and lifetime psychopathology.

To characterize the relative contribution of objective and subjective experience of childhood maltreatment to the risk of psychopathology, we capitalized on this sample to test two competing a-priori hypotheses. First, if psychopathology emerges because of objective experience, then risk should be heightened in participants with official records of child maltreatment, regardless of whether they also retrospectively report it. Second, and alternatively, if psychopathology emerges because of subjective experience, then risk should be heightened in participants who retrospectively report a history of childhood maltreatment, regardless of whether they were also identified through official records.

Results

Agreement between objective and subjective measures of child maltreatment. Objective and subjective measures of child maltreatment identified largely distinct groups of participants (Cohen's $\kappa=0.25$) with poor agreement across all maltreatment types (child physical abuse $\kappa=0.09$; child sexual abuse $\kappa=0.17$; child neglect $\kappa=0.32$; Fig. 1, column 1 and Supplementary Table 1), consistent with meta-analytical findings[4]. Because objective and subjective measures identified largely distinct groups of participants, it was possible to separate the relative contribution of objective and subjective measures of child maltreatment to psychopathology studying three target groups: (1) adult participants who were identified as victims of child maltreatment by virtue of official records but did not retrospectively recall the experience (objective measure); (2) adult participants who were identified as victims of child maltreatment by virtue of official records and also retrospectively recalled the experience (objective and subjective measures); and (3) adult participants who retrospectively recalled being maltreated in childhood but were not identified as victims of child maltreatment by virtue of official records (subjective measure).

Associations of objective and subjective measures of child maltreatment with psychopathology. We first tested whether, compared to those with neither objective nor subjective measure of childhood maltreatment, participants in the three groups were at elevated risk of developing any psychopathology during their lifetime. Participants were classified as having developed any psychopathology if they met lifetime criteria for a broad set of psychiatric disorders (depression, dysthymia, generalized anxiety disorder, post-traumatic stress disorder (PTSD), antisocial personality disorder, alcohol abuse and/or dependence, or drug abuse and/or dependence). We found that participants identified as victims of child maltreatment only by virtue of official records did not have different risk of any lifetime psychopathology compared to those with neither objective nor subjective measure of childhood maltreatment (objective measure: risk ratio, RR = 0.92, 95% confidence interval, CI = 0.78–1.08; Fig. 1a, column 2 and Supplementary Table 2). In contrast, participants with both objective and subjective measures of child maltreatment showed greater risk of any lifetime psychopathology compared to those with neither measure (objective and subjective measures: RR = 1.35, 95% CI = 1.21–1.50; Fig. 1a, column 2 and Supplementary Table 2). Finally, participants identified as victims of child maltreatment only through retrospective recall also showed elevated risk of any lifetime psychopathology compared to those with neither measure (subjective measure: RR = 1.29, 95% CI = 1.15–1.45; Fig. 1a, column 2 and Supplementary Table 2).

Associations of objective and subjective measures of child maltreatment with internalizing and externalizing disorders and with individual diagnoses. Because the commonly described structure of psychopathology identifies underlying constructs of internalizing and externalizing disorders[8] and the two constructs may show differential associations with risk factors, we next tested whether the above pattern of association was sensitive to the psychopathology construct used. Consistent with the above findings, participants with only the objective measure of childhood maltreatment (official record) did not have different risk of internalizing disorders compared to those with neither objective nor subjective measure (RR = 0.87, 95% CI = 0.62–1.22; Fig. 1a, column 3 and Supplementary Table 2), while participants with objective and subjective measures (RR = 2.08, 95% CI = 1.67–2.60) and those with subjective measures only (RR = 1.73, 95% CI = 1.35–2.21) had significantly elevated risk. Similarly, participants with only the objective measure of childhood maltreatment did not have different risk of externalizing disorders compared to those with neither objective nor subjective measure (RR = 0.96, 95% CI = 0.79–1.16; Fig. 1a, column 4 and Supplementary Table 2), while participants with objective and subjective measures (RR = 1.32, 95% CI = 1.16–1.51) and those with subjective measures only (RR = 1.27, 95% CI = 1.10–1.48) had significantly elevated risk.

We next examined the sensitivity of findings across individual diagnoses. Different individual lifetime diagnoses showed inconsistent bivariate associations with objective and subjective measures of childhood maltreatment (Supplementary Table 3). However, we found that the pattern of findings described above was broadly invariant across diagnoses (Fig. 2 and Supplementary Table 2).

Associations of objective and subjective measures of child maltreatment with psychopathology across different maltreatment types. Because the agreement between objective and subjective measures was inconsistent across different types of child maltreatment (child physical abuse, child sexual abuse and child neglect; Supplementary Table 1) and because different types of child maltreatment showed inconsistent bivariate associations with psychopathology (Supplementary Table 4), we tested whether the associations of objective and subjective measures of child maltreatment with psychopathology varied as a function of maltreatment type. We found that the pattern of associations described above was broadly invariant across maltreatment types (Fig. 1b–d and Supplementary Table 5). Of note, these analyses were based on comparisons between participants with a specific maltreatment type (for example, child physical abuse) and participants without such maltreatment type (for example, no childhood physical abuse). However, participants without a specific maltreatment type might have had other maltreatment types (for example, childhood sexual abuse or neglect) and, thus, might have been an inadequate control group, possibly masking the contribution of objective measures of child maltreatment to psychopathology. Therefore, we restricted our analyses to include only participants without any maltreatment type as the control group. We found that the pattern of findings described above similarly applied here, too, although the small sample size of some study groups hindered firm conclusions (Supplementary Fig. 1 and Supplementary Table 6).

Associations of objective and subjective measures of child maltreatment with psychopathology across genders and races. Because the prevalence of both child maltreatment measures and psychopathology varied based on gender and race (Supplementary Tables 7–9), we tested whether the associations between childhood maltreatment measures and psychopathology also varied according to these characteristics. We found that the above pattern of associations similarly applied to men and women (Supplementary Fig. 2 and Supplementary Table 10). Furthermore, the above pattern of associations similarly applied to participants of black and white races (Supplementary Fig. 3 and Supplementary Table 10).

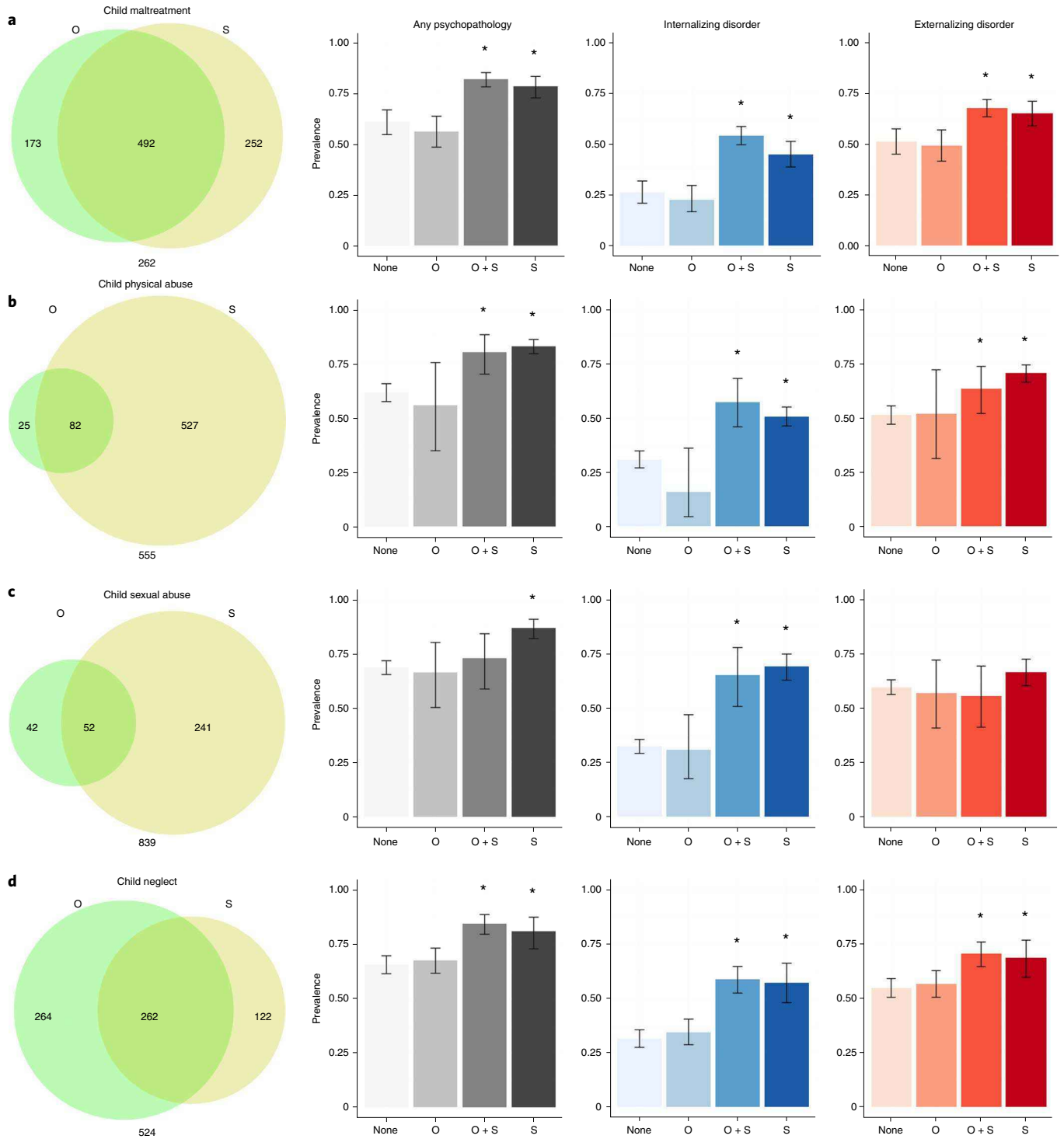

Fig. 1 | Prevalence of psychopathology in participants with objective and/or subjective measures of child maltreatment. a–d, Prevalence of psychopathology with any type of child maltreatment (physical abuse, sexual abuse or neglect) (**a**); child physical abuse (**b**); child sexual abuse (**c**); and child neglect (**d**). The first column displays the Venn diagrams for the overlap between groups identified by virtue of objective (O) and/or subjective (S) measures (in green and/or yellow, respectively); the second column refers to any psychopathology (grey shades); the third column refers to any internalizing disorder (depression, dysthymia, generalized anxiety or PTSD; blue shades); the fourth column refers to any externalizing disorder (antisocial personality, alcohol abuse and/or dependence, or drug abuse and/or dependence; red shades). See Supplementary Tables 2 and 5 for details of the analyses. Error bars, 95% CI; asterisks indicate that the corresponding prevalence estimate differs from the prevalence in the 'none' group at $P < 0.05$.

Recall bias test. Finally, because current psychopathology at the time of recall of childhood maltreatment may negatively bias autobiographical memory[9,10], the elevated risk of lifetime psychopathology in participants who retrospectively recalled being maltreated in childhood (both the 'objective and subjective' measure and the 'subjective' measure) could have been artificially inflated. To test this artifactual explanation for our findings, we restricted our analyses to participants without current psychopathology at the time of

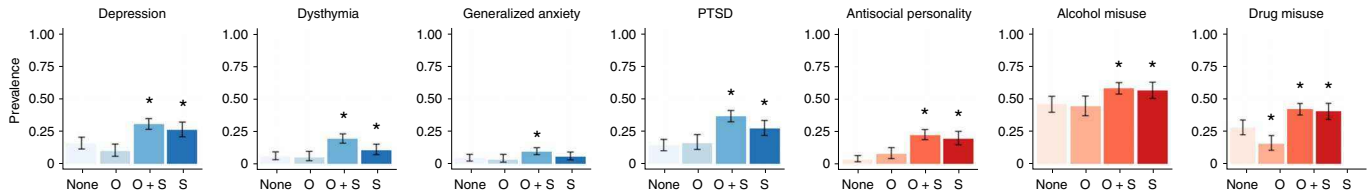

Fig. 2 | Prevalence of individual diagnoses in participants with objective and/or subjective measures of child maltreatment. See Supplementary Table 2 for details of the analyses. Error bars, 95% CI; asterisks indicate that the corresponding prevalence estimate differs from the prevalence in the 'none' group at $P < 0.05$.

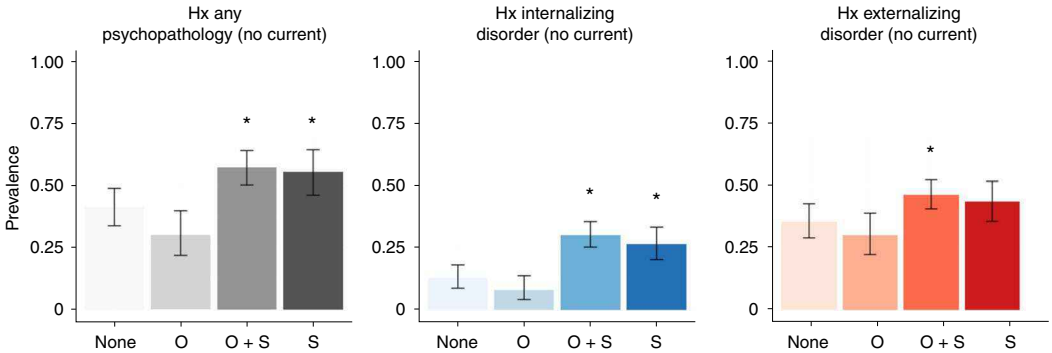

Fig. 3 | Prevalence of a history of psychopathology in participants with objective and/or subjective measures of child maltreatment in the subsample without current psychopathology at the time of subjective measure assessment. See Supplementary Table 11 for details of the analyses. Error bars, 95% CI; asterisks indicate that the corresponding prevalence estimate differs from the prevalence in the 'none' group at $P < 0.05$. Hx, history.

recall. We found that the prevalence of any lifetime psychopathology, internalizing disorder and externalizing disorder was overall lower in this subsample but the pattern of findings described above similarly applied here (Fig. 3 and Supplementary Table 11).

Discussion

The risk of psychopathology linked to objective experiences of childhood maltreatment, even for severe cases of maltreatment identified through official court records, is minimal in the absence of a subjective appraisal. In contrast, the risk of psychopathology linked to subjective experiences of childhood maltreatment is high, whether or not subjective appraisal is consistent with objective measures. The findings were remarkably invariant across different types of maltreatment and psychopathology and across genders and races, expanding initial observations made with regard to drug abuse in this cohort[11]. These results suggest that psychopathology emerges as a function of subjective rather than objective experience of childhood maltreatment.

These findings should be interpreted in the context of potential limitations. First, the stronger association of subjective versus objective measures of childhood maltreatment with psychopathology might reflect misclassification. This might occur because official court records used here as objective measures of childhood maltreatment are highly specific (low false positives) but are not very sensitive (high false negatives), so are unlikely to capture all cases of maltreatment in the population. Of note, court records have particularly low sensitivity for cases of child sexual abuse[4,12], which are more often private, hidden by the perpetrators and untold by the victims. However, we observed a similar pattern of findings across all maltreatment types despite the known differences in sensitivity (Fig. 1 and Supplementary Table 5). Furthermore, our results suggest that reclassification of participants would not substantially affect the results. Because of low sensitivity in official court records, participants who should have been classified as having only the objective measure of maltreatment might have been misclassified as having neither objective nor subjective measure; similarly, participants who should have been classified as having both objective and subjective measures of maltreatment might have been misclassified as having only the subjective measure. However, there were no clear differences in the prevalence of psychopathology between participants with only the objective measure of maltreatment and those with neither objective nor subjective measure; and there were no clear differences in the prevalence of psychopathology between participants with objective and subjective measures of maltreatment and those with only the subjective measure (Fig. 1 and Supplementary Tables 2 and 5). As such, misclassification of children with objective experience of maltreatment is not a satisfactory explanation for the results.

Second, the stronger association of subjective compared to objective measures of childhood maltreatment with psychopathology might be explained by negative biases in autobiographical memory owing to psychopathology at the time of subjective appraisal[9,10]. However, we observed the same pattern of findings in a subset of participants without psychopathology at the time of subjective appraisal (Fig. 3 and Supplementary Table 11), suggesting that such recall bias is not a satisfactory explanation for the results. It is also possible that a history of psychopathology before the subjective appraisal could have biased the retrospective reports[9,10]. For example, residual memory biases might have persisted after remission as stable vulnerability factors. Furthermore, previous psychopathology could have biased previous recall of maltreatment and such biased recall of maltreatment might have been endorsed after remission. Further research is also needed to establish whether subjective measures of childhood maltreatment have stronger association with subsequent psychopathology than do objective measures[13,14].

Third, the stronger association of subjective versus objective measures of childhood maltreatment with psychopathology might be an artefact owing to treatment effects. Court substantiation of

maltreatment cases might have triggered legal actions to protect the children and to buffer the mental health consequences of maltreatment through clinical interventions[15], potentially leading to an underestimate of the associations observed here. We do not have comprehensive data about mental health support received by participants to directly test this hypothesis. However, it is likely that minimal mental health support was provided to victims of child maltreatment in the late 1960s. Furthermore, treatment effects would have buffered the mental health consequences both in participants with only the objective measure of maltreatment and in participants with objective and subjective measures of maltreatment. However, the two groups have different patterns of association with psychopathology: while participants with objective and subjective measures of maltreatment have elevated risk of psychopathology, participants with only the objective measures do not (Fig. 1). Treatment effects are, therefore, not a satisfactory explanation for the results.

Fourth, the stronger association of subjective versus objective measures of childhood maltreatment with psychopathology might reflect the influence of unmeasured variables. For example, we acknowledge that we do not have detailed information on the severity or duration of the actual maltreatment experience, or the intensity of subjective distress reported by maltreated children. These variables might have a causal role on psychopathology by increasing the likelihood of subjective reports of childhood maltreatment. However, these measures might also be associated with psychopathology through other pathways independent of subjective reports, thereby creating spurious findings.

Fifth, it is unclear if the findings in this cohort could replicate elsewhere. However, we found that results similarly applied to men and women as well as black and white participants (Supplementary Figs. 2 and 3 and Supplementary Table 10), supporting their likely generalizability to other samples. Furthermore, although this cohort is unique owing to its reliance on official court records for the objective measure of childhood maltreatment, its size, the follow-up into adult life, and the strength and breadth of its psychiatric assessment, other cohorts have found consistent results. For example, within more contemporaneous but smaller groups of maltreated children identified by child protection services, young people with concordant self-reports of maltreatment typically showed more emotional and behavioural symptoms than those without self-reports[16–18]. Similarly, subjective measures based on retrospective recall of childhood adversity were more strongly related to psychopathology than prospective measures based on maternal reports, interviewers' observation and case notes in the Dunedin and Environmental Risk (E-Risk) cohorts[19,20]. More broadly, the findings resonate with the role of individual cognitive appraisal in the response to stressors[21] and particularly in mediating the development of psychopathology after traumatic events in children and adults[9,22,23]. While the role of subjective appraisal has been previously discussed in the context of trauma and PTSD, we present here the first evidence that it is also central to the broader psychopathological consequences of childhood maltreatment. Despite these potential limitations, our findings have implications for research and clinical practice.

We found that risk of psychopathology is concentrated among individuals with subjective rather than objective measures of childhood maltreatment. These findings are important to inform sampling strategies for studies investigating the mechanisms through which maltreatment affects mental health. The findings suggest that aetiological studies should focus on young people and adults who provide their own personal account of childhood maltreatment experiences. Of course, these sampling strategies are already the most prevalent in neuroscience research, owing to the inherent challenges in sampling individuals with objective experiences of childhood maltreatment. Nevertheless, because of the evidence that objective and subjective experience of childhood maltreatment identify largely distinct groups of individuals, there is an urgent need to reconceptualize the interpretation of findings based on subjective measures of maltreatment. Because of the low agreement between objective and subjective measures of childhood maltreatment (Fig. 1 and Supplementary Table 1), aetiological studies based on subjective measures of maltreatment are unlikely to identify damages or abnormalities linked to actual exposure to maltreatment; rather, they are likely to identify correlates of unhelpful cognitions/memories about the self and the environment, which appear crucial to understanding risk of psychopathology. Brain imaging correlates of subjective measures of childhood maltreatment might also reflect a previous history of psychopathology. Studies with sampling based on objective measures will still be needed to investigate the causal neurobiological effects of actual exposure to maltreatment and their relevance to psychopathology. Furthermore, studies with sampling based on objective measures will be needed to understand why some maltreated children develop subjective appraisal of their ordeal while others do not, for example investigating the severity of the actual maltreatment experience, the intensity of subjective distress reported by maltreated children, the age at which the abuse took place, the role of social care involvement in buffering or accentuating the distress and the experience of later adversity. Finally, studies with sampling based on objective measures will also be needed to understand why some adults develop subjective appraisal of childhood maltreatment in the absence of objective experience, including the role of residual memory biases linked to previous psychopathology, personality, suggestibility and source-monitoring errors.

These findings also suggest that the current dominant explanatory model whereby objective exposure to childhood maltreatment triggers a biological stress response eventually resulting in psychopathology[24,25] should be updated to reflect the key role of subjective experience. These findings are not necessarily at odds with the results of several experimental animal studies demonstrating the causal effects of early-life stress on later brain structure or function within those experimental models[26]. Although groups of animals with or without exposure to early-life stress show neurobiological differences, there is notable heterogeneity in outcomes within groups of animals exposed to early-life stress. Of note, results from our study point to another group of at-risk individuals. Even in the absence of an actual experience of child maltreatment, some individuals may endorse cognitions/memories about themselves and their childhood environment that amount to a subjective experience of maltreatment[27,28], which is also associated with elevated risk of psychopathology. A focus on subjective experience will open new opportunities for multidisciplinary investigations in cognitive neuroscience, psychology and epidemiology to test whether manipulation of subjective appraisal of childhood maltreatment and related cognitions could alleviate psychopathology. Answers to these questions have the potential to substantially expand the way we understand, prevent and treat child maltreatment-related psychopathology[13,14,29].

Of course, our results do not diminish the significance of maltreatment in the lives of children. Maltreatment is a fundamental breach in the human rights of children and it is a moral duty to protect them from abuse and neglect. Our results also show that many children with official records and subjective appraisal of maltreatment go on to develop psychopathology regardless of their sex, race and family social class. In addition, individuals who construe their childhood experiences as maltreatment despite the lack of a documented history are similarly at high risk for psychopathology.

New solutions to the distressing and impairing psychopathology associated with childhood maltreatment may be found through deeper understanding of the subjective experience.

Methods

Design. This study used the same design as ref. [30]. The design information is reproduced with permission and minor modifications from ref. [30], except where otherwise indicated.

This prospective cohort design study was initiated in 1986 with a large group of documented cases of childhood physical and sexual abuse and neglect ($n=908$) and a comparison group of children matched on the basis of age, sex, race/ethnicity and approximate family social class at the time of the child maltreatment ($n=667$)[31]. Characteristics of the design include: (1) an unambiguous operationalization of abuse and neglect; (2) a prospective design; (3) separate neglected and abused groups; (4) a large sample; (5) a comparison group matched as closely as possible for age, sex, race and approximate social class background; and (6) assessment of the long-term consequences of abuse and neglect beyond childhood and adolescence into adulthood.

The rationale for identifying the abused and neglected group was that their cases were serious enough to come to the attention of the authorities. Only court-substantiated cases of child abuse and neglect were included here. Cases were drawn from the records of county juvenile and adult criminal courts in a metropolitan area in the Midwest during 1967–1971. To avoid potential problems with ambiguity in the direction of causality and to ensure that temporal sequence was clear (that is, child neglect or abuse led to subsequent outcomes), neglect and abuse cases were restricted to those in which children were less than 12 years of age at the time of the abuse or neglect incident. Thus, these are cases of childhood abuse and/or neglect. These design characteristics represent major strengths but they also pose limitations about the generalizability of the findings.

Identification of neglect cases is previously reported in ref. [32] and reproduced in this paragraph with permission and minor modifications. Neglect cases reflected a judgement that the parents' deficiencies in child-care were beyond those found acceptable by community and professional standards at the time. These cases represented extreme failure to provide adequate food, clothing, shelter and medical attention to children. Physical abuse cases included injuries such as bruises, welts, burns, abrasions, lacerations, wounds, cuts, bone and skull fractures and other evidence of physical injury. Sexual abuse charges included felony sexual assault, fondling or touching, sodomy, incest and rape.

The selection of a comparison group is described in ref. [33] and reproduced in this paragraph with permission. A critical element of the design involved the selection of a comparison group, matched with the maltreated sample on the basis of age, sex, race/ethnicity and approximate family social class during the time period under study. Matching for approximate family social class was important in this study because it is theoretically plausible that any relationship between child abuse and neglect and subsequent outcomes may be confounded with or explained by social class differences. It is difficult to match exactly for social class because higher income families could live in lower social class neighbourhoods and vice versa. The matching procedure used here is based on a broad definition of social class that includes neighbourhoods in which children were reared and schools they attended. Similar procedures, with neighbourhood school matches, have been used in studies of individuals with schizophrenia[34] to match approximately for social class.

A more recent textbook[35] also recommended using neighbourhood and hospital controls to match on variables that are related to outcomes, when random sampling is not possible. Busing was not operational at the time and students in elementary schools in this county were from small, socio-economically homogeneous neighbourhoods. The comparison group establishes the base rates of pathology we would expect in a sample of adults from comparable circumstances who did not come to court attention in childhood as victims of abuse or neglect.

To accomplish the matching, the abuse and neglect sample was divided into two groups, those under and those of school age at the time of the abuse or neglect incident. Using county birth record information, children under school age were matched with children of the same sex, race, date of birth (±1 week) and hospital of birth during 1967–1971. Of the 319 abuse and neglect cases, matches were found for 229 (72%) of the group. For children of school age, records of more than 100 elementary schools for the same time period were used to find matches with children of the same sex, race, date of birth (±6 months), class in elementary school during 1967–1971 and approximate home address. Since busing did not exist during this period in this metropolitan area, the elementary schools represented very homogeneous neighbourhoods. Matches were never made with students from another school, although it was sometimes necessary to select students from different classes or even different grades in the same school. Where an abused or neglected child had been held back a grade, resulting in a discrepancy between the child's age and grade, the match was made with age. Where a child had attended special education classes during the period, attempts were made to include matches from such classes. Of the 589 school-age children in the abuse and neglect sample, we found matches for 438, 74.4% of the group. Overall, 667 matches (73.4%) were found for the 908 abused and neglected children.

Non-matches occurred for a number of reasons. In the case of birth records, they occurred if the abused or neglected child was born outside the county or state, if information about date of birth was missing or if there had been a change of name for an adopted child. In the case of school records, non-matches occurred because the elementary school had closed during the past 20 years and class registers were consequently unavailable or because schools had been primarily uniracial (they were not necessarily integrated at the time) and a same-race match could not be found.

The design[36,37] involves the assumption that the major difference between the abused and neglected and comparison groups is in the abuse or neglect experience. Since it is not possible to randomly assign participants to groups, the assumption of equivalence for the groups is an approximation. If the comparison group included subjects who had been officially reported as abused at some earlier or later time period, this would jeopardize the design of the study. Therefore, official records were checked and any proposed comparison group child who had an official record of abuse or neglect in their childhood was eliminated. In these cases ($n=11$), a second matched subject was assigned to the comparison group to replace the individual excluded. Thus, the control group does not contain any known cases of child abuse or neglect. The number of participants in the comparison group who were actually abused, but not reported, is unknown.

Participants. For this paper, we use data from the second phase of the study, which involved tracing, locating and interviewing the abused and/or neglected children and comparison group members a mean of 22.3 years later (s.d. = 2.1, range = 17–28) during 1989–1995. Of the original sample of 1,575 (908 abused and/or neglected individuals and 667 controls), 1,307 subjects (83%) were located and 1,196 interviewed (76%). Of the people not interviewed, 43 were deceased (before interview), eight were incapable of being interviewed, 268 were not found and 60 refused to participate (a refusal rate of 3.8%). There were no significant differences between the interviewed follow-up sample ($n=1,196$) and the original sample ($n=1,575$) in terms of demographic characteristics (male ($P=0.28$); white ($P=0.10$); poverty in childhood census tract ($P=0.44$); current age ($P=0.88$); or group status (abuse or neglected versus controls ($P=0.11$)).

Approximately half the sample are female (48.7%) and about two-thirds are white (62.9%). The mean age of the sample at the time of the follow-up interview was 28.7 years (s.d. = 3.84). There were no differences in the demographic characteristics of the two groups (abused and/or neglected and matched controls) for gender, race/ethnicity or age. Sample members completed an average of 11.47 years (s.d. = 2.19) of school. The median occupational level for the sample was semiskilled workers, with less than 7% in levels 7–9 (managers to professionals). Thus, the sample is skewed toward the lower end of the socioeconomic spectrum.

Procedures. The procedures used are described in ref. [38] and reproduced in this section with permission. Two-hour in-person interviews that included a series of structured and semistructured questionnaires and rating scales were conducted between 1989 and 1995 obtaining information about cognitive, intellectual, emotional, psychiatric, social and interpersonal functioning. The interviewers were blind to the purpose of the study, to the participants' group membership and to the inclusion of an abused and/or neglected group. Similarly, the subjects were blind to the purpose of the study and were told they had been selected to participate as part of a large group of individuals who grew up in that area in the late 1960s and early 1970s. After a complete description of the study was provided to the subjects, subjects signed a consent form acknowledging that they were participating voluntarily. Institutional Review Board approval was obtained at Indiana University and State University of New York at Albany for the procedures involved in this study. For those individuals with limited reading ability, the consent form was read and, if necessary, explained verbally.

Measures and variables. In addition to reliability and validity, one important criterion in selecting and designing instruments for use in this research was the ability to compare findings from this research to the results of other studies. In selecting these measures, we were mindful of structuring the interviews to be sensitive to the feelings and needs of our participants and to not overwhelm them with negative and highly intrusive and stressful questions.

Objective experience of child maltreatment. Official reports of child abuse and/or neglect, based on records of county juvenile (family) and adult criminal courts from 1967 to 1971, were used to operationalize maltreatment. Only court-substantiated cases involving children under the age of 12 years at the time of abuse and/or neglect were included. Within the present sample of 1,196, 56.5% were abused and/or neglected and 45.4% were neglected, 9.2% physically abused and 8.0% sexually abused. Findings based on this objective measure of maltreatment have been replicated by several, more contemporaneous cohorts[39–42], showing that: (1) the construct of childhood maltreatment captured in our sample is similar to the construct captured by other, more recent measures and (2) that the findings are relevant to modern society. Of note, substantiated court records provide the legal standard on which child protection actions are based and, thus, provide the strongest possible evidence for the objective experience of child maltreatment.

In our previous work 20 years ago[11], we have described court records as 'prospective' measures of child maltreatment. Subsequent work featured different types of prospective measures, more commonly based on parent/informant report and in some cases based on medical, child protection or court records[4]. Therefore, we have used here the more accurate terminology of 'objective' measures to clarify which type of prospective measure was used.

Subjective experience of child maltreatment. Retrospective self-reported measures were chosen to include a broad set of maltreatment experiences representative of

the experiences cited in the original (objective) court cases and participants were asked to respond about experiences that occurred before age 12 years to make the retrospective reports as similar to the court cases as possible. In addition, because no single retrospective assessment measure is universally endorsed by researchers, multiple measures of each type of maltreatment were included to be as comprehensive as possible.

Four measures were used to assess self-reports of childhood sexual abuse during Interview 1, all of which were adapted from previous work by Finkelhor[43,44] and Russell[45] and are described in Widom and Morris[46]. Two measures were used to assess retrospective self-reports of childhood physical abuse during Interview 1: the conflict tactics scale (CTS)[47] and the self-report of childhood abuse physical (SRCAP)[48]. Retrospective assessments of neglect were more challenging because at the time these retrospective reports were collected, the field lacked a validated neglect instrument. Lacking such an instrument, questions were designed to cover a range of neglect experiences (inadequate provision of food, clothing, shelter and supervision) that were similar to the charges in the official neglect petition. To assess childhood neglect, participants were asked three questions during Interview 1: (1) 'Were there ever times when you were a young child that a neighbour fed you or cared for you because your parents didn't get around to shopping for food or cooking, or when neighbours or relatives kept you overnight because no one was taking care of you at home?', (2) 'When you were a young child, did anyone ever say that you weren't being given enough to eat, or kept clean enough, or that you weren't getting enough medical care when it was needed?' and (3) 'When you were a very young child, did your parents ever leave you home alone while they were out shopping or doing something else?' If the participant responded 'yes' to any of these questions and the age at which the neglect occurred was determined to be before age 12 years, they were considered to be self-reporting childhood neglect. Of note, the field still lacks a stringently validated instrument to retrospectively assess childhood neglect, for example, owing to varying social norms, to low internal consistency of the measures reflecting the distinct components of neglectful experiences, and to limited validation of retrospective measures in children or adults with documented histories of neglect because of the challenges in recruitment. Nevertheless, commonly used measures of child neglect, such as the CTS[43] or the childhood trauma questionnaire (CTQ)[49], use questions that are not dissimilar to those used in our study (for example, asking mothers about whether they were unable to get enough food to the child, they were unable to take the child to the doctor or hospital, or they had left the child alone at home; or asking for self-reports on similar topics).

In our previous work 20 years ago[11], we have described these self-reports as 'retrospective' measures of child maltreatment to refer to the temporal ordering of the events. Here we refer to 'subjective' measures to reflect the increasing understanding of the psychological influences on these self-reports[4,9,10].

Lifetime and current psychopathology. Lifetime and current psychopathology were assessed during a 2-h in-person interview between 1989 and 1995 (mean age = 28.7 years) according to DSM-III-R (ref. [50]) criteria based on the National Institute of Mental Health Diagnostic Interview Schedule, Version III Revised[51]. Details of the Diagnostic Interview Schedule[51] and its use in our work are described in ref. [38] and reproduced in the rest of this paragraph with permission. The Diagnostic Interview Schedule[51], is a highly structured interview schedule designed for use by lay interviewers. The survey company who had used these methods as part of the Epidemiological Catchment Area studies[52] was hired to conduct the interviews. Field interviewers received a week of study-specific training and successfully completed practice interviews before beginning the study interviews. Field interviewer supervisors recontacted a random 10% of the respondents for quality control. Frequent contacts between field interviewers and supervisors were held to prevent interview drift, to monitor quality and to provide continuous feedback. Computer programmes for scoring the Diagnostic Interview Schedule were used to compute DSM-III-R diagnoses. Adequate reliability for the Diagnostic Interview Schedule has been reported[53].

Participants were assessed for the following psychiatric disorders: depression, dysthymia, generalized anxiety disorder, PTSD, antisocial personality disorder, alcohol abuse and/or dependence, or drug abuse and/or dependence. Participants who met criteria for diagnoses of depression, dysthymia, generalized anxiety disorder or PTSD were classified as having experienced internalizing disorder, whereas those who met criteria for diagnoses of antisocial personality disorder, alcohol abuse and/or dependence, or drug abuse and/or dependence were classified as having experienced externalizing disorder. Those who experienced either internalizing or externalizing disorder were classified as having experienced any psychopathology. This classification reflects the commonly observed structure of psychopathology[8]. Participants with lifetime psychopathology had experienced psychopathology at any point in their lifetime. Participants with current psychopathology had experienced psychopathology some time within the past year (the 12 months before the interview). Papers from this study using the same psychiatric assessment methods have been published in leading psychiatric journals[38,54].

Data analyses. To characterize the overlap between groups of participants identified by virtue of prospective or retrospective measure of childhood maltreatment, we computed the agreement between these two measures using Cohen's κ.

To separate the relative contribution of objective and subjective measures of child maltreatment to psychopathology, we identified three groups: (1) adult participants who were identified as victims of child maltreatment by virtue of official records but did not retrospectively recall the experience (objective measure); (2) adult participants who were identified as victims of child maltreatment by virtue of official records and also retrospectively recalled the experience (objective and subjective measures); and (3) adult participants who retrospectively recalled being maltreated in childhood but were not identified as victims of child maltreatment by virtue of official records (subjective measure). The prevalence of psychopathology in these three groups was then compared to the prevalence of psychopathology in a group of participants with neither objective nor subjective measure of childhood maltreatment. To test differences in the prevalence of psychopathology between the three target groups described and participants with neither objective nor subjective measure of childhood maltreatment, log-binomial models (log-link generalized linear model) were used.

To test the sensitivity of the results to various sources of artefact and bias, we re-ran group comparisons: (1) using internalizing and externalizing disorders as dependent measures; (2) using individual diagnoses as dependent measures; (3) using individual types of maltreatment as independent measures; (4) using individual types of maltreatment as independent measures and restricting the sample to participants without any maltreatment type (rather than those without an individual type of maltreatment); (5) separately in males and females; (6) separately in black and white race individuals; and (7) restricting the sample to those without any psychopathology at the time of retrospective recall of child maltreatment history.

All statistical tests were two-sided. All analyses were carried out in STATA 15 (ref. [55]) and R 3.5 (ref. [56]).

Reporting Summary. Further information on research design is available in the Nature Research Reporting Summary linked to this article.

Data availability

The data reported in the current article are not publicly available because they contain extremely sensitive information that could compromise research participant privacy and confidentiality. We cannot provide individual level data from this project because our confidentiality agreement with the participants in this study precludes this. The data are available on request from C.S.W. by qualified scientists. Requests require a concept paper describing the purpose of data access, ethical approval at the applicant's university in writing and provision for secure data access.

Code availability

The data analysis script is available from A.D. upon request.

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Author contributions

A.D. and C.S.W. contributed to the conception and design of the work, interpretation of the data, revision of the work and both approved the final manuscript. A.D. was involved in data analysis and drafting of the work. C.S.W. was involved in acquisition of the data.

Competing interests

The authors declare no competing interests.

Additional information

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Correspondence and requests for materials should be addressed to A.D. or C.S.W.

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Data collection	n/a
Data analysis	All analyses were carried out in STATA 15 and R 3.5.

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Data availability
The data reported in the current article are not publicly available because they contain extremely sensitive information that could compromise research participant privacy and confidentiality. We cannot provide individual level data from this project because our confidentiality agreement with the participants in this study precludes this. The data are available on request from the corresponding author [CSW] by qualified scientists. Requests require a concept paper describing the purpose of data access, ethical approval at the applicant's university in writing, and provision for secure data access.

Code availability
The data analysis script is available upon request from the corresponding author [AD].

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Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	Quantitative study
Research sample	This prospective cohort design study was initiated in 1986 with a large group of documented cases of childhood physical and sexual abuse and neglect (N = 908) and a comparison group of children matched on the basis of age, sex, race/ethnicity, and approximate family social class at the time of the child maltreatment (N = 667). For this paper, we use data from the second phase of the study, which involved tracing, locating, and interviewing the abused and/or neglected children and comparison group members a mean of 22.3 years later (SD = 2.1, range = 17-28) during 1989-1995. Approximately half the sample is female (48.7%) and about two-thirds is White (62.9%). The mean age of the sample at the time of the follow-up interview was 28.7 years (SD = 3.84).
Sampling strategy	To sample cases of maltreatment, only court-substantiated cases of child abuse and neglect were included here. At the start of the study, in 1986, cases were drawn from the records of county juvenile and adult criminal courts in a metropolitan area in the Midwest during the years 1967 through 1971. A comparison group of children matched on the basis of age, sex, race/ethnicity, and approximate family social class at the time of the child maltreatment
Data collection	Official records. Official reports of child abuse and/or neglect, based on records of county juvenile (family) and adult criminal courts from 1967-1971, were used to operationalize maltreatment. Within the present sample of 1,196, 56.5% were abused and/or neglected and 45.4% were neglected, 9.2% physically abused, and 8.0% sexually abused. Retrospective self-reports. Four measures were used to assess self-reports of childhood sexual abuse, all of which were adapted from previous work by Finkelhor and Russell and are described in Widom and Morris40. Two measures were used to assess retrospective self-reports of childhood physical abuse: the Conflict Tactics Scale (CTS) and the Self-Report of Childhood Abuse Physical (SRCAP). Lifetime and current psychopathology. Lifetime and current psychopathology were assessed during a two-hour in-person interview between 1989-1995 (mean age= 28.7 years) according to DSM-III-R criteria based on the National Institute of Mental Health Diagnostic Interview Schedule, Version III Revised
Timing	This prospective cohort design study was initiated in 1986, based on cases were drawn from the records of county juvenile and adult criminal courts in a metropolitan area in the Midwest during the years 1967 through 1971. For this paper, we use data from the second phase of the study, which involved tracing, locating, and interviewing the abused and/or neglected children and comparison group members a mean of 22.3 years later (SD = 2.1, range = 17-28) during 1989-1995.
Data exclusions	n/a
Non-participation	For this paper, we use data from the second phase of the study, which involved tracing, locating, and interviewing the abused and/or neglected children and comparison group members a mean of 22.3 years later (SD = 2.1, range = 17-28) during 1989-1995. Of the original sample of 1,575 (908 abused and/or neglected individuals and 667 controls), 1,307 subjects (83%) were located and 1,196 interviewed (76%). Of the people not interviewed, 43 were deceased (prior to interview), 8 were incapable of being interviewed, 268 were not found, and 60 refused to participate (a refusal rate of 3.8%). There were no significant differences between the interviewed follow-up sample (N = 1,196) and the original sample (N = 1,575) in terms of demographic characteristics (male [p = .28]; white [p=.10]; poverty in childhood census tract [p = .44]; current age [p=.88]; or group status (abuse or neglected versus controls [p=.11]).
Randomization	Participants were not randomly allocated to childhood maltreatment because of obvious ethical concerns. However, the two main groups of participants with vs without actual experience of maltreatment (based on official court records) showed no differences in key demographic characteristics (i.e., gender, race/ethnicity, and age) because of a painstaking matching procedure inbuilt in the study design.

Reporting for specific materials, systems and methods

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☒	☐ Palaeontology
☒	☐ Animals and other organisms
☐	☒ Human research participants
☒	☐ Clinical data

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Human research participants

Policy information about studies involving human research participants

Population characteristics	see above
Recruitment	The rationale for identifying the abused and neglected group was that their cases were serious enough to come to the attention of the authorities. Only court-substantiated cases of child abuse and neglect were included here. Cases were drawn from the records of county juvenile and adult criminal courts in a metropolitan area in the Midwest during the years 1967 through 1971. A comparison group of children matched on the basis of age, sex, race/ethnicity, and approximate family social class at the time of the child maltreatment. Children were ages 0-11 when their cases came to the attention of the courts and matched control children were identified through school and hospital of birth records. Based on information from the interview in young adulthood, sample members completed an average of 11.47 (SD = 2.19) years of school. The median occupational level for the sample was semi-skilled workers, with less than 7% in levels 7-9 (managers to professionals). Thus, the sample is skewed toward the lower end of the socioeconomic spectrum.
Ethics oversight	IRB at Indiana University and State University of New York at Albany

Note that full information on the approval of the study protocol must also be provided in the manuscript.