Understanding the Impact of Childhood Maltreatment on Epistemic Trust, Learning and Psychopathology Throughout the Lifespan

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Thesis declaration form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Overview

Part 1presents a systematic literature review of 20 quantitative papers comparing maltreated and non-maltreated children's performance on memory tasks involving varying degrees of interpersonal information. Findings suggest that children's basic memory processes may be impaired when the to be remembered information contains more interpersonal content, however heterogeneity in terminology and methodology between studies impede the ability to draw firm conclusions.

Part 2, which was part of a joint thesis project with MacGregor (2021), uses a novel retrospective measure of childhood maltreatment to explore the relationship between temporal characteristics of maltreatment subtypes and adult psychopathology symptomatology. The role of impaired social learning, as measured by a social learning task completed under one of four ostensive cue conditions, is also explored. Chronicity of maltreatment, and peer emotional bullying were identified as particular risk factors for adult psychopathology symptoms. Social learning was not found to mediate such associations.

Part 3 provides a critical appraisal of the research process, considering the impact of completing this piece of work in the Covid-19 context, before moving on to consider the influence of previous personal clinical and research experience on the process. Implications of the research findings for future research, clinical practice, and my own career are considered.

Impact statement

The findings from this study have implications within and beyond academia. Firstly, they highlight the need to for researcher to study nuances within broader conceptualisations such as 'maltreatment' and 'cognition'. Additionally, researching social cognition in maltreated children is an area for future development. Given maltreated children's voices are typically not heard and continue to infrequently be heard along the potential trajectory toward mental health and/or forensic settings, qualitative research represents another area for future research.

Neglect was associated with cognitive deficits in part 1, whilst non-physical abuse and chronicity of maltreatment were a particular risk factors for psychopathology symptomatology in part 2. Non-physical abuse has typically been more difficult to evidence than physical and sexual abuse, and the findings from this study highlight the importance for professionals to be able to identify and evidence non-physical forms of maltreatment and thresholds for intervention. Identifying and intervening in non-physical maltreatment will reduce chronicity of maltreatment. This is an area ripe for research to generate theory-practice links.

The findings have implications for schools. As links between Child and Adolescent Mental Health Services (CAMHS) and schools strengthen, a role for mental health workers will be to support school professionals in their knowledge of attachment and epistemic trust, supporting formulation of behaviours within such theoretical frameworks, and encouraging the development of trauma informed schooling. Beyond the academic value of school, adults in the school system represent potential for the modelling of healthy relationships that may buffer against the detrimental effects of a hostile home environment. Thus, working with the school system is an important role for CAMHS professionals.

Pupil Referral Units represent a setting where environmental support may contribute to the lowering of epistemic vigilance and facilitate learning. Research in such contexts may inform helpful approaches for mainstream schools to prevent removal.

Peer emotional abuse was identified as a particular risk for adult psychopathology symptoms. Schools should be supported in being able to identify and promptly respond to all forms of bullying with clear intervention strategies. Clinically, it is clearly vital to directly ascertain risk from peers as routinely as we ascertain risk from parents with young people.

Parental education level and an individual's highest education level were identified as risk factors for psychopathology in both papers. The importance of intergenerational interventions that highlight the value of education are warranted. It is unlikely that a child will meaningfully engage in education if the family system around them communicates devaluing messages.

The findings of this research will be prepared for publication in relevant journals, in addition to being summarised and shared with colleagues in previous and future CAMHS jobs.

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Part 1: Literature Review

Can Epistemic Trust Theory Help to Explain the Poor Academic Outcomes of Maltreated Children?

Abstract

Aims

Maltreated children exhibit poorer educational outcomes than their non-maltreated peers. Epistemic trust theory may provide one account for such differences. This systematic review aimed to compare maltreated and non-maltreated children on a social learning task.

Methods

PsycINFO, Medline, ERIC, British Education Index and Web of Science were searched to identify articles published in peer review journals that compared maltreated and non-maltreated children on social learning tasks. Only one study comparing non-maltreated and maltreated children on a social learning task was identified. Therefore, studies comparing maltreated and non-maltreated children on memory tasks were retrieved. Memory performance between maltreated and non-maltreated children was compared across tasks that involved high, medium, and low levels of interpersonal information as a proxy for degree of social learning involved. 20 studies met inclusion criteria.

Results

Consistent with previous research, deficits in maltreated children's basic memory processes were not consistently reported. Broad terminology and a focus on meta-concepts may account for this. There was evidence to suggest that differences in memory performance between maltreated and non-maltreated children are more pronounced when tasks involve a higher degree of interpersonal information.

Conclusions

There is a pressing need for research comparing maltreated and non- maltreated children on social learning tasks, given evidence that maltreatment is a risk factor for

impaired social functioning across the lifespan. Research on cognition and maltreatment should attend to the nuances within meta-terminology to make sense of consistently mixed findings in the field.

Introduction

Childhood Maltreatment and Associated Outcomes

National and international legislation outlines the fundamental human right every child has to a safe and developmentally nourishing childhood (Children Act, 1989, 2004; Department for Education, 2018; United Nations Children's Fund, 1989). Yet childhood maltreatment is common, and within the UK context of the Covid-19 Global Pandemic, there has been a dramatic increase in serious incidence notifications and child deaths (Campbell, 2020; Sidpra, Abomeli, Hameed, Baker & Mankad, 2021; Social Care Institute for Excellence, 2021). Evidently, three decades after this legislation was enacted, much remains to be done to ensure children secure their right to grow up in an environment free from abuse, neglect and violence.

Childhood maltreatment is a risk factor for undesirable outcomes in physical, psychological, and social functioning domains throughout the lifespan (Cicchetti & Toth, 2005; Felitti et al., 1998). As well as being associated with increased risk for a range of physical health problems (Afifi et al., 2016; Felitti et al., 1998; Reidl et al., 2019) and early death (Brown et al., 2009; Rogers, Power & Pereira, 2019), adversity in childhood has been linked with an increased risk for psychopathology in child and adult samples (Chandan et al., 2019; Pine et al., 2005; Robinson et al., 2009).

Additionally, childhood maltreatment is associated with substance misuse (Darke, 2013; Conroy, Degenhardt, Mattick & Nelson, 2009; Khantzian, 2003) and contact with the criminal justice system (Ford, Bellis, Hughes, Barton & Newbury,

2020; Ministry of Justice, 2012). Not only does this represent a distressing developmental pathway for the individual, but such services require substantial resources and incur a significant financial and societal cost (Isumi et al., 2020; Peterson, Florence & Klevens, 2018; Thielen et al., 2016).

Ethically, we as psychological professionals and researchers have a responsibility to better understand the developmental trajectories associated with childhood maltreatment in order to provide efficacious preventative interventions that support more favourable outcomes.

Childhood Maltreatment and Educational Outcomes

Education is a moderating factor in the relationship between childhood abuse and negative outcomes in later life (Klika, Herrenkohl & Lee, 2013; Loukas, Roalson & Herrera, 2010; Romans, Martin, Anderson, O'Shea & Mullen, 1995), even after controlling for the influence of academic achievement (Williams, MacMillan & Jamieson, 2006). Studies on risk and protective factors relating to adverse childhood experiences (ACES) have identified education as a protective factor at the child, caregiver, and community level (Felitti et al.,1998). Parental low educational achievement has been identified as a risk factor for maltreating children (Sidebotham & Golding, 2001), and this relationship may contribute to intergenerational patterns of maltreatment and poor academic achievement. Supporting maltreated children to do well in school has the potential to contribute to breaking this intergenerational cycle.

Despite the protective role of education, maltreated children are likely to have poorer educational outcomes than their non-maltreated peers (Elklit, Michelsen & Murphy, 2018; McGuire & Jackson, 2018). A global systematic review and meta-

analysis considering findings from 21 countries assessed the relationship between multiple types of violence in childhood (physical, sexual and emotional violence, neglect, witnessing domestic violence, bullying, adolescent relationship violence and community violence) and a variety of educational outcomes such as school dropout, school absence and academic achievement (Fry et al., 2018). The authors summarise that any form of violence in childhood increases the likelihood of school dropout.

Understanding the Relationship Between Childhood Maltreatment and Poor Educational Outcomes

There are numerous factors that may contribute to maltreated children's poor academic outcomes, such as school absence, lack of resources, peer difficulties and cognitive difficulties. Indeed, social learning difficulties (Hanson et al., 2017) and cognitive difficulties (Young-Southward, Eaton, O'Connor & Minnis, 2020) in this population have been evidenced.

Social Learning

The classroom, and school setting more broadly, are highly social environments for developing youth, who are constantly surrounded by peers of similar and varying ages, as well as numerous adults with differing levels of authority and interactional styles. Those that have experienced trauma within a caregiving relationship may understandably find such a setting overwhelming and experience an ongoing sense of threat (McCrory et al., 2013), both of which may impair social learning.

Epistemic trust refers to an individual's openness to consider novel information as personally relevant, to be trusted, and therefore worth integrating into their lives (Fonagy & Allison, 2014; Fonagy, Luyten & Allison, 2015). This evolutionary system of social and cultural knowledge transmission from one

generation to the next is fundamental to human social development (Csibra & Gergely, 2011; Tomasello et al., 2012). A complimentary theory in this instance is Bowlby's attachment theory (1958), another evolutionary theory that posits children are born with a biological drive to attach to a caregiver to survive. Maltreatment from a caregiver violates these evolutionary systems of attachment and epistemic trust, leaving the maltreated child more likely to adopt a stance of epistemic vigilance – that is, one in which information provided by others is treated with scepticism and not to be trusted (Sperber et al., 2010). This makes evolutionary sense for a maltreated child – elders of the species cannot be trusted to provide consistent care; in fact, they may cause harm, therefore it is wiser to treat information parted by them with vigilance as opposed to open acceptance. Clearly, within a teacher pupil dynamic, this state of vigilance would prove detrimental in terms of educational outcomes.

Early adverse experiences within caregiving relationships are likely to have long lasting consequences, in both conscious and unconscious realms of functioning, for an individual's ability to place trust in others in the future. Indeed, infancy has been identified as a particularly sensitive time to experience victimisation of adult maltreatment. This is likely linked to a neurobiological sensitive period (Andersen & Teicher, 2008; Bock, Rether, Groger, Xie & Braun, 2014; Humphreys et al., 2019; McCrory & Viding, 2015) and additionally represents the first stage of Erikson's psychosocial development – trust vs mistrust (Erikson, 1950, 1968). The relationship with our caregivers is the first template of an intimate relationship, which provides a template for how we relate to others in the world. Attachment and social cognitive researchers agree that these templates of self, other, and self in relation to other act as a framework that guides perception, attention, behaviour and future expectations

within various interpersonal relationships (Lynch & Cicchetti, 1998; Niedenthal, Brauer, Robin & Innes-Ker, 2002; Spangler, Maier, Geserick & von Wahlert, 2010; Valentino, Cicchetti, Rogosch & Toth, 2008a).

The school setting represents an environment in which these representational models, and related patterns of epistemic trust/mistrust are inevitably re-enacted. Children are consistently presented with novel information during schooling – not only academic content, but also social and relational information between themselves, peers and adults (Bell, Bayliss, Glauert & Ohan, 2018; Darling-Hammond & Cook-Harvey, 2018). A child primed to reside in epistemic mistrust will likely struggle to relax their vigilance and subsequently openly take on information from teachers and peers as relevant in trustworthy. Indeed Hanson et al. (2017) showed that children exposed to physical abuse performed worse on an associative learning task involving prediction of a reward in response to a stimulus. However, literature in this area - that is, comparing maltreated and non-maltreated children's performance on a social learning task, is extremely scant. In fact, at the time of review, Hanson et al. (2017) was the only paper of this sort identified during an initial scoping overview. Yet studies such as these are vital in developing a more detailed understanding of why maltreated children perform more poorly in school.

Cognition

Cognitive impairment is another factor that may explain the link between childhood maltreatment and educational outcomes. Research has consistently evidenced cognitive impairments in maltreated children in comparison to non-maltreated peers (Beers & De Bellis, 2002; Irigaray et al., 2013; Porter, Lawson & Bigler, 2005; Young-Southward et al., 2020). However, whilst impairments in some cognitive domains have been consistently evidenced in maltreated samples, other

areas, such as basic memory, provide a more mixed profile (Goodman, Quas & Ogle, 2009; Irigaray, 2013). In Lund, Toombs, Radford, Boles and Mushquash's systematic review (2020) concerning adverse childhood experiences and executive functioning in children and adults, 35% of the papers included reported no evidence of differences in cognition between maltreated and non-maltreated groups.

Researchers have typically sought to understand these mixed findings in cognition, and specifically memory, by gathering more information about the maltreated child's context and experience. Latent vulnerability theory suggests that a child's brain will develop in a way that is adaptive to the type of hostile environment it finds itself in (McCrory, Gerin & Viding, 2017; McCrory, Ogle, Gerin & Viding, 2019). Neurophysiological development that was a helpful response to threat or neglect, may have unfavourable outcomes in different environments, such as the classroom (Bell et al., 2018).

Different forms of maltreatment may bring about different neurophysiological and cognitive profiles. Contemporary approaches have conceptualised maltreatment experiences in terms of fear vs neglect streams (Machlin, Miller, Snyder, McLaughlin & Sheridan, 2019; McLaughilin, Weissman & Bitrán 2019; Sumner, Colich, Uddin, Armstrong & McLaughlin, 2019). Fear, which may be more overtly heightened in abused children, may lead to an overactive amygdala and consequential hyper-attentiveness to information in the surrounding environment, potentially leading to better than average performance on cognitive tasks, such as memory tests (Cabrera, Torres & Harcourt, 2020; Hein & Monk, 2017; McCrory et al., 2019). Conversely, the neglected stream may represent a group of children who have not learnt the skill of sustained attention due to a lack of interaction with an attuned caregiver. This may plausibly lead to more severe and

consistent cognitive impairments and under-performance on cognitive tasks (Demeusy, Handley, Rogosch, Cicchetti & Toth, 2018; Terock et al., 2020).

A complimentary approach to the theory of latent vulnerability in understanding the mixed findings is to consider the nature of the memory task employed and the impact of this on a child's memory performance. For example, for children who have been maltreated and reside in a place of epistemic vigilance, paradigms involving a high degree of interpersonal information may result in pronounced deficits, due to an understandable resistance to trust information from others. However, a less social task, for example a paradigm involving shapes and numbers, may pose less of a threat to a maltreated child's epistemic trust system, and thus may not bring about such observable deficits in performance. Considering developmental experience alongside the content of cognitive tasks may assist in untangling the mixed profile of findings in this area.

The current review

Although discussed separately above, social learning theories and theories of cognitive development can be seen as interlinked and complimentary. It is understandable that a child who enters the social world of the classroom in a state of epistemic vigilance will struggle to take on new information, and consequently will perform more poorly on global measures of cognition.

During the initial stages of this review, the aim was to consider the role of epistemic trust in maltreated children's poor educational outcomes by reviewing literature comparing maltreated and non-maltreated children's performance on an experimental social learning task. However, during an initial scoping search, only one paper (Hanson et al., 2017) was identified by both myself, and two additional researchers with expertise in the child development field. This in and of itself is a

striking finding; this seems to be an area with a scant research base, which is concerning given the range of interpersonal and deficits maltreated children are at risk of developing (Alink, Cicchetti, Kim & Rogosch, 2012; Hanson et al., 2017).

To pursue this area of interest, an alternative research base was reviewed by comparing maltreated and non-maltreated children's performance on memory tests with varying degrees of interpersonal information. Findings on maltreated children's basic memory processes remain mixed (Goodman et al., 2010; Howe, Toth & Cicchetti 2006;).

From an epistemic trust perspective, it is plausible that tasks involving interpersonal information may bring about a state of epistemic hypervigilance in children with experiences of maltreatment. Contrastingly, we would hypothesise that children who have not experienced maltreatment will be more likely to acknowledge and make use of ostensive cues involved in the administration of a memory paradigm, leading them to relax epistemic hypervigilance and shift towards a position of epistemic trust in which they are ready to learn and take on new information. This would mean that maltreated and non-maltreated children may perform similarly on tasks that have a low level of interpersonal information, but non-maltreated children's performance may be markedly superior on paradigms in which ostensive cues are offered to them.

Interpersonal information was operationalised in this instance by considerations of two domains; the degree of interaction between researcher and child during the task dissemination, and the degree of person-related information to be remembered in the task paradigm.

Although it was not possible to ascertain the use of specific ostensive cues across tasks, it was hypothesised that more interaction with researchers during the

administration of tasks would inherently involve a higher degree of ostensive cues than tasks without this – for example, eye contact, engaged interaction and reciprocal conversation to ensure the child understood the tasks, thus identifying them as an individual agent.

Guided by findings of impaired social learning in maltreated children (Hanson et al., 2017) and the theoretical framework of epistemic trust (Egyed, Kiraly & Gergely, 2013; Fonagy & Allison, 2014; Sperber et al., 2010; Sperber & Wilson, 1995), it was hypothesised that tasks involving person related to be remembered information would be more likely to tap into systems of epistemic vigilance and threat than tasks involving for example digits or nouns as to be remembered information. This is because epistemic trust is primarily a theory of social information transmission, thus social information may be more likely to illuminate an individual's degree of epistemic trust in information parted by others than non-social information. To summarise, the research questions for this review were:

1) Do maltreated children perform more poorly than non-maltreated children on basic memory tasks?
2) If so, are the differences more pronounced when the task paradigm involves a high amount of interpersonal information?

Method

Search Strategy

On 13th February 2021, five databases were searched (PsycINFO, Medline, ERIC, British Education Index and Web of Science) from date of origin to present day to identify experimental, peer reviewed studies in which individuals who had experienced childhood maltreatment completed a memory task. Non-English texts were excluded as the researcher did not have access to a translator.

Prior to running the final search, three key papers identified during a scoping search (Bremner et al., 1995; Eisen, Goodman, Qin, Davis & Crayton, 2007; Wingo, Fani, Bradley & Ressler, 2010) were used to ensure the search strategy was sensitive enough to identify relevant papers. All three papers were identified. The initial search, detailed in table 1, was carried out using subject headings and keywords in OVID PsycINFO, before being exported to the remaining databases.

Guidelines outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statements (PRISMA) were followed. The review protocol was registered on the international prospective register of systematic reviews (PROSPERO) on 26th April 2021 prior to data extraction (registration number CRD42021249981).

Table 1

Search terms entered in OVID PsycINFO

1	((Test* or inventory or task or paradigm or design or trial or assess* or perform* or outcom* or function* or experiment*) adj4 (Memory or learn* or recall or remember* or retriev*))
2	exp memory/ or cued recall/ or exp free recall/ or learning/ or exp "memory and learning measures"/ or exp "recall (learning)"/
3	((Child* or infant or toddler or adolescen* or youth* or young* or juvenile or teen* or minor*) adj4 (Maltreat* or neglect* or chastise* or abus* or cruel* or violen* or developmental trauma or trauma*))
4	exp Child Neglect/ or exp Child Abuse/
5	exp Sexual Abuse/ or exp Physical Abuse/ or emotional abuse/
6	exp Early Experience/
7	5 and 6
8	3 or 4 or 7
9	1 or 2
10	8 and 9

Inclusion and Exclusion Criteria

Quantitative studies in which a group with a history of childhood maltreatment were compared with a group without childhood maltreatment were included. Childhood maltreatment in this instance was defined in line with the Children Act (1989) and included physical abuse, sexual abuse, emotional abuse, neglect and witnessing domestic violence. These forms of maltreatment are deemed to be more pertinent to the theory of epistemic trust due to the inherent violation of the caregiver/child relationship and subsequent potential disruption to the attachment system (Fonagy & Allison, 2014). Studies in which community violence, peer violence or a one-off incidence of trauma (i.e. an accident) were used as measures of childhood maltreatment were not included in the search.

Childhood maltreatment needed to be evidenced by statutory documentation to be included. Although this likely brings about bias, in that the sample are those with the most chronic/severe experiences of maltreatment, there are also drawbacks to the alternative of self-report measures, which risk inaccuracy (Baldwin, Reuben, Newbury & Danese, 2019). Moreover, given the mixed findings in the field of maltreatment and cognition, sampling those with the more severe experiences of maltreatment will be informative as to whether patterns do exist. If we find patterns in a severely maltreated sample, future studies can consider whether such patterns stand at lesser levels of severity.

The dependent variable of interest was performance on a memory test. Autobiographical memory, directed forgetting and false memory tasks were not included. However if false memory studies also included a true recall element with sufficient data pertinent to the research question, these were included. Studies which used historical datasets were not included.

A critique of studies assessing epistemic trust is the focus on 'correctly remembering' declarative information, an approach which typically fails to touch on the more socially situated context of epistemic trust (Schroder-Pfeifer, Talia, Volkert & Taubner, 2018). Therefore, studies administered via a computer were excluded.

At first, adult studies were included in the search due to the paucity of child research relating to social learning and memory identified in this area during a scoping search. However, during the abstract scanning stage of the review, it became clear that there were enough studies to focus on just child samples, thus adult studies were excluded.

Study Selection

Papers were screened by a single researcher. If the primary researcher was uncertain about whether a paper met inclusion criteria, a three-way consensus with two additional researchers with expertise in the field was performed.

Figure 1 shows the results of the database search. A total of 5,580 papers were identified across the databases and exported to Endnote reference manager software. After removing duplicates, 4,219 papers remained for initial screening. First, titles and abstracts were scanned, and 3,850 papers which were clearly not relevant to the research question were excluded (animal studies, adult studies, brain injury studies etc). This left 369 papers for further review. The abstract of each of these studies was read in full, and the full text article accessed if further clarity against the inclusion and exclusion criteria was necessary. Of these, 313 were excluded for reasons outlined in figure 1.

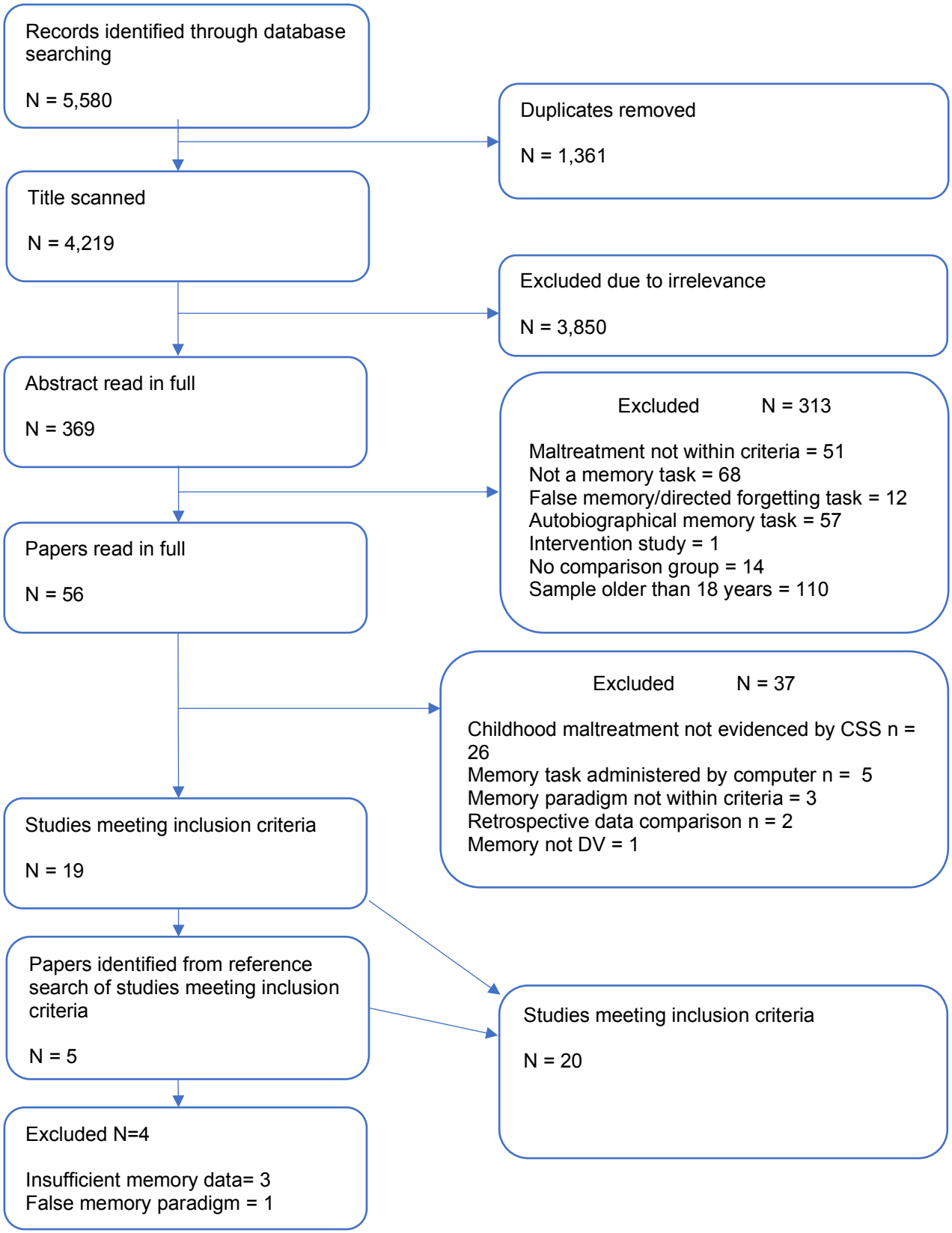
From the literature search, 56 papers were read in full. Of these, 19 papers were deemed to meet inclusion criteria and the reference lists of these studies were reviewed to source additional papers. From this, five papers were sourced, however

only one of these met the threshold of inclusion criteria. Thus 20 papers remained for data extraction, quality assessment and synthesis.

At the time of the search, the author set up an online alert system across the original databases for the search terms entered. No additional papers meeting the inclusion and exclusion criteria were identified through this system.

Figure 1

Outcome of database searches



Quality Assessment

Papers were quality assessed using the Crombie critical appraisal tool (Crombie, 1997). The Crombie can be adapted to reflect the nature of the studies gathered in one's individual review. A framework used in Steele, Bialocerkowski and Grimmer (2003) was deemed suitable for the nature of the current review. The quality assessment criteria, and study ratings are provided in Appendix A. Each item is classified as 'yes' (1 point), 'partially' (0.5 points) or 'no' (0 points). The maximum quality score was 16. All papers included in the review were either 'high' (n=17) or 'medium' (n=3) quality. One paper (Jimeno, Latorre & Cantero, 2020) scored 16, whilst the lowest scorers were Perna and Kiefner (2013) and Meesters, Merckelbach, Muris and Wessel (2000) with 10 and 9.5 points respectively.

All studies had clearly stated aims and most had an adequate description of the participant groups. All studies were cross-sectional and attempted to match maltreated and non-maltreated groups on demographics, although there was variability in the extent to which potential confounding variables were accounted for at this stage of research. For example, some researchers matched groups on age and gender (Meesters et al., 2000) whilst others attempted to match on age, gender, socio-economic status and IQ (Vasilevski & Tucker, 2016). Studies varied greatly in sample size, with two papers (McWiliams, Harris & Goodman, 2014; Meesters et al., 2000) reporting a sample size of 27, and others (Cicchetti, Rogosch, Howe & Toth, 2010; Valentino et al., 2008a) reporting upwards of 250 participants. Although numerous studies had a large sample size, only one explicitly justified their sample size via a written power analysis in the paper (Jimeno, Latorre & Cantero, 2020).

The most methodologically robust studies checked the social care records of participants in the non-maltreated group as well as collecting self-report measures to ensure a sufficiently valid control group (Cicchetti et al., 2010; Demeusy et al., 2018; Lynch & Cicchetti, 1998). They also ensured that researchers were blind to the maltreatment classification of participants during administration of memory paradigms (Lynch & Cicchetti, 1998). Many used valid and reliable measures of memory that have consistently been used in the field, whilst others had more novel paradigms created/amended for their study (Lynch & Cicchetti, 1998; McWilliams, Harris & Goodman, 2014; Valentino et al., 2008a; Valentino, Cicchetti, Rogosch & Toth, 2008b). Some papers did not provide details about the paradigm beyond the name (Perna & Kiefner, 2013), whilst others provided full, detailed descriptions (Barrera, Calderon & Bell, 2013; Cicchetti, Rogosch, Howe & Toth, 2010; Kirke-Smith, Henry & Messer, 2014;). Similarly, some studies gave scant details about order of administration, whilst others clearly outlined this process under their procedures. One test used the adult version of the California Verbal Learning Test due to absence of a Spanish translated child version of the tool (Barrera, Calderon & Bell, 2013).

Most data analyses and results were thoroughly described and clearly presented. There were small issues with levels of significance in some papers, where thresholds after multiple tests were not correctly adjusted for (De Bellis, Wooley & Hooper, 2013), and in one case, where $p=0.07$ was taken as evidence of significant difference (Meesters et al., 2000). The authors do not outline clear hypotheses to be tested in their paper, thus it is difficult to ascertain whether significance was based on a one-way or two-way test. If it was the latter, this is problematic because all other papers in the review were using $p=0.05$ as their significance cut off.

In terms of data analyses, numerous covariates were controlled for across the studies; age, sex, IQ/cognitive performance, child's current living arrangements, ethnicity, socio-economic status, parental education level were attended to either by running correlations to explore relationships between data and/or entering these demographic factors as a co-variate in analyses. Some differences between group caregiver IQ were identified but not controlled for (De Bellis, Hooper, Spratt & Woolley, 2009; Pears & Fisher, 2005). Interestingly, parental mental health was not assessed or controlled for in any of the studies.

All papers drew plausible conclusions from their data, and most interpreted significant and null findings within the context of broader literature. Researchers tended to consistently make recommendations for future research directions, but less consistently outlined real life implications for clinical work and policy.

Results

Data Extraction

Data relevant to the research questions were extracted from each paper into a table for easy comparison within and between studies (Table 2). This included information about the sample, the memory domain assessed and test used, degree of interpersonal information involved in the task and data analysis/findings.

Table 2

Overview of studies meeting inclusion criteria from OVID search

Authors/date/country	Participants (n, age, recruitment)	Type of maltreatment	Memory task	Additional variables and analysis	Interpersonal content (paradigm/administration)	Findings	Crombie overall rating (/16)
Lynch & Cicchetti (1998) USA	Maltreated (n=71), non-maltreated (n=102) Both samples recruited from a summer camp for economically disadvantaged children 8-13y	Sexual abuse (22.5%) Physical abuse (36.6%) Neglect (40.9%)	Mother-referent incidental recall task	Age, sex, ethnic minority status, mother's level of education, SES covariates in analysis Community victimisation and maternal relatedness ratings entered in to MANCOVA alongside childhood maltreatment, free recall as outcome measure	P = • List of positive and negative person attributes • Mother-referent encoding and recall A = • Attribute list presented verbally to child one at a time whilst child also shown a card with individual word typed • Asked "Does this word describe your mom?" (Mother-referent encoding) • Asked "Does this word have big letters?" (Structural encoding) • Children verbally asked to recall as many words as possible	• MANCOVA to examine the impact of maltreatment, victimisation by community violence and security of relatedness on free recall of positive and negative attribute words. None of main effects were significant; maltreatment status F(4,158)=.60, p=.66 • Interactions between maltreatment status and level of victimisation on free recall of positive and negative words was significant F(4,158)=2.38, p<.03 • Effect of maltreatment on recall of mother referent words was moderated by security of child patterns of relatedness • There were no effects of maltreatment, victimisation or patterns of relatedness or their interactions on recall of structurally encoded words	14 (High)
Meesters, Merckelbach, Muris & Wessel (2000) Netherlands	History of trauma (n=10), no history of trauma (n=17) Both samples recruited from an urban institution for youth care 14-19y	Sexual abuse (40%) Physical maltreatment (30%) Neglect (30%)	Neutral short story recall task (semantic encoding and long term-retrieval)	T-tests to compare trauma vs no trauma on semantic memory task, depression measure and autobiographical memory. Correlation matrix of all above variables, plus age	P = • Neutral short story (unclear if interpersonal or not) A = • Story read to the child, who is asked to reproduce the narrative as accurately as possible (Story 1)	• Traumatised and control individuals did not differ in terms of immediate (t=-0.46, p=0.64) or delayed story recall (t=-0.50, p=0.62) • On average, both groups recalled about 16/20 meaningful elements, indicating that encoding and storage of verbal, associative material was adequate	9.5 (Medium)

					• Child is asked to recall the story again after 15 minutes (Story 2)	• Traumatised higher than non-traumatised on depression (t=1.52, p=0.07) • Traumatised worse on autobiographical memory (t=-1.87, p=0.037) • Autobiographical memory was not correlated with age, long term semantic memory or depression scores	
Beers & De Bellis (2002) USA	Maltreated with PTSD (n=14) recruited from paediatric psychiatric outpatient sample and non-maltreated controls (n=15). 9-14y	Sexual abuse (50%) Physical abuse (14%) Witnessing Domestic Violence (36%)	CVLT (verbal learning, recall, semantic memory) ROCFT (visual working memory)	T-tests between groups on all cognitive measures in a battery of cognitive tests (not just memory)	CVLT: P = • List of 15 words in three nonaffective semantic clusters (things to wear, play with, fruits) A= • List read five times to the child who must recall as many words as possible ROCFT: P = • Copying a non-familiar, non-human two-dimensional figure A = • Child verbally asked by researcher to reproduce figure	• Maltreated children with PTSD performed worse on CVLT long recall only (t=2.01, p=0.05) • No differences between groups on CLVT short delay, discriminability, or ROCFT recall	11 (Medium)
Pears & Fisher (2005) USA	Foster care children recruited through child welfare system (n=99), and community comparison group	Sexual abuse (17%) Physical abuse (14%) Emotional abuse (8%) Neglect (61%)	NEPSY (Memory for faces immediate and delayed, memory for names learning trials and delayed, narrative memory)	Whether foster child was new to care or not was included in the variables Researchers looked at physical growth measures, general cognitive functioning, language and executive	P = • Memory for faces by presenting child with photographs and asking the child to remember the faces and sorting these in to gender piles in	• Groups did not differ significantly on memory measures (t=-2.32, p=.02) • Significant negative correlation between being removed due to emotional abuse/neglect, and memory score (r=-.36, p<.01)	14.5 (High)

	recruited through flyers in supermarkets, day-care centres, newspapers (n=54) 3-6y			functioning as well as memory measures T-tests to see if groups differed Correlations between placement characteristics and cognitive measures	• immediate and delayed (30 mins) • Memory for names involves name learning of eight line drawings of children with immediate and delayed (30 mins) recall • Narrative memory involves a child listening to a story, then recalling it A = • Data gathered in a lab-based setting during three visits over a four-week interval • Narrative memory involves verbal interaction with researcher		
Nolin & Ethier (2007) Canada	Neglect with physical abuse (n=56) and neglect without physical abuse (n=28) recruited from Child Protection Services and non-maltreated children recruited via schools (n=53) 6-12y	Neglect with physical abuse (67%) Neglect without physical abuse (33%)	CVLT (verbal learning, recall, semantic memory)	Socio-economic status controlled for MANOVA with group membership as IV and neuropsychological test results as DV (battery of tests used) Univariate analyses to determine which tests best differentiated three groups Post-hoc analyses revealed specific comparisons between groups where main effect was found	P = • List of 15 words in three nonaffective semantic clusters (things to wear, play with, fruits) A = • List read five times to the child who has to recall as many words as possible	• MANOVA indicated a significant difference between the groups when all measures were taken together (p<.001) • No significant differences between the three groups on memory test F=0.77, p=.465	13 (High)
Valentino, Cicchetti,	Abused (n=76), neglected	Sexual abuse (14%)	Self-referent incidental recall task	Age evaluated as an IV in analyses	P =	• No significant differences emerged as a function of maltreatment subtype, F	15 (High)

Rogosch & Toth (2008a) USA	(n=92) and non-maltreated (n=116) Both samples recruited from a research programme designed to provide children from low socioeconomic status families a recreational experience in which children's behaviour can be observed in an ecologically valid context 7-14y	Physical abuse (34.6%) Emotional maltreatment (52.5%) Neglect (63.7%) (N.B. % total represents co-morbidity)		Researchers also looked at false recall rates Self-schema, maltreatment and dissociative symptomatology assessed (gender as covariate)	A =	• List of positive and negative person attributes • Self-referent encoding and recall • Attribute list presented verbally to child one at a time whilst child also shown a card with individual word typed • Asked "Is this word like you?" (Self-referent encoding) • Asked "Is this a long word?" (Structural encoding) • Children verbally asked to recall as many words as possible	(2,240)=.43. Thus the experience of maltreatment did not have an impact on children's ability to use self-schema to facilitate recall, nor did it impact on children's average recall	
Valentino, Cicchetti, Rogosch & Toth (2008b) USA	Maltreated (n=96) and non-maltreated (n=128) Both samples recruited from a research programme designed to provide children from low socioeconomic status families a recreational experience in which	Sexual abuse (27%) Physical abuse (52%) Emotional maltreatment (75%) Neglect (88%) (N.B. % total represents co-morbidity)	Mother-referent incidental recall task	Instruction (maternal referent vs structural) x Rating (yes/no) repeated measures ANCOVA on proportion scores with subtype (abused vs. neglected, vs. non-maltreated) as between subjects variable. Age, ethnicity, and cognitive performance as covariates Self and teacher ratings of depression related symptomatology Gender as co-variate in depression analyses	P = A =	• List of positive and negative person attributes • Mother-referent encoding and recall • Attribute list presented verbally to child one at a time whilst child also shown a card with individual word typed • Asked "Does this word describe your mom?" (Mother-referent encoding) • Asked "Does this word have big letters?" (Structural encoding)	• Significant main effect of maltreatment subtype emerged, F(2,211)=3.92, p<.05 • Abused children demonstrated lower average recall (M=.12, SD=.07) than did the non-maltreatment group (M=.14, SD=.07, p<.01) and marginally less than the neglected children (M=.15, SD=.07, p<.06) • Recall between neglected and non-maltreated children did not significantly differ • Sexually abused (M=.119, SD=.07) and physically abused (M=.113, SD=.07, p=ns) did not significantly	14.5 (High)

	children's behaviour can be observed in an ecologically valid context 8-13.5y					• Children verbally asked to recall as many words as possible	differ in memory performance. Compared physically abused and sexually abused children's memory – no significant differences • Abused children demonstrated most internalising symptomatology in comparison to non-maltreated. Neglected had elevated levels of internalising symptomatology, but a lesser degree than abused • Positive or negative maternal schema had a significant relationship with internalising symptomatology in neglected children only (positive maternal schema had lower levels of internalising symptomatology)	
De Bellis, Hooper, Spratt & Woolley (2009) USA	Neglected with PTSD (n=22) and neglected without PTSD (n=39) were recruited through adverts targeted as Department of Social Services agencies. Controls (n=45) recruited from surrounding areas by	Neglect with PTSD (36%) Neglect without PTSD (64%)	NEPSY (Memory for faces immediate and delayed, memory for names learning trials and delayed, narrative memory)	Memory domains part of a larger cognitive battery MANOVAS across neurocognitive domains and academic achievement. Follow up pairwise comparisons. Ran tests with and without IQ as co-variate.	P =	• Memory for faces: presenting child with photographs and asking the child to remember the faces and sorting these in to gender piles in immediate and delayed (30 mins) • Memory for names involves name learning of eight-line drawings of children with immediate and delayed (30 mins) recall	• Significant differences between groups on all memory tasks with medium to large effect sizes $F(6,178)=4.33$, $p<.001$ • Neglect groups performed significantly lower on Memory for Faces, Names and Narrative memory than controls • Neglect with PTSD group performed lower than control group on Memory for Faces Immediate • Neglect with PTSD performed lower than both control and neglect without PTSD groups	13.5 (High)

	adverts in schools and paediatric clinics. 4-12y				A=	• Narrative memory involves a child listening to a story, then recalling it • No information provided	• Pairwise comparisons for supplemental scores revealed two neglect groups performed lower than controls, but did not differ from each other • Did not see major differences between neglect with/without PTSD, except for poorer Memory for Faces-Delayed Recall	
Cicchetti, Howe, Rogosch & Toth (2010) USA	Maltreated (n=143) and non-maltreated (n=174) Both groups were recruited from a recreational summer programme designed for low-income children (Two cohorts of children from different years aggregated for this study) 6-13y	Sexual abuse (14.7%) Physical abuse (36.4%) Emotional maltreatment (73.4%) Neglect (79.7%) (N.B. % total represents co-morbidity)	CVLT (verbal learning, recall, semantic memory)	ANCOVA on generally memory processing, including short and long delay recall, and recognition memory (children's age and vocabulary scores were covariates in all analyses) Vocabulary measure Teacher reports of dissociation Morning salivary cortisol levels	P = A =	• List of 15 words in three nonaffective semantic clusters (things to wear, play with, fruits) • List read five times to the child who must recall as many words as possible	• No significant main or interactive effects for maltreatment subtype and general memory processes • Maltreatment and cortisol regulation were not related to short or long delay recall or recognition memory for nontraumatic material	14.5 (High)
Bucker, Kapczinski, Post, Cereser, Szobot, Yatham, Kapczinski, Kauer-Sant Anna (2012) Brazil	Early severe trauma (n=30) recruited from foster homes, controls (n=30) recruited from primary health care centres, schools, and	Abuse prior to the age of 4 years Sexual abuse (20%) Physical abuse (43.4%)	WISC Digit span, including forward and backward subtests (working memory), part of a wider neurocognitive battery of tests	T-tests to compare children with trauma and controls General linear modelling for exploratory clinical predictors of psychiatric symptoms in children with trauma	P = A =	• To be remembered information are numbers • Researcher verbally read digits to child who had to verbally recall as directed	• Children with trauma and their caregivers showed significantly fewer years of education than the control group and their caregivers (t58=2.048, p=.045, and t49=2.428, p=.019 respectively) • Those with trauma showed worse performance that	13.5 (High)

	paediatric clinic in catchment areas 5-12y	Neglect (86%) (N.B. % total represents co-morbidity)		Conducted analyses with and without age and sex as covariates (significant findings did not change)		• those without on the WISC Digit span test F(1,51)=8.55,p=.005, including forward (t51=2.29, p=.02) and backward (t51=2.35, p=.02) subtests • Significant interaction between early trauma and presence of psychiatric symptoms in association with cognitive impairment (p=.018). This interaction was statistically significant for digit span (p=.011, r2=0.16) and digit forward (p=.013, r2=0.16) • Children with trauma showed higher prevalence of subsyndromal symptoms ($x^2_{1=}$15.93, p<.001; OR, 18.3; 95% CI, 3.6-91.2)	
Perna & Kiefner (2013) USA	Maltreated children (n=18) and non-maltreated children (n=23), recruited from a school setting after referral for neuropsychological testing 11y	Physical and/or emotional abuse and severe neglect (% not defined)	WISC digit span Children's memory test	Full scale IQ as covariate and corrected for group comparisons ANCOVA for group status and neurocognitive measures Memory tests as part of wider neurocognitive battery Self and parent reports on mental health measures. Interview with clinician to ascertain PTSD diagnosis	WISC: P= To be remembered information are numbers A= Researcher verbally reads digits to child who must verbally recall as directed Children's Memory Test: No information provided	• Abused group performed significantly worse on measures of working memory F(1,37)=7.52, p<.01 • No significant differences in Children's Memory Test between groups	10 (Medium)
Barrera, Calderon, Bell (2013) Colombia	CSA with PTSD symptoms (n=13), sexual abuse with no	CSA with PTSS (33.3%) CSA without PTSS (66.7%)	CVLT (Adult)(verbal learning, recall, semantic memory)	PTSD/psychiatric measures Memory measures part of wider battery	CVLT: P = • List of 16 words in three nonaffective semantic clusters	• No differences in these memory tests between sexually abused and controls	14.5 (High)

	PTSD symptoms (n=26) recruited from a non-governmental organisation for CSA. Controls (n=37) recruited from a local school 8-14y		ROCFT (visual working memory)	One way ANOVA to assess differences in results across three groups T tests (all cases) vs controls Logistic regression	(things to wear, play with, fruits) A = • List read five times to the child who has to recall as many words as possible ROCFT: P = • Copying a non-familiar, non-human two-dimensional figure A = • Child verbally asked by researcher to reproduce figure	• No difference between CSA with PTSS and CSA without PTSS • Logistic regression to see if performance on any of the neuropsychological tests predicted likelihood of participants having experienced CSA. Model was significant ($x^2(7,n=76)=15.346$, $p=0.032$) • Only Stroop errors made significant contribution to model	
De Bellis, Wooley & Hooper (2013) USA	Maltreated (n=38) and maltreated with PTSD (n=60) recruited from Child Protection Services and non-maltreated controls (n=104) recruited from schools and other community settings in local area. 6-17y	Maltreated (38.8%) Maltreated with PTSD (61.2%)	CVLT (verbal learning, recall, semantic memory) TOMAL Paired Recall Subtest (Verbal memory) Symbol Digit Paired Associative Learning Test	Clinical measures – internalising/externalising, dissociation, global functioning Memory measures part of wider neurocognitive battery Full scale IQ Academic achievement ANCOVA for IQ and MANCOVA for each of the neuropsychological domains. SES, child's current living arrangements and caregiver IQ considered as covariates	CVLT: P = • List of 15 words in three nonaffective semantic clusters (things to wear, play with, fruits) A = • List read five times to the child who has to recall as many words as possible TOMAL: P= • Word pairs for associative learning A= • Researcher verbally presents pairs to child Symbol Digit Paired Associative Learning Test: P= • List of symbols to learn, which were paired with a digit	• Maltreated perform more poorly than controls in the memory test $F(6,134)=3.60$, $p=0.02$ • No difference between those with PTSD and no PTSD on memory measures (and neuro measures more generally) • Only sexual abuse index significantly and negatively correlated with memory domain ($r=-.497$, $p<.01$) when controlling for all other types of maltreatment and severity (correlated with language too but no others) • SES and caregiver IQ were lower in maltreated children with PTSD than controls but did not differ from the maltreatment group	14.5 (High)

					A= • Visual presentation of each symbol-digit pair for 3 seconds • Subject shown symbol alone and verbally asked to recall number paired with it		
McWilliams, Harris & Goodman (2014) USA	Experiment 1: Maltreated (n=20) recruited from Child Protection Services (6 non-maltreated pps disclosed maltreatment and were allocated to this group), non-maltreated (n=15) recruited from local community events, newspaper advertisements, online forums, and community organisations	Physical maltreatment, exposure to DV, emotional abuse, neglect, sexual abuse (% not defined)	Positive emotive video scene of family interaction followed by verbal questioning (episodic memory)	Full scale IQ Child PTSD symptoms, internalising symptoms Regression models examining whether age, maltreatment status and trauma related psychopathology uniquely predicted eyewitness memory (controlling for income and IQ)	P = • Video of a family dinner in which children are told that they are allowed to start revisiting their father again. Children are overjoyed. Clip lasted about 5 minutes A = • Children verbally asked four free recall questions, followed by 20 direct (yes/no) questions including specific questions and misleading questions	• Higher levels of psychopathology, above and beyond maltreatment history, were significantly related to children's memory error for positive information	12.5 (High)
	Expermient 2: Maltreated (n=19) recruited from Child Protection Services, non-maltreated (n=8) recruited	Physical maltreatment, exposure to DV, emotional abuse, neglect, sexual abuse (% not defined)	Negative emotive video scene of family interaction followed by verbal questioning (episodic memory)	Full scale IQ Child PTSD symptoms, internalising symptoms Regression models examining whether age, maltreatment status and trauma related	P = • Video of a moderately intense verbal argument between a husband and wife about a disruptive party thrown in their home. Argument ends with couple deciding	• Age, maltreatment status and trauma related psychopathology did not uniquely predict memory for negative information presented	12.5 (High)

	from local community events, newspaper advertisements, online forums and community organisations 9-15y			psychopathology uniquely predicted eyewitness memory (controlling for income and IQ)	to get a divorce, both adults and children in clip express sadness. Clip lasted about 5 minutes. A = • Children verbally asked four free recall questions, followed by 21 direct (yes/no) questions including specific questions and misleading questions.		
Kirke-Smith, Henry & Messer (2014) UK	Maltreated (n=40) recruited from specialist schools for young people with Emotional and Behavioural difficulties, non-maltreated (n=40) recruited from mainstream secondary schools 11-18y	Sexual abuse (32.5%) Physical abuse (30%) Emotional Abuse (67.5%) Neglect (55%) Witnessing DV (22.5%) N.B. % total represents co-morbidity)	Listening Recall Task (verbal executive loaded working memory) Odd-One-Out Task (non-verbal executive loaded working memory)	Fluency, switching and inhibition measures included IQ measure included SDQ Anxiety and depression measures Means/SD/ranges for groups on neurocognitive measures calculated Hierarchical multiple regression to assess group differences in EF performance with each of the 10 EF measures as DV in turn. Group (maltreated/non-maltreated) entered at Step 2	Listening Recall Task: P = • Series of short sentences A = • Experimenter reads sentences to participant Odd-One-Out-Task: P = • Cards containing visual two identical items, one similar but slightly different item A = • Participant verbally asked to point to item that was different	• Significant group differences found for most measures, adolescents exposed to child maltreatment achieved lower scores on verbal and non-verbal executive loaded working memory (p<.001) • Anxiety, depression, and behavioural difficulties more common in the maltreated group and accounted for significant portions of the variance in executive loaded working memory (verbal and non-verbal)	14.5 (High)
Vasilevski & Tucker (2016) Australia	Maltreated (n=39) recruited from Department of Human Services	Maltreatment (type and % not defined)	RAVLT (Semantic memory) WISC-IV Working Memory Index (Digit	MANOVA to analyse the differences between two groups on cognitive domains.	RAVLT: P = • List of 15 nouns A = • List read by experimenter. Child	• Secure welfare group had fewer years in formal education than control group (p<.001) • Significant group differences found on the RAVLT	14 (High)

	Social Work, and non-maltreated (n=43) recruited from government secondary schools 12-16y		span, Number-letter sequencing) SSST (Working memory)	MANOVA to analyse differences between groups on affective measures Bivariate correlations to analyse relationship between cognitive and affective measures	has to verbally repeat back. WISC WMI: P= • Series of letters and numbers to be repeated back in alphabetical and numerical order A= • Lists read by experimenter. Child has to verbally repeat back SSST: P = • Two sets of unrelated sentences and two comprehension questions in relation to the sentences (one for each set) A = • Participants had to listen to a list of sentences, then answer a question in relation to one of the sentences, then recall the last word of each sentence in the order they were read	delayed recall (F=7.87, p=0.006, d=0.63) and total learning (F=13.13, p=.001, d=0.81) • Significant group differences on the SSST with medium effect sizes (F=8.83, p=.004, d=0.67) • No significant differences on the WISC-IV WMI • Exploratory analyses regarding length of time in care and cognitive variables. No main effect except RAVLT Retention (r=-.35, p=.03), which suggests that as duration of child protection goes on, the ability to recall information following interference decreases	
Nooner, Hooper & De Bellis (2018) USA	Maltreated boys (n=42) and girls (n=56) recruited through adverts targeted and Child Protection	Neglect - failure to provide Neglect – failure to supervise Physical abuse	CVLT(verbal learning, recall, semantic memory) TOMAL Paired Recall Subtest	Clinical measures for PTSS and internalising/externalising symptomatology Full scale IQ (DV, not controlled for) Controlled for SES	CVLT: P = • List of 15 words in three nonaffective semantic clusters (things to wear, play with, fruits) A = • List read five times to the child who must	• Maltreated boys and girls had a greater number of internalising (F(3,194)=8.88, p<.0001, d = 1.42)) and externalising behaviours (F(3,194)=8.88, p<.0001, d=1.62)) compared to controls • Maltreated boys performed more poorly in the memory	15 (High)

	Services. Non-maltreated boys (n=45) and girls (n=59) recruited from surrounding community and schools 9-15y	Sexual abuse Witnessing DV Emotional abuse (% not specified)		ANCOVA and follow up tests Pearson's correlations to examine the relationships between behavioural measures and each neuropsychological measure	recall as many words as possible TOMAL: P= • Word pairs for associative learning A= • Researcher verbally presents pairs to child	domain compared with both non-maltreated boys (F(3,194)=11.11, p=<.002) and girls (F(1,194)=4.56, p<.0001), and effect sizes were in the large range (d=.85, d=1.23 respectively) • Maltreated boys performed more poorly than maltreated girls on the CVLT but not the TOML • Maltreated girls also performed more poorly in the memory domain compared with non-maltreated girls on both measures of memory with effect sizes in the medium to large range	
Demeusy, Handley, Rogosch, Cicchetti & Toth (2018) USA	Neglect (n=45) recruited from Child Protection Services and non-neglect (n=44) from those receiving Temporary Assistance to Needy Families. Data drawn from larger randomised clinical trial which recruited infants with and without histories of maltreatment and mothers.	Neglect (100%) 62.2% direct targets 37.8% sibling target	Three boxes stationary task (spatial working memory) Three boxes scrambled task (non-spatial working memory)	Clinical measures of internalising and externalising symptomatology, (aggression main interest) T-test to compare performance of children from neglecting families to no neglect family Structural equation modelling to assess whether WM mediated relationship between early neglect and aggression	Three boxes stationary: P = • Three boxes in front of child, different colour and accompanying shape. Reward of child's choice in the boxes A = • Boxes placed in front of child. Child watched experimenter put child's choice of reward in each box. Boxes pushed towards child who was encouraged to find the reward Three boxes scrambled: P= • Same as above but boxes scrambled during interim part of task. This task	• Children from neglecting families demonstrated higher levels of aggression (t(82)=-2.759, p<.01) poorer performance on the three boxes stationary task (t(85)=2.500, p<.05)compared to comparisons at age • No significant differences between children from neglecting families and controls on the three boxes scrambled task • Neglect during infancy was a significant predictor of higher levels of aggression in toddlerhood (b=.215, SE=.103, p<.05) • Children with poorer spatial working memory skills exhibited higher levels of aggression 12 months later (b=-.284, SE=.108, p<.01)	13.5 (High)

	12-38m				therefore measures object memory instead of spatial memory	• Children in neglecting families did not significantly differ from those in non-neglecting families on three box scrambled task, and performance on this task did not significantly predict aggression	
Jimeno, Latorre & Cantero (2020) Spain	Abused (n=22), neglected (n=26) recruited from recruited from out of home care settings and non-maltreated (n=61) recruited from nearby school 13-16y	Physical, psychological, and/or sexual abuse (45.8%) Neglect (54.2%)	WISC Digit Span Forward (Working Memory) WISC Digit Span Backward (Working Memory) WISC Arithmetic (Working Memory)	Over-general memory task Depression inventory MANCOVA controlling for gender, with group as between subject factor and categories of retrieval as DV MANCOVA to measures differences by groups on two WISC tests	WISC Digit Span P = • To be remembered information are numbers A = • Researcher verbally reads digits to child who has to verbally recall as directed WISC Arithmetic: P = • Numerical content A = • Orally administered arithmetic questions	• Both abused and neglect groups performed significantly worse on digit total ($F(2,106)=9.08$, $p<.001$) and arithmetic ($F(2,106)=8.95$, $p<.001$) than non-maltreated	16 (High)
Marques, Belizario, Castanho de Almeida Rocca, Saffi, de Barros & de Padua Serafim (2020) Brazil	Sexually abused (n=34) recruited from outpatient clinica of Psychiatry and Forensic Psychology and non-sexually abused (n=25) recruited from local primary and secondary schools 8-11y	Sexual abuse (100%)	WISC Digit Span Forward (Working Memory) WISC Digit Span Backward (Working Memory) Trail Making Task B (Working Memory) ROCFT (Non-verbal spatial memory) SRT (Long term retrieval, Long term storage, Consistent long-term retrieval,	Clinical variables T-tests to compare groups on various neurocognitive measures Bonferroni set at $p<0.0022$	WISC Digit Span P = • To be remembered information are numbers A = • Researcher verbally reads digits to child who has to verbally recall as directed Trail Making Task B: P = • Letters and digits on a page which must be connected in alternating manner by pen and paper	• Children with sexual abuse had inferior performance on SRT, particularly short-term retrieval ($p<0.001$), random long-term retrieval and the trial making test B ($p<0.001$) • No significant differences in groups on WISC measures or ROCFT • Children who were anxious or fearful, had difficulties with operational memory and difficulty sleeping had more trouble performing tasks that required attention and memory (TMT-B, RLTR)	13 (High)

	Random long erm retrieval, Short Term Retrieval) (Verbal learning and Memory)	A = • Verbal explanation of task, task completed by pen and paper ROCFT: P = • Copying a non-familiar two-dimensional figure (unclear what figure is) A = • Child verbally asked by researcher to reproduce figure Selective Reminding Test: P = • 12 words (high imagery nouns) A = • Words read verbally to child who is asked to verbally recall them over multiple trials

Note: CVLT – California Verbal Learning Test, CSA – Child Sexual Abuse, NEPSY – A Developmental Neuropsychological Assessment, PTSD – Post Traumatic Stress Disorder, PTSS – Post Traumatic Stress Symptoms, RAVLT – Rey Osterrieth Auditory Learning Task, ROCFT – Rey Osterrieth Complex Figure Test, SES – Socioeconomic Status, SRT – Selective Reminding Test, SSST – Swanson Sentence Span Test, TOMAL – Test Of Memory And Learning, WISC – Wechsler Intelligence Scale for Children.

Data Synthesis

All studies used an experimental group and a control group. They were all cross-sectional in design, with one paper that used a cross-sectional cohort design and tested infants at multiple ages (Demeusy et al., 2018). The selected studies were published between 1998 and 2020. In most studies, memory tests were part of a wider battery of neurocognitive tests administered to the child.

Overall, the studies represent data from 2,310 children, ranging in age from 12 months to19 years. De Bellis, Wooley and Hooper (2013) and Nooner, Hooper and De Bellis (2018) analysed the same sample of 202 children, firstly with a focus on maltreatment, cognition and post-traumatic stress symptoms, then with regard to sex differences in cognition and maltreatment. Lynch and Cicchetti (1998), Valentino et al. (2008a), Valentino et al., (2008b) and Cicchetti et al. (2010) recruited children from an annual recreational programme in New York. It is unclear whether each study assessed a different sample of children from this annual programme, or whether some children undertook measures that were reported across different studies.

Twelve of the 20 studies were conducted in USA, with nine of these studies coming from two major research groups (Beers & De Bellis, 2002; Cicchetti et al., 2010; De Bellis et al., 2009; De Bellis, Wooley & Hooper, 2013; Demeusy et al., 2018; Lynch & Cicchetti, 1997; Nooner, Hooper & De Bellis, 2018; Valentino et al., 2008a; Valentino et al., 2008b) who accounted for 406 and 337 participants, respectively. There were three studies from South America, three from Europe, one from Australia and one from Canada.

Sixteen studies looked at multiple types of maltreatment, whilst two studies focused specifically on neglect and two focused specifically on sexual abuse. However, nearly all studies comment that their sample had typically experienced multiple forms of maltreatment. Some studies classified children based on their 'primary' maltreatment type, whilst others registered each type of abuse the child had experienced. Cicchetti used the same classification system in each of his studies, namely the 'Maltreatment Classification and Rating System', (Barnett, Manly & Cicchetti, 1991), which assists in bringing increased objectivity between studies in terms of maltreatment definitions.

Child Maltreatment and Memory – the Field of Research to Date

A striking finding from this review was the dearth of literature considering the relationship between childhood maltreatment and basic memory processes in child samples. In the earliest paper of this review (Lynch & Cicchetti, 1998), the authors note that there were no studies concerning basic memory process in children who had experienced maltreatment, and that they were conducting the first. Indeed, De Bellis et al. (2009) and more recently Demeusy et al. (2018) report that memory development and childhood neglect, the most prevalent form of childhood maltreatment, is still vastly understudied in child samples.

The scarcity of literature in this area parallels the difficulties the main author had during an initial scoping search to find literature comparing maltreated and non-maltreated children's performance on a social learning task. It appears that there are areas of basic cognitive processing and social cognition that remain largely understudied in maltreated children. Numerous authors have acknowledged substantial research in 'typically developing children' but a vacuum of such work

with maltreated children (Goodman, Quas & Ogle, 2009; Howe, Cicchetti & Toth, 2006; Howe, Toth & Cicchetti, 2006).

Results Across all Types of Paradigms

Across all 20 studies, eight reported consistent deficit (Bucker et al., 2012; De Bellis et al., 2009; De Bellis, Wooley & Hooper, 2013; Demeusy et al. 2018; Jimeno, Latorre & Cantero, 2020; Kirke-Smith, Henry, Messer, 2014; Nooner, Hooper & De Bellis, 2018; Valentino et al., 2008b), six reported mixed profiles of deficit (Beers & De Bellis, 2002; Marques et al., 2020; McWilliams, Harris & Goodman, 2014; Pears & Fisher, 2005; Perna & Kiefner, 2013; Vasilevski & Tucker, 2016), and six reported no evidence of memory deficit between maltreated and non-maltreated children (Barrera, Calderon & Bell, 2013; Cicchetti et al., 2010; Lynch & Cicchetti, 1998; Meesters, Merckelbach & Muris, 2000; Nolin & Ethier, 2007; Valentino et al., 2008a). These findings are in line with previous systematic reviews which have reported mixed findings when comparing maltreated and non-maltreated children on measures of cognition (Irigaray et al., 2013; Lund et al., 2020).

Understanding the Findings Within the Theory of Epistemic Trust

One way to try and make sense of the mixed findings is to consider the type of memory paradigm used, with a focus on content of interpersonal information.

To this end, paradigms across all studies were categorised in to high, medium, and low interpersonal content (Appendix B). Those in the 'high' category involved paradigms that directly tapped into the attachment system, or represented socio-emotional processing through interpersonal administration of a paradigm that involved visual and semantic social information (i.e. a face or self/other referent attribute information).

Those in the 'medium' category included tasks that involved interactions with the researcher, and verbal communication across tasks, such as word or sentence recall. However, the content of to-be remembered information was less person specific, for example a story or a list of non-person attribute words.

Tasks categorised in the 'low' interpersonal category were tasks that did not involve interpersonal to be remembered information, such as digit span and arithmetic, symbol digit pairing and trail making tasks.

Performance Across 'High' Interpersonal Tasks

Lynch and Cicchetti (1998) and Valentino et al. (2008b) used a mother-referent incidental recall task to explore interactions between maternal representations, encoding and recall with children who had experienced a range of maltreatment. In this paradigm, children were presented with a list of positive and negative attributes, and asked "Does this word describe your Mom?" (mother-referent encoding) or "Does this word have big letters?" (structural encoding). Lynch and Cicchetti (1998) found no evidence of significant main effects on free recall of maltreatment group, however they did report an interaction between victimisation in the community and maltreatment on free recall. The effect of maltreatment on the recall of mother-referent words was moderated by the security of the child's pattern of relatedness, such that maltreated children with secure attachments recalled a higher proportion of no rated positive attribute words than did non-maltreated children. Although a somewhat paradoxical finding, that secure children displayed a bias for negative mother-referent stimuli, it may be that insecure children employ defensive strategies in which they are unable to acknowledge the imperfections of their caregivers (Goodman, Quas & Ogle, 2009; Vondra, 1989). No main effect of memory, community victimisation, or interaction effects were found on the recall of

structurally encoded words. Taken together, these findings suggests that basic memory processes are more vulnerable to deficits when encoding information under circumstances in which the attachment system is triggered. However, it is of note that there were no direct effects of maltreatment status on mother-referent recall, only interaction effects. Perhaps mixed findings across the field are in part a result of the varying degrees of stringency across studies when considering the role of such covariates.

Valentino et al. (2008b) used the same design, but found a significant main effect of maltreatment subtype, in which abused children demonstrated lower average recall than neglected and non-maltreated children. Given the similarities in recruitment strategy and paradigm, it is difficult to make sense of these findings alongside those reported in Lynch and Cicchetti (1998). The only notable difference is covariates controlled for, in which Lynch and Cicchetti (1998) controlled for age, sex, ethnic minority status, mother's level of education and socioeconomic status, whilst Valentino et al. (2008b) controlled for age, ethnicity and cognitive performance only. This is a plausible reason for the differences, as caregiver IQ and socioeconomic status have both been highly correlated with maltreated children's cognitive performance (Lund et al., 2020). The social context within which the attachment relationship occurs has been the focus of recent literature (Fonagy et al., 2021; Fonagy & Campbell, 2021).

Valentino et al. (2008a) used the same paradigm but with self-referent as opposed to mother-referent encoding. This paradigm inherently contains ostensive cuing, in that children were asked questions that identified them as a unique individual. During the encoding phase of positive and negative person attributes, participants were asked "Is this word like you?" (self-referent encoding) or "Is this a

long word?" (structural encoding). There was no main effect of maltreatment type, thus maltreated children's self-schema did not negatively impact their recall for person attributed words.

The Developmental Neuropsychology Assessment (NEPSY) was deemed high on interpersonal rating because participants have to remember names and faces. Both De Bellis et al. (2009) and Pears and Fisher (2005) used this paradigm in their studies. Pears and Fisher (2005) reported that maltreated and non-maltreated groups did not differ significantly on memory measures, whereas De Bellis et al. (2009) reported significant differences between groups on all memory tasks, with large to medium effect sizes. Although these findings seem contradictory, Pears and Fisher (2005) reported a significant negative correlation between emotional abuse/neglect and memory score. De Bellis et al. (2009) sample were only those who had experienced neglect. Therefore, it seems that children who are neglected tend to perform worse on the NEPSY consistently over these studies. Moreover, the lack of pronounced group differences in Pears and Fisher's study (2005) may be linked to age of participants, given literature that suggests deficits in memory of maltreated children become more pronounced with age (Howe, Cicchetti & Toth, 2006). Their sample was 3-6 years old, whereas De Bellis et al. (2009) sample had an age range of 4-12 years.

The final paradigm in the "high" interpersonal category is a paper involving two studies by McWilliams, Harris and Goodman (2014). In this paradigm, two separate groups of children, both of which consisted of maltreated and non-maltreated participants, watched a video clip of a family interaction. The first group watched a pleasant interaction, whilst the second group watched an unpleasant interaction. Maltreated and non-maltreated children were compared on their recall in

this episodic memory paradigm. Maltreatment history was not a significant main predictor of memory performance for the positive or negative film clip. However, higher levels of trauma related psychopathology and younger age significantly predicted commission errors to direct questions in the positive video condition. The authors take this to suggest that psychopathology related factors, above and beyond the experience of maltreatment impact on basic memory processes, and that maltreatment in and of itself does not lead to such deficits.

Performance Across 'Medium' Interpersonal Tasks

Medium rated interpersonal tasks were those that involved a degree of interaction with the researcher, and/or typically included recall of semantic information either in word, sentence or story form. Of the nine studies in this category, four found no differences in performance between maltreated and non-maltreated children (Barrera, Calderon & Bell, 2013; Cicchetti et al., 2010; Meesters et al., 2000; Nolin & Ethier, 2007). One found mixed profiles (Beers & De Bellis, 2002) and four found evidence of memory deficit in maltreated children (De Bellis, Woolley, Hooper, 2013; Kirke-Smith, Henry & Messer, 2014; Nooner, Hooper & De Bellis, 2018; Vasilevski & Tucker, 2016).

The most used paradigm in this category was the California Verbal Learning Test (CVLT), a paradigm which tests verbal learning, recall and semantic memory. Seven studies employed this paradigm, which provides an opportunity for comparing results across studies using a standardised measure of memory.

Nolin and Ethier (2007) compared neglected children with and without physical abuse to controls and found no significant differences on this memory test. Cicchetti et al. (2010) compared children with a range of maltreatment experiences and found no differences between the groups on this task. Barrera, Calderon and Bell

(2013) compared children with sexual abuse and post-traumatic stress symptoms, sexual abuse with no post traumatic symptoms, and controls on the CVLT and found no evidence of difference between maltreated and non-maltreated groups.

In contrast to this group of null findings, three studies reported marked differences between maltreated and non-maltreated children's performance on the CVLT. Beers and De Bellis (2002) compared 9-14 year olds with a mix of maltreatment and a diagnosis of PTSD and found that maltreated children performed worse on long recall only. De Bellis, Woolley and Hooper (2013) and Nooner, Hooper and De Bellis (2018) used the same sample of children in their papers (the former explored the data considering the role of post-traumatic stress symptoms, whilst the latter looked at gender differences in performance in the sample), thus both studies report that maltreated children performed worse than non-maltreated on the CVLT. De Bellis, Woolley and Hooper (2013) found that child sexual abuse in particular was negatively correlated with memory, a finding that is in direct contrast with Barrera, Calderon & Bell (2013).

These mixed findings are difficult to make sense of. Perhaps it is post-traumatic symptomatology, as opposed to the experience of maltreatment itself, that is responsible for these differing results on the CVLT. However, there is contradicting evidence of the role of post-traumatic stress symptoms in that the majority of papers that found difference had samples that had post-traumatic stress symptoms, yet Barrera, Calderon and Bell (2013) considered the role of post-traumatic stress symptoms and found no difference between the two groups. De Bellis, Woolley and Hooper (2013) reported that only child sexual abuse was significantly negatively correlated with memory performance, however Barrera, Cauldron and Bell (2013) reported no such difference in their sample of sexually

abused youth. The latter report used the adult measure of the CLVT, which the authors comment may have made subtle differences in verbal memory more difficult to detect. Additionally, they had a smaller sample which may have also made subtle differences difficult to detect. Findings from the field of childhood maltreatment and basic memory impairment suggest that impairment in this function (if any) may be subtle. Therefore in order to identify these differences, studies need to use sensitive measures and ensure a substantially powered sample size. Additional methodological rigour, such as checking records and interviewing "non-maltreated groups" to ensure they have not experienced any form of maltreatment will be important too. Differences may be subtle in children, but the increased pronunciation in impairment in age suggests that increasing understanding of these subtleties during early development may help with preventative interventions that guide maltreated children to more adaptive developmental trajectories.

Kirke-Smith, Henry and Messer (2014) and Vasilevski and Tucker (2016) tested adolescent only samples in their studies, both of which involved word/short sentence recall. These studies recruited from similar sample pools, had comparable sample sizes, and found significant group differences in which maltreated youths performed more poorly on these basic memory tests. Meesters et al. (2000) also tested an adolescent only sample on a neutral short story recall task which involved semantic encoding and long-term retrieval. This study found no difference. This study had a very small sample size of 27, and both maltreated and non-maltreated groups were recruited from an urban institution for youth care with emotional and behavioural difficulties. It is plausible that the experimental and control group were more demographically and developmentally similar than those in Kirke-Smith, Henry and Messer (2014) and Vasilevski and Tucker's (2016) samples, so perhaps

this made cognitive differences between groups even more subtle. Moreover, the tasks used in Kirke-Smith, Henry and Messer (2014) and Vasilevski and Tucker (2016) papers tapped in to working memory, a domain that has been more consistently found to be impaired in children who have experienced maltreatment than other domains such as semantic and long-term memory (Cabrera, Torres & Harcourt, 2020).

Performance Across Low' Interpersonal Tasks

'Low' interpersonal tasks were those that typically involved numeric or symbolic paradigms, and a lower level of child interaction with the researcher. Seven studies used paradigms such as the WISC digit span, Rey Osterrieth Complex Figure Recall and Symbol Digit Paired Learning Test. Of these, four found that maltreated children performed more poorly than non-maltreated children (Bucker et al., 2012; Demeusy, et al., 2018; Jimeno, Latorre & Cantero, 2020; Perna & Kiefner, 2013), and three reported no significant difference between maltreated children and controls (Barrera, Calderon & Bell, 2013; Beers & De Bellis, 2002; Marques et al., 2020).

We would expect less mixed results in this category in line with the foundational hypothesis for this review; that differences between maltreated and non-maltreated children's performance on tests of basic memory would be more pronounced in paradigms that involved higher levels of interpersonal information. However, closer consideration of the results suggests that memory domain as opposed to level of interpersonal information/ostensive cues is accountable.

Interestingly, studies using the Rey Osterrieth Complex Figure Recall, a test of non-verbal spatial memory, all reported no significant difference between maltreated and non-maltreated children (Barrera, Calderon & Bell, 2013; Beers & De Bellis, 2002; Marques et al., 2020). Those studies in which group differences were

reported (Bucker et al., 2012; Jimeno, Latorre & Cantero, 2020; Perna & Kiefner, 2013) used the WISC digit span, a test of working memory. Although Marques et al. (2020) did not find significant differences between sexually abused children and controls on the WISC digit span in their study, they did report deficits on the trail making test, another measure of working memory.

Demeusey et al. (2018) reported significant differences in maltreated and non-maltreated children's performance on a spatial working memory task. This cross-sectional cohort design collected demographic information when infants were 12 months of age, administered spatial and non-spatial working memory tasks at 24 months of age, and collected parental reports of aggression at 36 months of age. They found that at 24 months, infants from neglected families were more likely to exhibit poorer working memory on spatial (but not non-spatial) working memory paradigms than those from non-neglecting families. Moreover, they reported that this spatial working memory performance at 24 months mediated the relationship between neglect status and parent reported aggression at 36 months. This longitudinal design allows some degree of causal inferring not afforded by the purely cross-sectional designs constituting the rest of this review.

It seems that the pattern observed here relates to the domain of memory being assessed, rather than level of interpersonal information. Tasks involving attention and working memory reveal more pronounced differences in functioning between maltreated and non-maltreated children. Moreover, the impact of maltreatment on this particular memory domain is evidenced even in infancy (Demeusy et al., 2018).

Additional Factors for Consideration

Type of Maltreatment

Nolin and Ethier (2007) and De Bellis et al. (2009) both looked exclusively at children who had experienced neglect. Nolin and Ethier (2007) used the CLVT, a measure categorised in the "medium" group in terms of interpersonal information. They found no significant difference between neglect without physical abuse, neglect with physical abuse and controls. Similarly, De Bellis et al. (2009) compared neglect with PTSD, neglect without PTSD and controls, but contrastingly found a series of significant differences with medium to large effect sizes on all memory tasks. The paradigm used in this study was the NEPSY, which rated highly in terms of interpersonal information. This paradigm involves the encoding, storing and retrieval of personal information, namely faces and names. Perhaps neglected children show particular deficits in interpersonal memory, given their limited interpersonal interactions with others within the home environment. Pears and Fisher (2005) also used the NEPSY in their study. Although they found no difference between maltreated and non-maltreated children on the NEPSY when all types of maltreatment were analysed as one group, they did find a significant negative correlation between being removed due to emotional abuse/neglect, and memory score. Taken together, these studies evidence some consistency in terms of neglected children performing more poorly on tests involving high levels of interpersonal content than their non-abused peers. However, on other tests in the "high" rated category, namely mother-referent incidental recall task (Valentino et al., 2008b) neglected children did no worse than non-maltreated children in their free recall of words.

Nolin and Ethier (2007) also considered the impact of multiplicity of maltreatment types, by comparing children who had experienced solely neglect with children who had experienced neglect plus physical abuse. Overall, taking together

performance on all cognitive tests, the neglected group with abuse performed more poorly than the neglect alone group, and controls. However, the two neglect groups did not significantly differ on the memory domain. This illustrates that although maltreated children may evidence impairments in broad domains such as "cognition", there is likely to be varying profile of strengths and needs within this.

Two studies looked specifically at children who had experienced sexual maltreatment. Barrera, Calderon & Bell (2013) compared sexually abused children with and without post-traumatic stress disorder on the CVLT and ROCFT. This study found no differences between sexually abused children and controls on the measures. Similarly, Marques et al. (2020) found that children who had been sexually abused did not differ from controls on tasks that scored low on interpersonal measures, namely the WISC digit span, and the ROCFT. However, sexually abused children did differ on the Selective Reminding Test, a measure which involves verbal encoding and recall between researcher and child. Those who were sexually abused did perform worse on the Trail making task B, and although this was a 'low' interpersonal rating task, it did assess working memory and switching, cognitive functions that may be particularly vulnerable to the impacts of early maltreatment (Cabrera, Torres & Harcourt, 2020).

Age of Sample

Pears and Fisher (2005) and Demeusy et al. (2018) looked at exclusively child samples, with a focus on children who had experienced neglect. Pears and Fisher (2005) reported that for children between 3 and 6 years of age who were in foster care, being removed due to neglect/emotional maltreatment was significantly associated with worse performance on a memory test, whereas other forms of maltreatment (namely sexual abuse and physical abuse) did not evidence this

correlation. However, 69% of this sample experienced neglect or emotional abuse, so perhaps the authors were more likely to find an effect in this group than they were in the smaller groups of physically and sexually abused youth. Demeusy et al. (2018) reported that neglected infants evidenced poorer performance on a spatial working memory task, a finding which suggests that this domain of basic memory displays impairment early in development.

Jimeno, Latorre and Canterro (2020), Kirke-Smith, Henry and Messer (2014), Meesters et al. (2000), Perna and Kiefner (2013) and Vasilevski and Tucker (2016) looked at exclusively adolescent samples.

Jimeno, Latorre and Canterro (2020), Kirke-Smith, Henry and Messer (2014), and Perna and Kiefner (2013) all reported that maltreated children evidenced worse performance on their various working memory tasks than non-maltreated children. However, Vasilevski and Tucker (2016) found no differences between groups on the WISC in their study, although they did report differences on the Swanson Sentence Span Task, another measure of working memory. These authors also reported differences on the Rey Auditory Verbal Learning task, which is a measure of semantic memory. Meesters et al. (2000) reported no differences between adolescent groups on a semantic task. Although mixed, these findings suggest that adolescent samples continue to evidence deficits in working memory, and perhaps are beginning to evidence deficits in other domains such as semantic memory too. It is important to hold in mind that Meesters et al. (2000) had the smallest sample in the review and scored the lowest on study quality, thus their findings may hold less validity than others in this area of comparison.

There were intergenerational effects in many studies, such that caregiver education was seen to mediate the relationship between childhood trauma and

performance on memory tests. Lynch and Cicchetti (1998) found that maltreated children were more likely to come from families with fewer years of maternal education than the non-maltreated group. Pears and Fisher (2005) similarly reported significant differences in the highest level of education attained by caregivers in their study. De Bellis, Woolley and Hooper (2013) tested caregiver IQ using subtests of the WAIS in order to control for environmental factors in their study, and found that caregiver IQ was lower in the maltreated groups than controls. Bucker et al. (2012) outlined that parental low education level was a risk factor associated with childhood maltreatment. Moreover, they found that both parents of maltreated children and maltreated children themselves had fewer years in education than the comparison children and their caregivers. Collectively, such findings highlight the intergenerational patterns of low education and increased risk of childhood maltreatment.

Discussion

This review initially intended to compare maltreated and non-maltreated children's performance on a social learning task, to further understand the role of social learning difficulties in maltreated children's poor academic outcomes. However, an initial scoping search of the literature identified just one study comparing maltreated and non-maltreated children on such a paradigm (Hanson, 2017). This was an informative finding in and of itself, in that it revealed a key gap in this area of research.

Hanson's (2017) findings support the notion that social learning difficulties contribute to poor academic outcomes in maltreated children. To further explore this relationship, this review focused on memory paradigms as a proxy for social learning tasks. Two research questions were generated:

1) Do maltreated children perform more poorly than non-maltreated children on basic memory tasks?
2) If so, are the differences more pronounced when the task paradigm involves a high amount of interpersonal information?

Basic Memory

This review echoes previous research evidencing mixed findings across studies concerning maltreated children's performance on tasks of basic memory (Goodman, Quas, & Ogle, 2009; Howe, Toth & Cicchetti, 2006). Collectively, the findings here suggest subtle differences in basic memory functioning, with factors such as memory domain tested, characteristics of paradigm employed, type of maltreatment and age of child interacting to evidence different profiles of memory functioning. Research in this area has typically focused on broad areas of functioning, namely "cognition" and "maltreatment", with little attention to these micro-level factors and their interaction. The use of such broad terminology, without consideration of interactions within these domains seems to in part be a reason for consistently mixed findings.

For example, tasks involving working memory more consistently highlight differences in functioning between maltreated and non-maltreated children (Masson, Bussieres, East-Richard, R-Mercier & Cellard, 2015), whereas those involving other domains, such as visuo-spatial and longer-term memory, showed a less robust trend of difference. Thus it may not be that children's overall basic memory is impeded by the experience of maltreatment. Rather, a sub-domain within this, namely working memory, is impeded.

Developmental Change

Working memory deficits were reported in infants (Demeusy et al., 2018) and adolescents (Jimeno, Latorre & Cantero, 2020) in this review. Irigaray et al. (2013) looked at the cognitive profile of child, adolescent and adult samples in their systematic review and noted evidence of cognitive differences between maltreated and non-maltreated samples from childhood into adulthood. However, the profiles of difference varied across the lifespan, such that differences between maltreated and non-maltreated groups in childhood centred on attention and executive function, whereas adults demonstrated these differences in addition to impairments in verbal episodic memory and abstract reasoning domains. Indeed, comparing findings from child only (DeMeusey et al., 2018) and adolescent only samples (Kirke-Smith, Henry & Messer, 2014; Vasilevski & Tucker, 2016) in this review suggests that working memory and attention is affected early and consistently throughout development, with domains such as longer-term memory and semantic memory later being impeded. This makes sense and supports the theory of latent vulnerability; chronic stress responses likely lead to neurophysiological adaptations to areas of the brain such as the prefrontal cortex, resulting initially in impairments in fundamental cognitive domains such as attention in childhood. These neurobiological responses would likely contribute to pronounced difficulties in more complex and secondary areas of cognition over maturation, such as long-term planning, cognitive flexibility, and memory (Lund et al., 2020; Su, D'Arcy, Yuan & Meng, 2019).

Although observable differences in basic memory functioning are less pronounced in childhood, there is evidence that these subtle differences have the potential to develop into significant deficits in multiple areas with age. Future

research should be informed by the subtleties identified in this review when considering memory domain measured, type of paradigm used and type of maltreatment assessed. We need to understand and identify subtleties in functioning, across groups, to provide tailored and effective preventative interventions. Resources are best spent understanding the nuances underpinning broader patterns, rather than conceiving interventions that are too broad in their scope to effectively help the profile of need in the target population.

Profile of Maltreatment Experience

In this review, there was evidence to suggest that neglected children are most susceptible to exhibiting deficits in basic memory. Stein, Hanna, Vaerum and Koverola (1999) state that different constellations of abuse experience produce different neurocognitive sequelae. It is plausible that the type of abuse, relation to perpetrator, developmental stage at time of abuse, chronicity of abuse, gender and gender relation to perpetrator, lone or sibling abuse would impact not only the schemas the maltreated child begins to make in terms of socio-emotional functioning and identity development, but also the neuropsychological responses to their unique individual experience. For example, sexual abuse may plausibly impact visuo-spatial memory and proprioception (my body is not controlled by me, others control it), whilst neglect may impact interpersonal recognition, tasks involving language and verbal communication as a result of lack of consistent interpersonal stimulus (Gerin, Hanson, Viding & McCrory, 2019; Teicher & Samson, 2013).

The Role of Ostensive Cues and Epistemic Trust in Learning and Memory

There was some challenge in comprehensively addressing the second research question of this review, given the variability of memory domains assessed and tests used, which impede the ability to make direct comparisons regarding the impact of level of interpersonal information on memory performance. However, the findings do go some way in supporting the hypothesis that difference between groups are more pronounced on tasks with higher levels of interpersonal information. In the "low" interpersonal group, only those tests that involved working memory showed a difference between maltreated and non-maltreated groups. The three studies which did not involve working memory consistently evidenced that maltreated individuals performed no differently from their non-maltreated peers (Barrera, Calderon & Bell, 2013; Beers & De Bellis, 2002; Marques et al., 2020).

Contrastingly, in the "high" interpersonal group, there were observable differences between neglected children and their non-maltreated peers on the NEPSY, a test of face and name recognition. Such findings make sense– neglected children who have likely had limited cognitive and social stimulation would plausibly find it more difficult to recognise social information such as faces and names (Doretto & Scivoletto, 2018; Pollak, Cicchetti, Hornung & Reed, 2000).

Additionally, in Lynch and Cicchetti's study (1998), there was a significant main and interactive difference in maltreated and non-maltreated children's recall of mother-referent encoded words, but not structurally encoded words. Such findings evidence the role epistemic vigilance has in the process of attending to and recalling information. Information encoded within an attachment reference framework is less likely to be remembered than similar information encoded within a structural reference framework. It is plausible to suggest that the former induces a state of

epistemic hypervigilance in maltreated children, impairing cognitive functioning, whereas the non-maltreated children remain in a state of epistemic trust (Fonagy, Luyten & Allison, 2015).

The interactive effect reported in this study was in combination with experience of community victimisation, a finding which highlights the importance of assessing and considering additional covariates such as these in analyses. Epistemic trust, although fundamentally stemming from infant-caregiver relationships, is clearly vulnerable to the influence of broader social contexts that are characterised by ongoing threat (Friesthler, Merrit & LaScala, 2006; Fonagy et al., 2021; Lynch & Cicchetti, 1998). It is plausible that even if a child matured within a caregiving relationship characterised by epistemic trust, the experience of community threat and violence would communicate that a caregiver cannot be trusted to keep the infant safe from threat outside the family home. Higher rates of psychopathology in minoritised groups may, in part, reflect adaptive epistemic vigilance in response to societal threat (Barnett et al., 2019; Coulter et al., 2019; Maura & de Mamani, 2017; Ploderl & Tremblay, 2015).

Limitations

Although this review provides numerous insights into the study of childhood maltreatment, epistemic trust and basic memory functioning, there are limitations that should be considered.

This review included studies in which child maltreatment had been substantiated by child welfare records. Although this has the benefit of accuracy that self-report and retrospective studies have been critiqued to lack, a limitation is that the findings only reflect processes in potentially the most severe cases of child maltreatment, or at least only those that have been in contact with social services.

Similarly, all studies required parental consent for child welfare records to be accessed, or for a child to take part in the study. This inevitably represents a bias in which parents who are willing to work with child welfare professionals opt in for their children to be observed.

Using the degree of interpersonal information within memory tests as a proxy for social learning is another additional limitation of this review. This was an approach which came about due to the scant literature involving experimental social learning tasks. At the outset of review, it was anticipated that description of memory paradigms would give some indication of the level of ostensive cues employed, allowing tasks to be directly compared on this content. However, the information about materials and procedure was not detailed enough across the studies for this comparison to be robustly made. Indeed, the lead author could have contacted the authors of the included papers to ascertain the degree of ostensive cues included in each paradigm. However, it seemed unlikely that authors would remember details such as the manner of ostensive cues they employed in a specific study numerous years ago, particularly given the fact that this was not attended to in the original write up of the study. Thus, a somewhat crude method of categorising studies by interpersonal content was employed. This inevitably does not attune to the subtleties of interaction involved in each paradigm. Moreover, the memory paradigms were often part of a wider neurocognitive battery in studies. Thus, it may be that other paradigms in the battery had a high interpersonal content, whilst others had a low interpersonal content. This may have had differing impacts on epistemic hypervigilance in participants across studies.

Another critique is the ecological validity of the memory measures used, which are limited in their ability to reflect the nature of memory in real life settings. Typically, children are required to remember more complex and nuanced information than a list of unrelated words or digits during their education. They are required to draw concepts together and remember information that is not explicitly compartmentalised into a specific task. Correct recall of declarative information has been criticised as not attuning to the social context in which learning and the development of epistemic trust happens in real life (Schroder-Pfeifer, Talia, Volkert & Taubner, 2018). Thus, findings from the tasks in this review may have limited extrapolation to real life settings.

Another consideration is the ecological validity of these studies and how readily the findings from lab settings translate to the experience of learning in the classroom. It may be that that attachment system and epistemic hypervigilance are more easily triggered in an experimental setting with an unknown adult, or conversely, a lab setting may not trigger the attachment system to the same degree that a consistent daily relationship with an adult such as a teacher would. A group of studies took place within a summer camp setting (Cicchetti et al., 2010, Lynch & Cicchetti, 1998; Valentino et al., 2008a; Valentino et al., 2008b), and future research may wish to attempt to replicate administering learning and memory tests in such contexts to more realistically trigger the epistemic trust or vigilance children may experience in the classroom setting, or, conduct research in the classroom setting.

Future Research and Implications of Findings

Future research should in the first instance compare maltreated and non-maltreated children on tests of social learning. Secondly, in regard to the area of memory research, researchers should consider assessing memory domains with

multiple paradigms which vary in their content; for example tests of working memory that involve numbers vs faces, tests of semantic memory that involve nouns vs emotions. This will allow researchers to start coming to a more coherent understanding of the mixed profile of results consistently reported in the field.

Extending the sample age limit would assist researchers in making connections between childhood profiles of memory performance and adult profiles of memory performance. Current consensus is that the 18-year cut-off is too conservative to represent the end of adolescence and that brain maturation, particularly in areas such as the frontal lobe, are seen to continue beyond 18 years (Blakemore & Choudhury, 2006; Blakemore & Mills, 2014; Sawyer, Azzopardi, Wickremarathne & Patton, 2018). Thus, future studies may wish to consider 25 years as the upper age limit in their samples.

Researchers need to consistently assess, consider and control for covariates. Indeed, Young-Southward et al (2020) highlight in their systematic review that parent cognition was one of the multiple variables related to a child's performance on cognitive tests. They emphasise the need for studies to control for variables such as age, gender, parental education level, parental mental health, parental substance use.

During the initial scoping search and literature search, it was noted that very few qualitative studies in this area of childhood maltreatment and educational outcomes exist. Given maltreated children's voices are typically not heard, and continue to infrequently be heard along the potential trajectory toward mental health and/or forensic settings, this represents a fruitful area for future research. Findings in this area continue to be mixed, and complementing quantitative research with accounts from children, young people and teachers in numerous educational settings

(mainstream schools, Pupil Referral Units (PRUs), forensic and inpatient academic settings) may help recognise patterns of learning within and across children who have been maltreated (Hart, 2013). PRUs, which are more well-resourced to support their students, have more favourable outcomes/better CQC ratings than mainstream schools (Ofsted, 2007b; Sellgren, 2004). Improved educational outcomes for maltreated children are clearly possible, in the context of a real understanding of needs, and interventions tailored to specific needs.

Implications of Findings

The findings of this review have implications for educational, therapeutic and research settings.

Working memory, as opposed to basic memory functioning as a whole, was found to be an area more consistently negatively impacted as a result of maltreatment. In settings such as the classroom and the therapy room, maltreated children may need more scaffolding and time to take on information than their non-maltreated peers. It may not be that maltreated children cannot remember information, rather, they need a different set of support tools to learn information. This, teamed with a teacher's optimism that they can achieve and remember under the correct circumstances will likely have beneficial effects on maltreated children's educational outcomes. The fact that PRUs, settings which typically have a high proportion of maltreated pupils than mainstream schools, have better outcomes for maltreated children demonstrates the importance of whole school and individual professional's approach. Research and dissemination of findings regarding approaches that work in PRU's could help inform mainstream schools' approach (Hart, 2013).

In the therapy room, it may be important to support maltreated children by providing them with prompts and visual reminders of sessions and provide time and space for conversations in light of the fact that their long term memory seems to be better than working memory and immediate recall. With regards to supporting maltreated children to move from a place of epistemic vigilance to epistemic trust, therapists and teachers have a valuable opportunity to model a healthy and trustworthy attachment relationship. This takes the form of attuning to the young person in the therapy room, alongside evidencing consistency, transparency and holding the child's mind in mind outside of the therapy room and with professionals too.

Intergenerational effects were identified in numerous studies. This highlights the needs for interventions which not only focus on child development, but also support guardians of maltreated children to see the value in education and support their children in academic success (Mason, Taggart & Broadhurst, 2020).

Conclusion

There remains a mixed profile of findings regarding basic memory functioning in maltreated children. A reason for this may be that terminology such as 'cognition', 'memory' and 'maltreatment' are too broad to identify more nuanced but potentially more consistent patterns. An important next step is to further investigate the subtleties by bringing clarity and objectivity to terminologies and going beyond meta-descriptions of general functioning and deficits. Such research will inform more efficacious interventions for maltreated children both within the classroom and the therapy room.

Findings from this study suggest that differences between maltreated and non-maltreated children's basic memory may be more pronounced when there is a

higher interpersonal nature to the memory task. There is a pressing need for studies that compare maltreated and non-maltreated children's performance on social learning tasks to further explore this. Triangulating quantitative findings with qualitative findings from maltreated children will provide rich data that will further support the unpicking of mixed findings in the area.

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Part Two: Empirical paper

Using the Maltreatment and Abuse Chronology of Exposure Scale (MACE) to aid Understanding of the Relationship Between Childhood Maltreatment, Social Learning and Psychopathology

Abstract

Background

Childhood maltreatment has been identified as a preventable risk factor for a range of psychopathological and functional outcomes. The mechanism through which developmental psychopathology trajectories ensue remains less clearly understood. This paper aims to increase understanding of these mechanisms, by considering temporal characteristics of childhood maltreatment subtypes and their link with adult psychopathology, as mediated through impaired social learning.

Methods

English speaking participants were recruited to take part in an online paradigm in which they completed the Brief Symptom Inventory (BSI), Personality Assessment Inventory – Borderline Scale (PAI) and the Maltreatment and Abuse Chronology of Exposure scale before undertaking an incidental word recall task of person attribute words. Participants were allocated to one of four ostensive cue groups.

Results

Chronicity of maltreatment, as opposed to multiplicity of maltreatment, correlated most strongly with the BSI and the PAI. Peer emotional bullying and parental verbal abuse were most strongly correlated with the BSI and the PAI. Peer emotional bullying showed highly significant type x timing interactions when experienced at adolescence. Chronicity of maltreatment predicted PAI scores, but this effect was not mediated by social learning.

Conclusions

These findings highlight the importance of considering maltreatment characteristics beyond multiplicity, as well as peer maltreatment in future research.

Introduction

Childhood Maltreatment and Health Outcomes

Since Felitti et al. (1998) seminal study on adverse childhood experiences (ACES), it is widely accepted within and beyond the medical profession that adversity in childhood increases the likelihood for undesirable physical and mental health outcomes across the lifespan. Numerous studies have highlighted the link between childhood maltreatment and increased risk for a range of physical health complications (Afifi et al., 2016; Carr, Duff & Craddock, 2020; Riedl et. al., 2020; Williamson, Thompson, Anda, Dietz & Felliti, 2002) and early death (Brown et al., 2009; Kelly-Irving et al., 2013).

As well as an increased risk of physical health problems, maltreatment in childhood has been repeatedly identified as a risk factor in the development of a range of psychiatric disorders in adolescent (Negriff, 2020; Pandey et al., 2020; Tanaka, Schmuck & Paglia-Boak, 2011) and adult samples (Dovran et al., 2016; Edwards, Holden, Felitti & Anda, 2003; Felitti et al., 1998; Humphreys et al., 2020). Within diagnostic categories (i.e. depression), individuals with experiences of childhood maltreatment have been found to have an earlier age of onset, greater symptom severity, higher co-morbidity, increased risk for suicide and poorer response to treatment than those with no history of maltreatment, leading many (Chandan et al., 2019; Teicher & Samson, 2016) to suggest that maltreated individuals represent a clinically and neurobiologically distinct group.

Neurophysiological Consequences of Childhood Maltreatment

Contemporary developmental psychopathology theories (McCrory, Gerin & Viding, 2017; McCrory & Viding, 2015) view exposure to childhood maltreatment as a form of chronic toxic stress, which has harmful effects on a child's developing

neurobiology and physiology (Cabrera, Torres & Harcourt, 2020; Cecil, Zhang & Nolte, 2020; Gerhardt; 2004; Van der Kolk, 2015). Such stress may be particularly detrimental during infancy due to the malleable and plastic nature of the human brain at this time (Andersen & Teicher, 2008; Bock, Rether, Groger, Xie & Braun, 2014; Humphreys et al., 2019).

When faced with threat, the hypothalamic-pituitary-adrenal (HPA) axis releases cortisol to provide an individual with the additional energy to make adaptive cognitive, emotional and behavioural responses. Whilst cortisol is important for normal developmental processes such as growth (Epel, McEwen & Ickovics, 1998), when it is released at chronically high levels, for example in response to ongoing maltreatment or neglect, undesirable impacts on the structural and connective development of the brain ensue (Cabrera, Torres & Harcourt, 2020). The hippocampus, a brain area involved in learning and consolidating emotional memories; the amygdala, the brain's emotional centre; and the prefrontal cortex, an area involved in social cognition and motivational-affective processing, all have a high concentration of glucocorticoid receptors and are particularly sensitive to chronic cortisol dysregulation (Cabrera, Torres & Harcourt, 2020; Gunnar & Vazquez, 2001; Miller, Chen & Zhou, 2007). Indeed, decreased hippocampus volume (McLaughlin et al., 2016; Mielke et al., 2018), abnormal amygdala volumes (Jedd et al., 2015; Teicher & Khan, 2019) and reduced prefrontal cortex volumes (Crews, He & Hodge, 2007) have been repeatedly reported in samples who have experienced childhood maltreatment. There is evidence to suggest that certain brain abnormalities observed in adults with psychiatric diagnoses can be attributed to the experience of childhood maltreatment as opposed to psychopathology in and of itself (Chaney et al., 2014; Opel et al., 2016; Teicher & Samson, 2013).

The Brain as Adaptive

Latent vulnerability theory (Gerin, Hanson, Viding & McCrory, 2019; McCrory, Gerin & Viding, 2017; McCrory & Viding, 2015) posits that the developing brain grows in a way that is adaptive to the stressful environment during childhood but may be potentially problematic and contribute to mental disorder at later developmental stages.

For example, in a threatening home environment, elevated levels of cortisol may lead a child to be more alert and aware to escape potential danger. However, this prolonged pattern of cortisol dysregulation can, over time, influence brain structure development (Cabrera, Torres & Harcourt, 2020; Teicher, Samson, Anderson & Ohashi, 2010), which may result in a child beginning to evidence observable maladaptive functioning in areas of cognition (i.e. negative attribution bias, heightened threat system) and emotion (i.e. emotion regulation difficulties); patterns which in turn lead to negative behavioural outcomes (i.e. aggression, substance misuse, antisocial/criminal behaviour) and childhood and adult onset of psychopathology (Pine et al, 2005; Robinson et al, 2021).

Psychological Consequences of Childhood Adversity

Cognitively, such neurobiological adaptions result in maltreated children overestimating threat and underestimating reward in novel, neutral environments (Zhu, Chen & Xia, 2020). Indeed, maltreated children have been found to hold more negative beliefs about others' responsiveness and their ability to responds in supportive and non-coercive ways (Pears & Fisher, 2005; Price & Glad, 2003). Physically maltreated children have been found to be more hypervigilant to threat, and to recognise unconsciously processed signals of threat (McCory et al., 2013), and subtle facial displays of anger (Pollak, Cicchetti, Hornung & Reed 2000; Pollak,

Messner, Kistler & Cohn, 2009) more rapidly than non-maltreated children. Hanson (2017) reported that maltreated adolescents were less likely to use cues in the environment to estimate the probability of rewards, whilst others have reported blunted affect in maltreated adolescents in response to reward cues (Dillon et al., 2009).

Consistently overestimating threat and underestimating reward predisposes a child to have difficulties in building social relationships, and fundamentally trust, with others.

Impaired Social Learning as the Link Between Childhood Adversity and Later Psychopathology

Impaired social learning may be a consequence of childhood maltreatment, and a precipitant of mental disorder. Contemporary dimensional conceptualisations of mental illness propose that a common mechanism, namely 'the p-factor', underpins the risk for a broad span of metal health and other functional difficulties (Brown & Barlow, 2005; Caspi, 2014; Cicchetti & Rogosch, 1996; Constantinou & Fonagy, 2019; Luyten, Campbell, Allison & Fonagy, 2020; Patalay et al., 2015). It has been suggested that this p-factor is a proxy for compromised social learning (Fonagy et al., 2021).

Epistemic trust theory refers to the process through which an individual comes to consider new information from the social world as personally relevant and trustworthy (Csibra & Gergely, 2009). This evolutionary system allows a highly efficient transmission of culturally relevant knowledge between humans. Typically, a teacher of the species will employ a range of subtle yet marked signals, or 'ostensive cues' such as eye contact, person directed speech, turn-taking and emotional mirroring, that signal to the learner that they are recognised as an individual

(Gergely, Egyed & Kiraly, 2007). For example, when a mother smiles back to her child, within this is an implicit recognition of child as individual (Egyed, Kiraly & Gergely, 2013). This process of person-specific recognition facilitates the learner to move towards an attentional state in which they are open to receiving subsequent information as personally relevant and trustworthy. If consistently repeated, such an interaction will engender the development of epistemic trust and additionally salutogenesis, that is, the ability to benefit from positive influences in one's environment (Fonagy, Luyten & Allison, 2015).

Humans operate on a continuum between epistemic trust and epistemic vigilance, the position of which they locate themselves in being dependent and relational to the environment around them and their interactions with others (Fonagy & Allison, 2014). Establishing a baseline location on this continuum is established in infancy and epistemic vigilance, that is, a scepticism in relation to novel information, must be overcome before the development of epistemic trust can ensue. A caregiver who is attuned to their infant, accurately and consistently mentalising the infant's dynamic and subjective experiences, revels in the infant's joy and responds appropriately as a 'container' to distress will, over time, promote the transition from 'I' mode to 'We' mode (Fonagy et al., 2021; Higgins, 2020). This is facilitated by the process of accurately joining minds, bringing about the experience of joint attention and mentalising the infant's individual yet related perspective of the world (Tomasello, 2018; Tomasello, 2020). The experience of 'We-ness' in this sense provides the foundation for epistemic trust within the caregiving relationship, the establishment of which may then be extrapolated to other relationships and environments over time (Gallotti & Frith, 2013).

However if caregiving is inconsistent, passive or threatening, an infant will not be supported to overcome this evolutionary adaptive stance of epistemic vigilance and will learn that others do not "see" them and their needs. They will learn to treat information parted by others with scepticism, learning it is more adaptive to remain in 'I' mode, than risk the dangers of shifting to 'We' mode with an unreliable and potentially threatening other(s) (Fonagy, Luyten & Allison, 2015). Moreover, they will experience confusion about the minds of themselves, and others. The ways in which varying experiences of childhood maltreatment impact this process is still not well understood

Understanding the Ways in Which Childhood Maltreatment Impairs Social Learning

Subtypes of Maltreatment

Diverse experiences of adversity have typically been amalgamated into a homogenous group of 'maltreated individuals' in the literature (McLaughlin, Sheridan & Lambert, 2014; Sheridan & McLaughlin, 2014). Yet neuro-imaging findings demonstrate neural thinning in different parts of the brain in those exposed to verbal, visual (i.e. witnessing domestic abuse) or sexual abuse (Teicher & Samson, 2016). It is plausible that different forms of childhood maltreatment may be linked to different socio-emotional impairments via the impact on particular brain functional domains and the underpinning neural circuits.

There are many challenges in defining, measuring, and objectifying maltreatment experiences (Barnett, Manly & Cicchetti, 1991; Cicchetti & Manly, 2001). Distinguishing broadly between 'threat' forms of maltreatment, that is acts which pose a threat to one's physical or psychological integrity, and 'deprivation'

forms of maltreatment, that is the absence of expected environmental inputs such as physical and emotional nurture and cognitive stimulation, has been one area of growing interest (Lambert, King, Monahan & McLaughling, 2017; Sheridan & McLaughlin, 2014). A benefit of such conceptualisation is an acknowledgement of the high co-morbidity of maltreatment subtypes, alongside the recognition of different adverse experiences within broad terminology such as 'maltreated children'.

Research suggests threat vs deprivation experiences have differing impacts on brain structure (Everaerd et al., 2016; Herzog et. al., 2020; McLaughlin, Weissman & Bitran, 2019; Teicher et al., 2018), as well as cognitive and socio-emotional functioning (Lambert et al., 2017; McLaughlin, Weissman & Bitran, 2019). One could hypothesise that subsequent psychopathology trajectories may differ based on threat or deprivation experiences.

Temporal Factors of Maltreatment

Whilst research on cumulative maltreatment has been insightful (Merrick et al., 2017; Schillin, Aseltine & Gore, 2008), the need for a more nuanced understanding of time of onset and chronicity of maltreatment has been consistently articulated in the literature (Cowell, Cicchetti, Rogosh & Toth, 2015; Goodman, Quas & Ogle, 2010, Mathews, Pacella, Dunne, Simunovic & Marston, 2020).

The importance of temporal information relates to 'sensitive periods' of brain development; times in which the inhibitory and excitatory processes in the brain are in balance, resulting in particular sensitivity to the surrounding environment (Hartley & Lee, 2015). Detrimental impacts of maltreatment may have a bigger impact on the

developing brain during these times (Teicher, Samson, Anderson & Ohashi, 2016) and increase the risk of subsequent psychopathology (Kaplow & Widom, 2007; Schoedl et al., 2010). Sensitive periods have predominantly been identified as happening in infancy (Bock et al., 2014; Khoury, Pechtel, Andersen, Teicher & Lyons-Ruth, 2019) and adolescence (Fuhrmann, Knoll & Blakemore, 2015; Gerke et al., 2018; Herzog et al., 2020; Pechtel, Lyons-Ruth, Anderson & Teicher, 2014).

The brain may be particularly sensitive to different forms of maltreatment in relation to the developmental task of that time. For example, during infancy, when infants are wholly dependent on their caregiver for survival (Insel & Young, 2001; Strathearn, 2011), neglect may be most detrimental (Schalinski, Teicher & Rochstroh, 2019).

However, as we mature into adolescence, children become less dependent on their caregivers and social evaluation takes precedence (Sebastian, Viding, Williams & Blakemore, 2010). At this stage, verbal/emotional maltreatment from family and peers may be particularly stressful for the developing brain, therefore increasing risk for later psychopathology (Kaplow & Widom, 2007; Sebastian, Viding, Williams & Blakemore, 2010; Thornberry, Ireland & Smith, 2001).

Type by timing interactions are important areas to explore to aid understanding of developmental psychopathology trajectories (Fosse, Eidhammer, Selmer, Knutzen & Bjorly, 2021; Herzog et al., 2020; Schalinski et al., 2016; Teicher & Samson, 2016). Yet there is sparse research evidencing precise sensitive periods for social, emotional and cognitive development and the impact of maltreatment experiences on these areas (McLaughlin, Weissman & Bitran, 2019).

Maltreatment Beyond the Caregiving Relationship

Contemporary developmental psychopathology theories have started to consider how threat in the home links with threat outside the home (Fonagy et al., 2021; Freisthler, Merritt & LaScala, 2006; Karter & Kamens, 2019; Lang et al., 2020; Lynch & Cicchetti, 1998). There is clear evidence that bullying in childhood contributes to psychiatric symptomatology (Hawker & Boulton, 2000; Hill, Mellick, Temple & Sharp, 2017; Kim & Leventhal, 2008; Klomek et al., 2008; Klomek, Sourander & Gould, 2010; Schreier et al., 2009; Winsper, Hall, Strauss & Wolke, 2017). Longitudinal studies suggest that being a victim of bullying has a causal effect on the presence of psychopathology symptomatology in adulthood, particularly internalising disorders (Klomek, Sourander & Elonheimo, 2015).

Childhood development requires a child to transition from complete dependence on a caregiver, towards increased independence and autonomy. Part of this process involves spending time with new individuals and groups outside the caregiving environment, such as nursery and school. These new contexts require an individual to assess whether a stance of epistemic vigilance or epistemic trust is warranted. If these new environments show themselves to be characterised by ongoing threat, in the form of bullying for example, or more broadly through processes of systemic oppression and subjugation, it is plausible that an individual will recognise that it is not adaptive to be open to taking on information from others and learning in this environment (Luyten, Campbell, Allison & Fonagy, 2020).

Thus, epistemic trust, although fundamentally stemming from infant-caregiver relationships, is clearly vulnerable to the influence of broader social contexts that are characterised by ongoing threat (Fonagy et al., 2021).

Measuring Childhood Maltreatment

Studying adults who have experienced childhood maltreatment increases understanding about developmental psychopathology trajectories. Two routinely used retrospective self-report measures are the Childhood Trauma Questionnaire (CTQ) (Bernstein, 1994), and the Adverse Childhood Experience Questionnaire (ACE-Q) (Felitti et al.,1998). Such measures have focused on the relationship between multiplicity and outcome, but lack consideration of the temporal nature of maltreatment. Moreover, the role of peer maltreatment has not been considered in these measures, despite a clear literature indicating the impact of bullying on mental health and social functioning.

The Maltreatment and Abuse Chronology of Exposure (MACE) (Teicher & Parigger, 2015) is a 52 item self-report questionnaire for adults who have experienced childhood maltreatment. Its foundations are in the CTQ and the ACE, however it considers additional information that has been found to be explanatory in the link between childhood maltreatment and psychopathology, such as temporal information and the experience of peer maltreatment. Indeed, the MACE has been reported to account for 2.00- and 2.07-fold more of the variance in psychiatric symptoms on average than the CTQ and ACE measures respectively (Teicher & Parigger, 2015).

Use of the MACE

To date, research using the MACE has primarily involved translation and validation studies (Fosse et al., 2020; Kluwe-Schiavon, Viola & Grassi-Oliveira, 2016), and using the measure with clinical (Schalinksi et al., 2016; Schalinski et al., 2019) and forensic samples (Fosse et al., 2021). In clinical samples, there has been exploration of the link between the MACE and mental health outcomes such as depression and anxiety (Fosse et al., 2020; Gerke et al., 2018; Khan et al. 2015; Reidl et al., 2020; Teicher et al., 2017) PTSD (Herzog et al., 2020; Schalinski et al., 2016) and psychosis (Schalinksi et al., 2019). However, no studies were identified that considered the link between the MACE and measures of personality disorder.

Current Study

This study aims to address several gaps identified in the existent literature. Firstly, it aims to use the MACE in a non-clinical sample and explore associations with measures of personality disorder as well as measures of mental health symptomatology. Given the benefit of this measure in providing temporal information, type by timing interactions will be considered in the analysis. Threat vs deprivation forms of maltreatment and their links with psychopathology will be compared in childhood vs adolescent life stages.

The MACE is advantageous in comparison to measures such as the CTQ not only due onset and chronicity considerations, but also the consideration of peer maltreatment. Thus, associations between peer maltreatment and psychopathology measures will also be explored.

Epistemic trust theory suggests that social learning mediates the association between maltreatment experiences and later psychopathology. Thus, this study will also include a social learning task, administered under one of four ostensive cue conditions, to test this relationship. It is anticipated that the difference in word recall between maltreated and non-maltreated individuals will be bigger in ostensive cuing conditions than in no-ostensive cuing conditions. This is based on the theory that maltreated individuals are likely to have a higher baseline of epistemic hypervigilance than non-maltreated individuals, and are consequently unable to make use of ostensive cues and move to a position of readiness for to be parted information. Contrastingly, non-maltreated individuals are more likely to make use of ostensive cues and thus be cognitively receptive to incoming information, resulting in better memory for to be remembered information.

With these aims in mind, the following hypotheses shall be tested:

1) Global measures of the MACE will be positively correlated with global measures of the BSI and the PAI
2) Subtypes of maltreatment will correlate differently with global measures of psychopathology
3) Threat and deprivation forms of maltreatment will correlate more closely within than between categories
4) Neglect experienced in childhood will be more detrimental to mental health than neglect experienced in adolescence
5) Parental and peer verbal and emotional abuse experienced in adolescence will be more detrimental to mental health than when experienced in childhood
6) Social learning will mediate the relationship between the associations identified when testing hypothesis 1

Method

Ethical Approval

This study has been approved by the UCL Research Ethics Committee (Project ID Number: 19367/001).

Design

A cross-sectional, between subject design was used. All participants completed a range of psychometric questionnaires before undertaking a social learning task. All elements of the study were conducted online. This study was a joint thesis project with MacGregor (2021). Details of shared and individual contributions to the research process can be found in the appendix.

Procedure

Participants contacted researchers in response to adverts to express interest in the study. They were then allocated to one of four social learning conditions and were sent information sheets (Appendix D) and consent forms (Appendix E) specific to their allocated condition. Pre-determined e-mail correspondence was employed for each participant depending on which condition they were in, to standardise the experimental paradigm across conditions and experimenters. Half the participants briefly met with a researcher on Microsoft Teams prior to completing the study survey, the remaining half received the survey link via e-mail only.

Once participants opened the survey link, they were asked to complete demographic information, before completing a battery of psychometric questionnaires. After completing these psychometric questionnaires, participants were presented with a word sorting task. Participants had to use their keyboard to categorise words as positive or negative, as quickly and accurately as possible. At the

end of this task, there was an incidental recall task, in which the participant was allocated two minutes to type as many words as possible that they could recall from the word list. At the end of the two minutes, participants were presented with a debrief form (Appendix F).

Participants

Two hundred and forty-nine English speaking adults aged 18-60 years were recruited via online methods to take part in the study. One hundred and twelve participants were recruited in response to an advert placed on the UCL Subject Pool, an online recruitment interface in which students can volunteer to take part in research studies, and in response to social media adverts placed on Facebook, Twitter and Reddit. In response to recruitment difficulties, and with the intention to increase sample heterogeneity beyond a purely student population, 137 participants were recruited via Prolific, an online platform designed to support researchers in recruiting participants for scientific studies. Participants were incentivised to take part in the study either by being entered into an Amazon prize drawer (and receiving a course credit for UCL students), or for those who took part via Prolific, receiving a payment in line with the standardised rate of website pay.

Measures

Demographic Questionnaire

Participants were asked which age group they were in, the gender they identified with, their ethnic background, current employment status and highest academic achievement.

Brief Symptom Inventory (BSI)

The BSI (Derogatis, 1993; Derogatis & Melisaratos, 1983) is a 53-item self-report inventory in which participants are asked how much they have been distressed by various psychiatric symptoms in the past seven days on a five-point Likert scale from 0 ("Not at all") to 4 ("Extremely"). The scale generates three global scores: Global Severity Index (GSI), Positive Symptom Distress Index (PSDI) and Positive Symptom Total (PST). Additionally, it provides scores for nine subscales: Somatisation, Obsessive-Compulsive, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobia, Paranoia and Psychoticism.

Cronbach alphas for subscales reported in the original administration of the BSI range from adequate to good, (Derogatis & Melisaratos, 1983) with reported values as follows: somatisation α = .80, obsessive compulsive α =.83, interpersonal sensitivity α = .74, depression α = .85, anxiety α = .81, hostility α = .78, phobia α = .77, paranoia α = .77 and psychoticism α = .71. Cronbach alphas for global scales range from high to excellent: GSI
α = .90, PSDI α = .87, PST α = .80 (Mohammadkhani, Dobson, Amiri, Ghafari, 2010). Cronbach alpha for BDI_GSI in this study was excellent, α = .93.

Test-retest reliability for the nine symptom dimensions ranges from .68 (Somatization) to .91 (Phobic Anxiety), and for the three Global Indices from .87 (Positive Symptom Distress Index) to .90 (GSI) (Durá et al., 2006; Long, Harring, Brekke, Test & Greenberg, 2007; Recklitis et al., 2006). With regards to validity, the BSI had a correlation of .92 to .99 with the Symptom Checklist 90 Revised, another well validated measure of a broad range of psychopathology symptomatology (Derogatis & Lazarus, 1994).

Personality Assessment Inventory – Borderline Features (PAI-BOR)

The PAI-BOR (Morey, 1991) is a 24 item self-report measure ascertaining ratings on four main clinical areas in Borderline Personality Disorder: emotional instability, problems with identity, difficulties with interpersonal relationships and self-harm. The latter scale taps into impulsivity more broadly and is not restricted to self-harm behaviours. Each scale comprises 6 questions and respondents are asked to rate each item on a four-point Likert scale from 0 ("False") to 3 ("Very True").

Internal consistency for the PAI-BOR has been reported to be good, with Cronbach Alpha at α=.84 (Trull, 1995). The measure has high test-retest reliability over a 3–4-week period (r=.86, Morey, 1991). Cronbach alpha for PAI_Total in this study was good, α = .81.

The Maltreatment and Abuse Chronology of Exposure (MACE)

The MACE (Teicher & Parigger, 2015) is a 52-item retrospective self-report scale for adults, used to gauge severity of exposure to ten types of childhood maltreatment (emotional neglect, non-verbal emotional abuse, parental physical maltreatment, parental verbal abuse, peer emotional abuse, peer physical bullying, physical neglect, sexual abuse, witnessing interparental violence and witnessing violence to siblings) and the chronicity of exposure to these events from 1-18 years. The MACE provides an overall chronicity score (chronicity of maltreatment 1-18y years) and multiplicity score (sum of maltreatment types). Questions specify the perpetrator of maltreatment experience as either adults inside the home, adults outside the family home, or peers.

Test re-test reliability scores over a six-month period have been reported at r=.88 for overall multiplicity scores and r=.91 for overall severity scores (Teicher & Parigger, 2015). The MACE is highly correlated with the Childhood Trauma

Questionnaire (r = .74) and the Adverse Childhood Experiences Scale (r= .70) (Teicher & Parigger, 2015).

In the current study, reliability ranged from acceptable to excellent: MACE multiplicity α=.97, MACE chronicity α= .97, MACE Emotional neglect α=.99, MACE physical neglect α=.99, MACE non-verbal emotional abuse α=.96, MACE parental verbal abuse α=.95, MACE parental physical maltreatment α=.91, MACE peer emotional bullying α=.89, MACE peer physical bullying α=.88, MACE sexual abuse α=.75

Experience of Close Relationships – Revised (ECR-R)

The ECR-R (Fraley, Waller & Brennan, 2000) is a 36-item self-report measure assessing romantic attachment in adults in terms of Avoidance and Anxiety. Respondents rate each item on a seven-point Likert scale ranging from 1 ("Strongly Disagree") to 7 ("Strongly Agree"). Avoidance and anxiety sub scales have displayed excellent internal reliability in previous studies, α=.93 and α=.95, respectively (Sibley, Fischer & Liu, 2005, Sibley & Liu, 2004).

Although the ECR-R was included in the experimental paradigm, this was analysed in a separate study by another researcher (MacGregor, 2021).

Reflective Functioning Questionnaire (RFQ)

The RFQ measures a person's capacity to understand themselves and others in terms of intentional mental states. Participants are asked to rate each item on a 7-point Likert scale ranging from 1 ("Do not Agree at all") to 7 ("Agree completely'"). The measure is based on two scales; certainty about mental states, and uncertainty about mental states, which have been reported Cronbach alphas of 0.67 and 0.63 in non-clinical samples, respectively. The test-retest reliability has been evidenced at

rs=0.84 for uncertainty about mental states and rs=0.75 for certainty about mental states, respectively (Fonagy et al., 2016).

Although the RFQ was included in the experimental paradigm, this measure was analysed in a separate study by another researcher (MacGregor, 2021).

Experimental Task: Word list

This study used the same word list derived by Fillingham (2018), who followed Horder, Cowen, Di Simplocop, Browning and Harmer's (2009) methodology by selecting 55 words (Appendix H) from a list of 555 personality-trait words, as rated by 100 respondents (Anderson, 1968). There were 28 positive words, and 27 negative words. Positive and negative words were matched for length and magnitude of valence rating.

An avatar of the researcher explained the task on the screen (Appendix I). Participants were asked to sort the words in to positive or negative categories, using the keyboard button 'A' for positive, and 'L' for negative, with the instruction that they should move as quickly and accurately as possible. Participants completed a trial of five words before being presented with the remaining 50 words.

Words were presented in the same order to all participants. Each word appeared on the left for 2 seconds. The word then disappeared from the screen and 'positive (A)' and 'negative (L)' appeared on screen as a prompt for participants to respond using their keyboards. Participants could respond before the presentation of the option screen simply by pressing the 'A' and 'L' buttons on their keyboard. Once participants had responded, the next word was presented.

Incidental Recall

At the end of the word list task, participants were presented with a screen saying "Okay, please type in the box below as many of the attribute words that you

classified as positive or negative earlier as you can. You have 2 minutes to type as many as you remember" (Appendix K). A free text box was provided for participants to type.

Experimental Conditions

There were four experimental conditions in this experiment: person ostensive cuing, computer ostensive cuing, combined person and computer ostensive cuing, and no ostensive cuing. Interaction within and outside this main task differed slightly depending on which condition the participant was in. Both researchers followed a set of pre-defined scripts to ensure standardisation (Appendix L).

Person Ostensive Cueing Condition

Those in the 'person ostensive cueing' condition were not addressed by name in their initial sign-up e-mail. They met with a researcher via Microsoft Teams prior to completing the Qualtrics survey. The researcher asked the participant what they would like to be called, where they were located, what they did, and took an interest in them as an individual. They used the participant's name throughout the dialogue as an ostensive cue and maintained an engaged facial expression throughout.

Computer Ostensive Cuing Condition

Those in the 'computer ostensive cueing' condition were addressed by name in their initial sign-up e-mail. They did not meet with a researcher on Microsoft Teams prior to completing the Qualtrics survey, but received computerised ostensive cues via an avatar of the experimenter during the Qualtrics survey (Appendix M). For example, the avatar asked the participant what they would like to be called, used their name in further interactions throughout the word sorting task and made comments such as "I'm rooting for you (name)!". The avatar also gave the

participant an option as to whether they would like a short or a long explanation of the task, therefore recognising them as an individual with preferences and needs.

Combined Ostensive Cueing Condition

Those in the 'combined ostensive cueing' condition received both person and computer ostensive cues. They were greeted by name during the initial e-mail liaison, met with a researcher on Microsoft Teams prior to completing the Qualtrics survey, and also received ostensive cues from the researcher avatar during the experimental paradigm.

No Ostensive Cueing Condition

Individuals in the 'no ostensive cueing' condition received no personalised cues; once returning their consent form they were sent the Qualtrics link to the survey and asked to complete it. Their computer programme did include a research avatar to standardise the Qualtrics paradigm across conditions, but the avatar did not ask for their name or preferences of task explanation and did not provide encouraging comments to the participant during the word task.

Data Analysis

Power Analysis

Power calculations were completed using the 'G*Power 3.1' programme (Faul, Erdfelder, Lang & Buchner, 2007). Alpha was set at 0.05. The effect size was set at 0.3 as guided by previous literature reporting correlations between the MACE and psychopathology measures (Teicher & Parigger, 2015). With power set at 0.8, the analysis generated a necessary sample size of 84.

For type by timing interactions, a power analysis based on ANOVAs comparing four groups of developmental stages were run. Alpha was set at 0.0125 to account for multiple comparisons. Guided by previous literature comparing

psychopathology outcomes at different stages of development, the effect size was set at 0.25 (Pechtel, Lyons-Ruth, Anderson & Teicher, 2014; Schalinksi et al., 2016). With power set at 0.8, the analysis generated a necessary sample size of 244.

Power calculations for the mediation analysis were informed by Fritz and MacKinnon (2007). With power set at 0.8, a sample size of 163 was needed to detect an effect size of 0.25 in both path A and path B when running a percentile bootstrapping mediation in 'Process 3.5'.

Imputation and Initial Scoping

Data were downloaded from Qualtrics to Excel and stored on UCL OneDrive. After data cleaning, data were exported to the Statistical Package for Social Sciences (SPSS) Version 27 for further analysis.

Raw data were reviewed to check that they were complete and had been accurately recorded (i.e. imputed scores were within the response range). Seventeen data points were missing on the BSI and six were missing on the PAI-BOR. Missing data points were addressed by calculating the mean score for the participant on that given scale and replacing the missing data with this figure.

In terms of the word recall data, four participants were removed from all analyses as inspection of the raw data revealed that they had consistently got the positive and negative letters on the keyboard the wrong way round. Regarding the MACE data, one participant was removed as scores from five of the maltreatment sub-domains, and the two global domains were missing. A total of 244 participants remained for data analysis.

Normality and Outliers

The BSI_GSI, PAI_Total and MACE multiplicity and MACE chronicity scores were checked for normality and outliers via observations of histograms and box and whisker plots. One clear outlier became apparent across all measures, and further inspection of the data showed that this participant had the same response for normal and reverse scored items on the RFQ, and answered nearly all BSI questions 'Extremely', response patterns indicative of poor effort. This outlier was removed, leaving 243 participants for final analysis.

Observation of histograms in addition to skew and kurtosis calculations, as indicated by z-scores outside -1.96 and +1.96, revealed that much of the data was non-normally distributed. Age and gender were both skewed and kurtotic, whilst highest education level and ethnicity were both kurtotic, but not skewed. Word recall was normally distributed.

On the psychometric measures, skew was identified on MACE multiplicity, MACE chronicity and BSI_GSI scores. The BSI_GSI and PAI_Total scores were kurtotic. Shapiro Wilks values were significant on all four psychometric measures ($p<0.05$). Non-parametric analyses were employed.

Covariates

Covariates were identified based on previous research as well as checking the dataset for associations between demographics and dependent variables. Socio-economic status (SES) has been repeatedly identified as a risk factor for childhood maltreatment, however this was not directly assessed in the demographic questions of this paradigm, so could not be controlled for. Therefore, associations between age, gender, ethnicity, and education level were explored.

Hypothesis Testing

To test the hypotheses that global measures of the MACE would be positively correlated with global measures of the BSI and the PAI, correlations were conducted. Another set of correlations were conducted to ascertain the relationship between subtypes of maltreatment and global psychopathology scores, and within this, the relationship between different forms of maltreatment was explored.

To test type by timing interactions of maltreatment, participants were categorised in to one of four developmental experience groups for each subtype of maltreatment. Maltreatment occurring between 1-9 years was classified as childhood maltreatment, and maltreatment occurring between 10-18 years was classified adolescent maltreatment (Sawyer, Azzopardi, Wickremarathne & Patton, 2018). Other groups were 'no experience of maltreatment subtype' or 'child and adolescent experience of maltreatment subtype'. Separate tests were run for different maltreatment subtypes, with the four groups being compared to see whether total psychopathology scores differed. Guidance for threshold scores for the presence or absence of abuse of each subtype of maltreatment was sought from Teicher and Parigger (2015).

Mediation Model

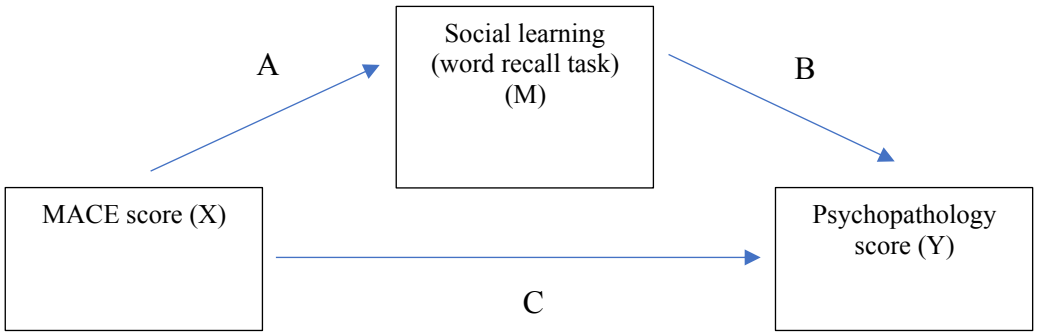
To test the hypothesis that social learning would mediate the relationship between associations identified during correlational analyses, the PROCESS SPSS (Model 4) tool (Hayes, 2017) was used to construct a regression model to ascertain the direct and indirect effect of childhood maltreatment and social learning on psychopathology scores. Ostensive cue condition was a covariate in the model.

A mediation model assesses the direct, indirect, and total effect of downstream variables, in this case severity of childhood maltreatment and capacity

for social learning, on an upstream variable, in this instance psychopathology symptomatology. A full mediation model would see the direct effect of X on Y (pathway C) disappear with the addition of M and a statistically significant AB path. Figure 1 demonstrates the conceptual paths used in the mediation model in this study.

Figure 1

Conceptual Path Diagram for the Effect of Severity of Childhood Maltreatment on Psychopathology Symptom Scores via Capacity for Social Learning



Results

Preliminary Results

Differences Between Recruitment Pools and Confounding Variables

Chi square tests were run to see whether UCL Subject Pool and Prolific samples differed in age category, ethnicity, gender or highest academic achievement. Independent samples Mann-Whitney tests were used to compare the two groups on BSI_GSI, PAI_Total, MACE multiplicity and MACE chronicity. As total word recall data was normally distributed, independent samples t-tests were used to compare samples on this measure.

Distributions were not significantly different from chance for age category x^2 (4, n=243) =8.69, p=.069. The groups did not significantly differ on PAI_Total (U=7390.5, p=0.872), MACE multiplicity (U=7880.5, p=.280) or MACE chronicity (U=7662, p=.510).

Distributions were significantly different from chance for gender x^2(1, n=243) =45.15, p<.001, with more females in the UCL subject pool sample than the Prolific sample. The two groups significantly differed on highest academic attainment x^2 (5, n=243) = 17.04, p=.004 and BSI_GSI (U=8548, p=0.022). The groups significantly differed on mean total word recall (t(243)=4.17; p<.001), with participants recruited from UCL subject pool recalling an average of 12.42 (SD=3.87) words, and those recruited from Prolific recalling an average of 10.36 (SD=3.81).

The prolific sample had a lower level of academic attainment. This makes sense as the UCL subject pool recruits University students, whereas prolific is open to a broader demographic of the public. The prolific sample also had higher BSI_GSI and recalled fewer words on average than the UCL subject pool group. One rational for recruiting via prolific was to increase sample heterogeneity. Thus, although there were differences between the two recruitment pools, the two samples were treated as a single sample in analyses.

Covariates in this Dataset

In this dataset, correlations revealed that age category negatively correlated with PAI_Total, and highest education level negatively correlated with BSI_GSI. Mann-Witney tests showed that males and females did not significantly differ on PAI_Total, BSI_GSI, or word recall. Kruskal Wallis tests showed that different ethnic groups did not differ on PAI_Total, BSI_GSI or word recall scores. Thus,

analyses were run with age and highest education level as covariates. Uncontrolled analyses can be found in the appendix.

Demographic Characteristics

The sample were predominantly female and 77.5% were below the age of 30. There was a roughly equal split between participants recruited from the UCL subject pool and those recruited from Prolific. The sample was predominantly white.

Table 1

Demographic Characteristics of the Sample

	Recruitment source					
	UCL subject pool/social media (N=109)		Prolific (N=134)		Total (N=243)	
	N	(%)	N	(%)	N	(%)
Gender						
Female	93	85.3	58	43.3	151	62.1
Male	16	14.7	76	56.7	92	37.9
Ethnicity						
White	61	56	114	85.1	175	72
Asian	10	9.1	5	3.7	15	6.2
Black	3	2.8	6	4.5	9	3.7
Chinese	27	24.8	0	0	27	11.1
Mixed	6	5.5	1	0.7	7	2.9
Other	2	1.8	8	6	10	4.1
Age category						
18 or younger	16	14.7	10	7.5	26	10.7
19-29 years	72	66.1	92	68.7	164	67.5
30-39 years	17	15.6	23	17.2	40	16.5
40-49 years	1	0.9	8	6	9	3.7
50-59 years	3	2.8	1	0.7	4	1.6
Highest academic attainment	0	0	3	2.2	3	1.2
Less than high school	20	18.3	47	35.1	67	27.6
High school or equivalent	16	14.7	25	18.7	41	16.9
College or equivalent	40	36.7	36	28.9	76	31.3
Undergraduate degree	24	22	20	14.9	44	18.1
Postgraduate degree	9	8.3	3	2.2	12	4.9
Doctorate						

Note: Percentages rounded to one decimal place

Hypothesis Testing

Hypothesis 1: Global measures of the MACE will be positively correlated with global measures of the BSI and the PAI

A series of partial correlations, controlling for age and education level, were conducted to explore whether there was an association between global measures of the MACE and global measures of psychopathology. 'MACE multiplicity' (comprising the number of different maltreatment types experienced) and 'MACE chronicity (comprising the number of years spanning age 1 to 18 that an individual experienced some form of maltreatment) were positively correlated with the BSI_GSI and PAI_Total. Table 2 shows the correlation matrix for this analysis. The strongest correlation was between chronicity of maltreatment and PAI scores. A correlation matrix for global scores of childhood maltreatment and psychopathology scores without controlling for age and education level can be found in the Appendix.

Table 2

Partial Correlations for Global Scores of Childhood Maltreatment and Psychopathology Scores Controlling for Age and Education Level

	Variable	1	2	3	4
1.	BSI_GSI	-			
2.	PAI_Total	.710*	-		
3.	MACE multiplicity	.305*	.301*	-	
4.	MACE chronicity	.308*	.348*	.930*	-

**p<0.01(two-tailed)*

Hypothesis 2: Subtypes of maltreatment will correlate differently with global measures of psychopathology

A series of partial correlations, controlling for age and education level, were conducted with subtypes of maltreatment and BSI_GSI and PAI_Total as variables (Table 3). Significance was set at p=0.001 to correct for multiple correlations. The BSI_GSI showed small and significant positive relationships with parental physical maltreatment, parental verbal abuse and peer emotional abuse. PAI_Total showed small and significant positive correlations with parental physical maltreatment, parental verbal abuse and parental non-verbal emotional abuse. Emotional neglect and peer emotional showed a small positive correlation with the PAI_Total.

Overall, parental verbal abuse and peer emotional abuse were most highly correlated with both measures, followed by parental non-verbal emotional abuse for PAI_Total and parental physical maltreatment for BSI_GSI. Sexual abuse was not significantly correlated with either psychopathology measure.

Table 3

Partial Correlations for Subtypes of Childhood Maltreatment and Psychopathology Scores Controlling for age and Highest Education Level

	Variable	1	2	3	4	5	6	7	8	9	10
1.	BSI_GSI	-									
2.	PAI_Total	708**	-								
3.	Parental physical maltreatment	.231**	.232**	-							
4.	Parental verbal abuse	.271**	.274**	.551**	-						
5.	Parental non-verbal emotional abuse	.207*	.248**	.297**	.462**	-					
6.	Emotional neglect	.068	.212**	.244**	.423**	.418**	-				
7.	Physical neglect	.168	.189*	.108	.278**	.271**	.520**	-			
8.	Peer physical bullying	.183*	.179*	.318**	.282**	.321**	.081	.128*	-		
9.	Peer emotional abuse	.296**	.291**	.272**	.398**	.359**	.166*	.065	.546**	-	
10.	Sexual abuse	.068	.063	.116	.167*	.147*	.155*	.166*	.067	.118	-

***p<0.001 (2-tailed)*
**p<0.05 (2-tailed)*

Hypothesis 3: Threat and deprivation forms of maltreatment will correlate more closely within than between categories

There was a high degree of inter-correlation between maltreatment experiences (Table 3). Parental acts of threat, namely physical maltreatment and verbal abuse, showed moderate and highly significant correlations ($r=.550$, $p<0.001$). Acts of deprivation, namely emotional neglect and physical neglect showed moderate and highly significant correlations ($r=.518$, $p<0.001$). Peer emotional abuse and physical bullying showed moderate and highly significant correlations ($r=.546$, $p<001$). Parental acts of threat (physical maltreatment, verbal abuse, non-verbal emotional abuse) correlated more highly with peer maltreatment factors than parental acts of neglect. A correlation matrix for subtypes of childhood maltreatment and psychopathology scores without age and education as covariates can be found in the Appendix.

Hypothesis 4: Neglect experienced in childhood will be more detrimental to mental health than neglect experienced in adolescence

Kruskal Wallis tests were conducted to ascertain type by timing effects of emotional and physical neglect in childhood and adolescence (neglect forms of maltreatment). Table 4 shows the mean rank scores of Kruskal-Wallis tests for each subtype of maltreatment. There was no significant difference in PAI|_Total scores between the four developmental groups for emotional neglect or physical neglect.

Table 4

Kruskal-Wallis Mean Ranks Scores Comparing Groups by Developmental Stage in Which Experience of Maltreatment Subtype Occurred on PAI_Total Scores

	Type of maltreatment			
	Physical neglect	Emotional neglect	Parental verbal abuse	Peer emotional bullying
	PAI_Total score mean rank (N)			
Developmental stage of victimisation				
None	117.33 (173)	111.64 (128)	113.78 (182)	110.67 (155)
Child only	123.19 (8)	146.86 (11)	212.75 (2)	100.67 (3)
Adolescent only	122.38 (13)	128.53 (29)	140.86 (33)	145.63 (61)
Both	138.19 (49)	133.50 (75)	148.60 (26)	137.7724)

Hypothesis 5: Parental and peer verbal and emotional abuse experienced in adolescence will be more detrimental to mental health than when experienced in childhood

Parental verbal abuse and peer emotional abuse were used as indicators of threat forms of abuse, as they were the most strongly correlated with the PAI_Total in analysis of subtype associations with psychopathology measures. There was a significant difference of timing of peer emotional abuse ($H(3)=12.417$, $p=0.006$). Pairwise comparisons revealed significant differences between the none and adolescent only groups ($U=3400$, $p=0.001$), which remained significant after Bonferonni adjustments for multiple comparisons.

Hypothesis 6: Social learning will mediate the relationship between the associations identified when testing hypothesis 1

Regression models were constructed based on the positive correlations identified between global measures of maltreatment and psychopathology in the initial analysis, with total word recall as the mediating variable, controlling for ostensive cue condition, age and education.

The total effect of MACE Chronicity on PAI_Total (Path C') was significant (Table 5). Bootstrapped 95% confidence intervals confirmed the significance of this effect. The mediating variable, social learning, did not have a significant effect on PAI_Total (Path B) and the independent variable, MACE Chronicity, did not have a significant effect on the mediating variable of social learning (Path A). For path B and path A models, bootstrapping confidence intervals included zero, confirming that there was no indirect effect of social learning and MACE Chronicity on PAI_Total. The findings suggest that in this instance, MACE Chronicity scores predicted scores

on PAI_Toal, but this effect was not mediated by social learning. The co-variates age and ostensive cue condition were not significant in any of the models.

Table 5

MACE Chronicity to PAI_Total: Direct, indirect and total effects

Direct effects					
Path	B	95% CI		*SE B*	*p*
		LL	*UL*		
MACE Chronicity to Total word recall (Path A)	-0.0135	-0.0490	0.0220	0.0180	0.4554
Total word recall to PAI_Total (Path B)	-0.1919	-0.5322	0.1485	0.1728	0.2678
MACE Chronicity to PAI_Total (Path C)	0.2697	0.1749	0.3644	0.0481	<0.001
Total and indirect effects					
MACE Chronicity to PAI_Total	*B*	95% CI		*SE B*	*p*
		LL	*UL*		

Note: CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

B (95% CI)= coefficient with 95% confidence intervals, SE B =standard error for beta coefficient, *p*= statistical significance

Similarly, although MACE chronicity scores predicted BSI scores, this effect was not mediated by social learning (Table 6).

Table 6

MACE Chronicity and BSI_GSI: Direct, indirect and total effects

	Direct effects				
Path	B	95% CI		*SE B*	*p*
		LL	*UL*		
MACE Chronicity to Total word recall (Path A)	-.0135	-.049	.022	.0180	.455
Total word recall to BSI_GSI (Path B)	-.0030	-.0078	.0017	.0024	.206
MACE Chronicity to BSI_GSI (Path C)	.0032	.1781	.3531	.0444	.000
	Total and indirect effects				
MACE Chronicity to BSI_GSI	*B*	95% CI		*SE B*	*p*
		LL	*UL*		
Total	.0032	.0019	.0045	.0007	.000
Indirect	.0000	-.0001	.0003	.0001	-

Note: CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

B (95% CI)= coefficient with 95% confidence intervals, SE B =standard error for beta coefficient, *p*= statistical significance

As shown in table 7, the mediating variable 'total word recall' did not significantly correlate with the IV (maltreatment), or either of the DVs (psychopathology). This provides the underpinning rationale for why neither of the mediation models were significant.

Table 7

Correlation Matrix for Mediating Variable of Total Word Recall with IV and DVs

Variable	1	2	3	4
1. MACE Chronicity	-			
2. BSI_GSI	.278**	-		
3. PAI_Total	.318**	.734**	-	
4. Total word recall	-.038	-.082	-.078	-

***p<0.001 (2-tailed))*

Discussion

Summary of Findings

This study aimed to explore the association between a novel retrospective measure of childhood maltreatment and psychopathology symptoms in a non-clinical sample, whilst considering the mediating role of social learning. There were moderate and highly significant correlations between global scores of the MACE and global scores on psychopathology measures. Several subtypes of maltreatment positively correlated with total scores on both measures and the most significant type by timing interaction on borderline personality symptomatology was peer emotional bullying in adolescence. Although maltreatment chronicity predicted borderline symptomatology and to a lesser degree, scores on the BSI, social learning was not found to mediate this relationship. The mediating variable, total word recall, did not correlated with either the IV or the DV, which explains why there was no indirect effect of the models. The implications of these findings, study limitations and future implications are further explored.

Beyond Multiplicity – the Importance of Chronicity of Maltreatment Experience

An advantage of the MACE over the CTQ and ACE, and the primary rationale for its development, is its ability to assist in routinely considering temporal facets of maltreatment experience (Fosse et al., 2021; Herzog et al., 2020; Schalinksi et al., 2016; Teicher & Parigger, 2015; Teicher & Samson, 2016). In this study, chronicity of maltreatment exhibited stronger and more significant relationships with both psychopathology measures than multiplicity scores. The link between maltreatment in childhood and increased risk for personality disorder symptoms is

well established (Ball & Links, 2009; Fossati, Madeddu & Maffei, 1999; Lieb, Zanarini, Schmahl, Lineham & Bohus, 2004; Widom, Czaja & Paris, 2009), however there are mixed findings on the role of chronicity in this relationship (Hecht, Cicchetti, Rogosch & Crick, 2014; Kurdziel, Kors & Macfie., 2018). In line with latent vulnerability theory, it is plausible that a longer duration of maltreatment would result in cumulative brain adaption and more pronounced differences in brain structure, leading to more pronounced mental health difficulties in adulthood (McCrory, Gerin & Viding, 2017; McCrory & Viding, 2015). It will be of interest to see how already established links i.e. maltreatment multiplicity and health outcomes (Felitti et al., 1998) are moderated and/or mediated by chronicity.

Maltreatment Subtypes and Psychopathology

Intercorrelation of maltreatment subtypes clustered around threat and neglect domains. This is in line with recent conceptualisations of childhood maltreatment that aims to provide a framework for more nuanced comparison beyond homogenous groups of 'maltreated' or 'non-maltreated' groups (McLaughlin, Sheridan & Lambert, 2014). Threat forms of maltreatment, namely parental physical abuse, parental verbal abuse, and peer emotional bullying all significantly correlated with both psychopathology measures. Borderline symptomatology additionally correlated with emotional neglect and parental non-verbal emotional abuse, the latter of which may represent elements of neglect, as well as threat. The use of the MACE within the threat and neglect framework highlights a challenge in this area of research, that is, the attempt to quantify and objectify widely varying and individually unique clusters of maltreatment experience. Qualitative research, which is somewhat lacking in the field, may compliment quantitative approaches by adding rich and detailed

understanding of constellations of maltreatment experience and developing trajectories.

Findings from this study suggest conceptualising maltreatment experiences within physical and non-physical typologies may be beneficial in understanding the mechanisms of developmental psychopathology. There was a trend for non-physical forms of maltreatment to be as strongly if not more strongly related with psychopathology symptomatology than physical forms of maltreatment. For example, parental verbal abuse and peer emotional abuse were more strongly correlated with both psychopathology measures than parental and peer physical abuse. Moreover, only emotional neglect, not physical neglect showed a significant correlation with any of the measures.

Relatively speaking physical maltreatment types, for example sexual abuse, has been more heavily researched than emotional abuse and neglect (Tschoeke, Bichescu-Burian, Steinert & Flammer, 2021; Wolok & Horowit, 1984). Indeed, the link between childhood sexual abuse and borderline personality disorder is well established (de Aquino Ferreira, Pereira, Benevides & Milo, 2018), although surprisingly this relationship was not evidenced in this study. More recently, findings have suggested that emotional abuse may be an important consideration in the aetiology of borderline personality disorder (Kuo, Khoury, Metcalfe, Fitzpatrick & Goodwill, 2015; Liu, Scopelliti, Pittman & Zamora, 2018; Rosenstein et al., 2018). Interestingly, Tschoeke et al., 2021 reported that borderline features were mainly predicted by emotional abuse, whereas dissociation was best predicted by sexual and physical abuse. Perhaps within the diagnostic category of borderline personality disorder, physical and non-physical childhood maltreatment results in differing symptoms profiles, as seen in other diagnostic profiles (Teicher & Samson, 2016).

Such patterns support the shift away from categorical conceptualisations of mental health disorders (Caspi et al., 2014).

In the current study, emotional neglect and parental non-verbal emotional abuse significantly correlated with borderline symptoms, but not mental disorder symptoms. Perhaps emotional maltreatment from caregivers which represent threat and neglect domains results in emotional confusion, instability of affect and a fragile sense of self, as often seen in those diagnosed with borderline personality disorder in adulthood (Lieb et al., 2004).

Temporal Maltreatment Characteristics and Psychopathology

The MACE provides the opportunity for type x timing interaction analyses. This study tested whether neglect experiences in childhood, and socially threatening experiences of maltreatment in adolescence were particularly associated with psychopathology scores.

Neglect did not show any type x timing effects in this study. This is surprising given literature suggesting infancy as a sensitive period in general, and potentially specifically for the experience of neglect (Insel & Young, 2001; Schalinski, Teicher & Rochstroh, 2019; Strathearn, 2011). Perhaps, given the evolutionary importance of a caregiver being just that – a giver of care, the impacts of neglect are consistent across developmental stages until full maturation at the end of adolescence. Or perhaps acts of omission (i.e. neglect) are less easy to retrospectively remember than acts of commission (i.e. physical abuse).

Peer emotional bullying in adolescence was associated with higher borderline personality symptomatology. This supports the notion that peer evaluation in adolescence can have long term implications for mental wellbeing and highlights the importance of considering maltreatment that takes place outside the family home in

the aetiology of psychopathology. Children who have been maltreated in the home may be more at risk for peer bullying (Benedini, Fagan & Gibson, 2016), and further understanding the relationship and cumulative dynamic between maltreatment in the home and victimisation outside the home is needed (Cecil, Viding, Barker, Guiney & McCrory, 2014; Coulton, Richter, Korbin, Crampton & Spilsbury, 2018; Lynch & Cicchetti, 1998).

Much of this sample were still in the developmental phase of 'adolescence' (Sawyer et al., 2018), a time in which the brain is particularly sensitive to social evaluation. Perhaps memories of adverse social interactions and victimisation during former school years have a bigger impact on mental wellbeing and sense of self at this developmental age. It would be interesting to see whether such a relationship was found in an older sample.

MACE Mediation by Social Learning

Chronicity of maltreatment was found to predict borderline symptom score. This relationship was not mediated by social learning, which was an unexpected finding given the substantial amount of literature evidencing the role of social learning in psychopathology (Bo, Sharp, Fonagy & Kongerslev, 2017; Fonagy et al., 2021; Katznelson, 2014). There are numerous possible interpretations of this finding.

Firstly, this was a non-clinical sample. Perhaps social learning impairments are not at a threshold to mediate relationships between maltreatment and psychopathology in this group. Interestingly, Teicher and Samson (2016), reported that brain abnormalities seen in maltreated individuals with psychopathology were also present in 'resilient' individuals, suggesting that for some individuals, the brain is able to make compensatory adjustments. Perhaps this sample of University

students and young professionals represented a ‘resilient’ sample who were still able to function well in terms of social interaction and learning.

Another possibility is that personality disorder symptomatology is the mediating factor in the relationship between childhood maltreatment and social learning; perhaps the development of mental health difficulties develops prior to impaired social learning.

The word recall element of the results looked at total number of words recalled. It would have been interesting to see whether findings were different if social learning was operationalised differently, for example, considering the ratio of negative to positive words recalled, given maltreated individuals potential hypervigilance to threat (Pollak, Cicchetti, Hornung & Reed 2000; Zhu, Chen & Xia, 2020).

Another possibility is that the paradigm used in this study as a measure of social learning did not accurately assess the domain we wished to measure. Typically, social learning tasks take place in person; communication is not a purely verbal interaction and the perception of body language and communication is qualitatively different online as opposed to in real life. Moreover, a word learning task is not typically how the process of epistemic trust, in which humans come to learn about the social knowledge of their species, would operate. Perhaps a more nuanced task that more readily links with systems of reward and threat anticipation would have been more appropriate for this study, had we had the timespan to prepare such a paradigm (Guyer et al., 2006; Hanson, 2017).

Additionally, other psychological and socio-cultural factors beyond social learning may account for the link between maltreatment in childhood and later psychopathology. For example, cognitive processes such as attention and memory

deficits (Irigaray et al., 2013) as well as rumination and negative views of the world have been suggested as mediating factors (Kim, Jin, Jung, Hahn & Lee, 2017). Post-traumatic stress symptomatology, poor self-concept and negative views of the world resulting from maltreatment may also contribute to the development of a range of mental health difficulties (Boger, Ehring, Schwarzkopft & Werner, 2020). It may be that difficulties with affect regulation can better account for the relationship between childhood maltreatment and later psychopathology than social learning deficits (Alink, Cicchetti, Kim & Rogosch, 2009; Van der Kolk, 2015). However, many of these cognitive and emotional factors can be conceptualised as arising from deficits in social learning. The physiological impacts of maltreatment beyond the brain, for example on inflammation in the body and vitamin deficiencies, have been articulated as potentially contributing to the development of difficulties in cognitive and emotional functioning, which may contribute to mental ill health (Coelho, Viola, Walss-Bass, Brietzke & Grassi-Oliveira, 2014; Danese, Pariante, Caspi, Taylor, Poulton, 2007). Socio-culturally, factors such as socio-economic status and poverty have also been named as mediating factors (Evans & Kim, 2013). It is likely that the broad range of potential mediators interact in complex ways. For example, perhaps certain physiological and cognitive mediators hold more weight in certain socio-cultural frameworks (i.e. rumination and negative views of the world are more significant mediators of mental ill health than attention and memory deficits when maltreatment occurs in the context of poverty).

Limitations

Although this research has strengths in its use of a novel measure of childhood maltreatment, there are a number of limitations. It is unclear whether the online paradigm we had to use as a result of the Covid-19 context measured what we

wanted to measure; namely, social learning. Ostensive cues, such as eye contact, gaze and mirroring gestures are difficult to sensitively replicate in an online format. Thus, the differences between no ostensive cues and combined ostensive cue conditions may have been too minimal to bring about differences in word learning. Moreover, completing a social learning task over the internet may have attenuated the extent to which maltreated individuals felt in a state of epistemic threat, due to the removed interpersonal nature of the interaction.

Another difficulty with the paradigm was that participants were asked to fill out the numerous demographic and psychometric scales at the start of the online task, followed by the word sorting task. This resulted in a marked gap between the researchers delivering ostensive cues, and the paradigm in which we expected influence of these cues. It would be interesting to see whether the results differed if the word sorting task came before the psychometrics.

Although our adverts specified English speaking participants, it was clear that there was variance in fluency across the samples. In hindsight, it would have been preferable to recruit participants whose first language was English, or include some sort of literacy test at the start of the paradigm in order to standardise language skill and control for this in the study. Participants had to type the words they could remember into the response box at the end of the task. Thus typing speed would be a confounding variable in this study.

Self-report measures of psychopathology symptoms and maltreatment history were employed in this study. Such measures may result in participants unintentionally and/or purposefully under or over reporting experiences. Discrepancies in retrospective and prospective accounts of childhood maltreatment

have been found to differ (Baldwin, Reuben, Newbury & Danese, 2019), with retrospective methodologies demonstrating a stronger link between maltreatment and psychopathology than prospective studies (Scott, McLaughlin, Smith & Ellis, 2012).

The MACE is a novel measure and although initial evidence suggests its utility in predicting psychopathology symptomatology (Teicher & Parigger, 2015), it has not been extensively validated. The measure is time consuming to complete, given the need to recall maltreatment experience at each year from 0-18 across 52 different maltreatment statements, which may impact on effort and accuracy. It is also unlikely that adults will have accurate memories of maltreatment experiences during infancy, and possibly other years of their childhood, thus the measure may bring about a tendency to remember later experiences of maltreatment more readily than childhood experiences. For example, an adult whose mother experienced post-partum mental ill health may have plausibly had some experiences of neglectful parenting during their infancy, but may not have conscious awareness of this to be able to recall it.

A strength of this study is that it explores type x timing interactions of maltreatment. However, due to the sample size, the size of some groups for comparison were very small, under 5 participants in 'child only experience of parental verbal abuse' for example. Thus these findings must be interpreted with caution and require replication with bigger sample sizes.

Data collection for this research took place during the Covid-19 pandemic, when mental health difficulties such as anxiety and depression were reported to be higher than normal (Moreno et al., 2020). It may be that if this research had taken place in a global context that was less threatening and anxiety provoking, differences between maltreated and non-maltreated people's mental health scores would have

been more pronounced. The increased general level of psychopathology may have dulled down differences.

Future Research

The findings of this study suggest that moving away from homogenous samples of 'maltreated children' is important for future research. Subdomains of maltreatment intercorrelated in threat and neglect groups in this study, but clustering physical and non-physical maltreatment, or predictable and unpredictable forms of maltreatment may be additional distinctions to make in future research. Such grouping moves away from homogeneity, whilst also mitigating against the reductionism of studying single maltreatment experiences, given high co-morbidity of maltreatment subtypes.

Given a contemporary shift towards conceptualising psychopathology in dimension rather than categorical terms, it would be helpful to assess the relationship of the MACE and different cognitive, emotional and behavioural symptomatology (for example, rumination, dissociation, self-harm). There is evidence that maltreated individuals have different symptom profiles as their non-maltreated counterparts with the same diagnosis (Teicher & Samson, 2013), therefore considering associations beyond global psychopathology scores would be of use.

Peer maltreatment in adolescence was found to be a particular risk for borderline psychopathology in adulthood in this sample. Research on preventing and intervening with bullying should be ongoing. This sample were predominantly young female, and it would be interesting to see if this association remained present at other points of the lifespan and for males as well.

This study has paid particular focus to the risk factors for later psychopathology, however the latent vulnerability brings attention to resilient as well

as risk trajectories after the experience of childhood maltreatment. Therefore, it is important to explore protective factors at developmental sensitive periods in a similar way to the way this study has attempted to identify temporal risk factors.

Retrospective measures of child maltreatment have not previously considered maltreatment outside the home alongside maltreatment taking place within the home. The findings from this study highlight the need to consider maltreatment and trauma experiences at multiple levels of the environment (Bronfenbrenner, 2005), and to consider the cumulative dynamics between maltreatment in the caregiving relationship and outside this relationship. Threat operates at multiple levels, the caregiving relationship being only one. Socio-analytic perspectives consider processes that play out within groups and society, stating that psychodynamic processes that typically occur within the caregiver-infant relationship also occur in social groups between those in power and those who are oppressed. Thus, society enacts patterns of abuse and neglect dynamics towards certain groups. It is necessary to start considering how to build epistemic trust with those who have been maltreated and traumatised by broader parts of the system, as well as those who have experienced maltreatment within the caregiving relationship.

Clinical Implications

Chronicity of maltreatment was found to be a key factor in the development of later psychopathology. The findings from this study highlight the importance for professionals to be able to identify and evidence emotional forms of maltreatment and thresholds for intervention, which are typically less straightforward to evidence than physical forms of maltreatment (Glaser, 2002). Difficulties evidencing the negative impact of such maltreatment potentially contributes to chronicity of maltreatment, which was identified as a risk factor for psychopathology. Supporting

professionals to ask about, evidence and intervene in emotional abuse and forms of neglect is vital.

Working together to safeguard children does not just rely on professionals working with children and young people, but those working with adults too. Professionals working with adults with mental health or substance misuse issues should be trained in the significant impact of non-physical maltreatment and the impact of chronicity. Such concerns should be given routine discussion space in MDT meetings to ensure a pro-active approach to prevention and intervention.

Peer maltreatment was linked to psychopathology in this study. Schools will vary in the degree to which bullying is problematic, and how skilful they feel in competently addressing these issues. It is important that schools feel confident in responding to bullying dynamics, so clear theory-practice links should be communicated from such research, with concrete recommendations and policy outlining how to identify and respond to incidences of emotional bullying.

In this study, in line with findings in the literature more broadly, adolescence represent a time of particular sensitivity to the evaluation of others. This has implications for therapy, in which the therapist may come to represent a trusted other whose evaluation holds particular weight with long lasting impact of self-evaluation. Thus, clinicians working with adolescents who have experience parental or peer maltreatment may wish to expend significant effort in clearly communicating the favourable, strengths based perceptions they have of the young person, to buffer against the impact of less favourable experiences they may have had in their past, or present. Additionally, interventions such as Interpersonal Therapy which pay particular attention to the role of social relations and interactions in treatment may be

helpful to consider not only for adolescents, but for adults who have experienced peer abuse or alienation during development.

Conclusion

Although there is increasing understanding of the link between adversity in childhood and poorer physical, psychological, social and functional outcomes in adulthood, much remains to be done to understand the mechanisms through this relationship. Considering chronicity of different maltreatment types and type x timing interactions are important next steps for the field. Moreover, beginning to understand the ways in which ween maltreatment in the caregiving relationship links with maltreatment and threat outside the caregiving relationship is warranted. Such developments will aid the progression of preventative rather than responsive interventions, and support guidance towards favourable trajectories for those who have experienced adversity in childhood.

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Part three: Critical Appraisal

Introduction

This appraisal summarises my reflections on the theoretical, conceptual and practical elements involved in completing the systematic literature review and empirical paper. It firstly considers a summary of findings and the impact the Covid-19 context had on the research process. It considers my prior clinical and research experience and the influence of these on my choice of topic and research approach. Finally, I consider future directions in terms of personal career and the implications of my findings.

Summary of findings

Paper 1 was a systematic literature review which focused on maltreatment and memory in child samples. This paper aimed to aid understanding about the social and cognitive factors that contribute to maltreated children's poorer academic outcomes. In summary, there was evidence that memory tasks involving higher levels interpersonal information led to a more pronounced difference in performance between maltreated and non-maltreated children than memory tasks with less interpersonal information. This suggests that the interpersonal environment of the school setting contributes to maltreated children's ability to learn new information. The findings from this paper go some way in aiding understanding of the mixed profile of findings on maltreated children's basic memory processes.

Paper 2 was an online experimental paradigm in which adults completed a battery of psychometric measures before undertaking a social learning paradigm, namely a person-referent word learning task. The focus of this paper was validating a new adult self-report measure of childhood maltreatment, the MACE, by considering links with psychopathology measures, and the role of social learning in these

associations. Chronicity of childhood maltreatment, peer maltreatment and non-physical maltreatment were identified as key areas associated with adult psychopathology. These findings highlight areas mental health and other professionals working with children should be particularly mindful of.

Context - Covid 19

It is difficult to reflect on the research process without first giving time to reflect on the context in which it was completed. Initially, my project involved observing mother-infant interactions at the Anna Freud Centre and coding the use of ostensive cues during a session in which the mother taught her infant the use of a novel-object. The Covid-19 pandemic started in March 2020, at which point I had completed the relevant paperwork and DBS checks to be able to work at the Centre, and had also visited to observe colleagues carrying out the paradigm. At the end of March the country went into a national lockdown and had to work exclusively from home, and there was ongoing uncertainty about how long it would be before we were allowed to return to workspaces. This left my thesis partner and I in a difficult situation, in which we wanted to wait long enough to see whether our face-to-face work would still be possible, but not too long that our major research project would be too heavily delayed if we had to change our design. This resulted in us waiting until November 2020 to assess the outlook, after which we agreed with our supervisors that it would be best to pursue an online paradigm with adults.

As well as a shortened timeframe for completing the thesis, I had undertaken much reading focused on the theoretical and conceptual details of epistemic trust theory and ostensive cues. Although this reading was relevant, my new focus on childhood maltreatment and the use of the MACE involved another substantial

overview of literature and background reading. We had to apply for new ethical approval which we received clearance for in February 2021. Taken together, the context resulted in a substantial delay to both the systematic review and experimental element of my thesis. This was my first experience of undertaking a systematic review and quantitative research, and although I enjoyed the opportunity for learning in both of these areas, doing so within a tighter than expected timeframe was at times stressful. However, although unavoidable, this experience has highlighted to me the importance of allowing enough time for each stage of the research process when I conduct research in future.

Alongside the logistical hurdles to navigate as a result of Covid-19, completing a thesis mostly from home has inevitably impacted the creativity and conceptual synthesising I have been able to bring to my thesis. Typically, there would have been more opportunities for informally conversing with fellow trainees and NHS colleagues about my thesis topic, a process which I believe supports the conceptualisation of new ideas and learning from others' unique experiences and perspectives on a topic. Writing my thesis in isolation and spending so much time at home has in my opinion undoubtedly influenced my cognitive clarity and focus.

That being said, the ongoing challenges of the last 18 months have also been a catalyst in my learning and understanding of my own personal working style and ways of managing stress. I have a better understanding of how to draw on my personal resources and skills in response to changing situations and ongoing high demands. I believe such skills will serve me well not only in future research contexts, but also for a long career in a resource challenged NHS.

A source of support during the process was being part of a joint project, connecting with the mind of another during periods of working alone at home has been hugely valuable. I benefitted from having a colleague to explain my ideas to and elaborate on logistical and theoretical issues through the process of conversing with someone familiar with the concepts. I have learnt from my thesis partner, in a way which I similarly anticipate he has learnt from me. Given research is rarely conducted by an individual, I believe I have learnt valuable skills about working within a research partnership/group that I will take in to future clinical and research settings.

The influence of prior clinical experience

I started the UCL Clinical Doctorate with experience in numerous clinical settings, all of which I believe contributed to my choice of researching the area of childhood maltreatment, cognition, and psychopathology.

During my Undergraduate degree, I worked in a high secure forensic hospital. During this placement, I was struck by the severity, chronicity and frequency of childhood abuse that many of the individuals in this setting had been subject to. Later, working in a care home for adults with severe and enduring mental health difficulties and offending histories revealed a similar pattern in which the majority of the residents had experienced rejecting or neglecting childhood experiences, characterised by maltreatment. More recently, in my older adult placement during clinical training, I have been moved when hearing people in the later stages of life talk about the detrimental impact childhood abuse and neglect has had on their self-worth, emotions and relationships throughout their lives. Increasing recognition of this lifelong impact of childhood maltreatment on mental wellbeing

and functioning led me to choose a thesis topic in childhood maltreatment, attachment, and epistemic trust across the lifespan.

One clinical role with young people has been particularly on my mind during the write up of this thesis; working in supported living for adolescents in the social care system who had experienced multiple placement breakdowns as a result of challenging behaviour. This job involved living alongside young people and supporting them in daily living skills for 3-4 days at a time, with overnight shifts. A deep and thoughtful use of attachment theory was central to working with these individuals who had experienced chronic maltreatment and multiple traumas. On reflection, there were numerous examples of using creativity to build epistemic trust in this role. Seemingly small but thoughtful daily interactions such as singing to songs the young person enjoyed when taking them in the car to appointments, supporting the young person to cook a meal they wanted to try and taking the young person to do an activity they enjoyed together facilitated many young people relaxing their epistemic vigilance over time and taking on information as relevant to them. Responding to incidences of challenging behaviour by attempting to connect with their mind and being transparent in allowing them to know what was going on in my mind also supported the development of trust. This sustained approach to supporting young people, even when challenging behaviours such as drug use, self-harm behaviour and verbal and physical aggression arose, provided a containing environment in which epistemic trust could slowly start to develop.

I noticed that over the period of typically six months to a year of sustained support such as this, many young people began to show changes in daily functioning, emotion regulation and behaviour. I believe that the supported living environment facilitated re-modelling of unhelpful attachment experiences, supporting young

people to relax epistemic vigilance and communicate with another who they had seen through daily experience was invested in their wants, their needs, and their mind. Many of these young people were diagnosed with "emerging borderline personality disorder", a diagnostic term which has historically been described as "untreatable" and more contemporarily, may receive that description of "difficult to engage". However, I saw change in many of these young people as a result of the trusting and supportive relationships they developed with care home staff. Such experience makes me consider the need in flexibility for interventions for these young people; although some may benefit from 1:1 or group therapeutic interventions, others may need more systemic approaches and we as professionals must see all young people as having the potential for change, and think beyond "traditional" therapeutic approaches.

This job makes me think about the need for more 'on the ground' perspectives in this research area, either from young people themselves, or those who know them personally, such as supported living workers, foster carers, social workers and teachers. The young people I worked with presented very differently in the daily living dynamic of the supported housing compared to meetings with professionals. Relationships with professionals who have had ongoing engagement and time to build trust with young people represent a dynamic in which maltreated children can relax their epistemic vigilance; something they may not be able to do in a novel research setting with unfamiliar adults and new information. This represents a fruitful area for future research – designs which tap into the voices of maltreated children directly or via trusted professionals, to hear their perspectives on things from a place in which their epistemic hypervigilance has been relaxed somewhat.

The experiences of young people who have overcome much adversity undoubtedly creates ways of perceiving, interpreting, and interacting with the world that are unique from most academics undertaking research in this area. We miss valuable perspectives that may aid understanding of what does and does not help, when we exclude the voices of these individuals in the development of research designs. Moreover, qualitative research either with young people, or those professionals that have built a degree of trust with them, would be a valuable area for future research.

Prior research experience

My research experience prior to the course was limited to qualitative undergraduate research. I purposefully chose a quantitative project as I wanted to qualify with skills in both analytic methodologies, with the view to being able to tailor any future research I undertake to the most fitting approach. The tighter than expected time frame for completing the experimental element of the thesis meant that there was a certain degree of pressure whilst attempting to learn new statistical techniques. However, I feel an increased sense of confidence and competence in my quantitative work and am pleased to be qualifying with this new skill.

An additional skill I have learnt is how to conduct a literature review. Although time consuming, I enjoyed the process of synthesising the literature and pulling together mixed findings by hypothesising about underlying trends and patterns of results. I enjoyed considering the finer patterns within the broader pattern of results. Not only has this process increased my research skills, but the process of reading and researching the field has provided me with a solid theoretical foundation to take forward to my work in Child and Adolescent Mental Health Services when I

qualify. I am eager to disseminate my findings within the service I am due to work in.

I enjoyed doing a project that involved working with numbers, alongside synthesising research with words. I feel this represents a good fit for my approach to work, in which I appreciate the balance of order and methodical approaches, alongside fluidity and conceptual creativity.

Methodological issues and concerns

A key methodological reflection from undertaking my literature review was the scant literature that was available comparing maltreated and non-maltreated children on social learning tasks. This was a rather concerning finding, given the well-established link between childhood maltreatment and later impairments in social functioning. A brief scoping review on social learning tasks in 'normally developing children' returned many more papers. This highlights that much research focuses on 'typically developing children', with less focus on children who have faced adversity or maltreatment. Although we need to understand typical development to understand developmental psychopathology pathways, the balance between these two areas seems to be misaligned at present. Future research should hold this in mind. We risk echoing patterns of neglect and communicating messages of low worth by failing to undertake meaningful research on maltreated children specifically.

With regards to the empirical paper, I was disappointed not to be able to gain face to face research skills with mother and infants, given this is the area I anticipate specialising in post-qualification. However, I was pleased that although I was using an adult sample, I was able to bring in a focus on childhood maltreatment by using

the MACE in the empirical paper, and by focusing on studies using child samples in my literature review.

The change in experimental paradigm meant considering how to recruit adults as opposed to mothers and infants. Moreover, the four ostensive cue conditions in our paradigm meant the need to power our study with a sufficiently large sample – in this case about 250. Given our delay in beginning our experimental study, this was a challenge. At first, we recruited through UCL subject pool, but difficulties reaching a sufficient sample size quickly resulted in us considering other options, such as advertising on social media platforms and recruiting through Prolific. This involved another ethics amendment and subsequent delay to recruitment.

Myself and my thesis partner had considerable delays in getting ethical clearance, as due to changing our paradigm, and needing to make amendments due to changes in recruitment pools. This has highlighted to me the need to factor in plenty of time for each stage of the research process, as inevitably parts of the process end up taking much longer than anticipated.

It is important to consider the extent to which the adaption of the social learning paradigm and ostensive cues to the online format reflected the constructs we wished to assess. For example, eye contact is a key ostensive cue, and this was difficult to consistently do in a similar manner to face to face interactions. Although myself and my thesis partner discussed making eye contact when planning our paradigm, this was difficult when we were reading scripts on screen, sending links over the chat function and also trying to look at the person on screen to take on their interaction cues.

Prior to, and during this thesis, I have found myself thinking about the ethical responsibility society has to support those who are born into environments of maltreatment and adversity. The trajectories from childhood maltreatment towards physical and mental health difficulties and incarceration are clear, and evidence the need for efficacious interventions. As researchers and Psychologists we must acknowledged our privileged position as professionals who hold a huge amount of power in comparison to children who experience maltreatment. Ethically, with that power comes the responsibility to be efficient and resourceful with research funding. Additionally, we also must promote the voices and wellbeing of those who have undeservedly been born into circumstances of maltreatment.

To this end for efficiency in research, more work is needed to standardise the terminology and measurement of childhood maltreatment. Currently, definitions and measurement vary hugely across the field. Standardising such concepts would allow more direct comparison across studies, samples and context and result in a clearer emerging picture, facilitating theory-practice links. There is a need for researchers to come converse about such terminology difficulties. A move towards routinely using a measure such as the MACE would allow for more fruitful conclusions to be drawn.

Finally, in line with my stance on recommending research that involves the voice of young people and professionals closely involved with them I wish to have been able to incorporate service user involvement in this project. However, given the online adult paradigm we ended up using, this was challenging to incorporate in the current research. This is something I will ensure to include in future research development.

Future directions for research and implications

Future research should proactively strive to include the voice of those with maltreatment experience, or professionals working closely with them. Interviews with young people themselves, social workers, teachers at mainstream schools and pupil referral units, or foster carers could generate a wealth of perspectives that researchers, in their removed position from these children's lives, may not have access to.

Much research focuses on deficits that maltreated children exhibit. However, there are settings in which the gap in academic performance between maltreated children and their peers is less pronounced. Qualitative work with Pupil Referral Units (PRU) may generate concrete recommendations for strategies and approaches that can be adapted for mainstream schools, supporting maltreated children in school before they reach the threshold for PRU referral.

Parental education is a risk factor for poor educational outcomes and psychopathology. Such findings highlight the need for intergenerational interventions that promote epistemic trust with parents as well as children and young people. Within my work in social care teams, I have witnessed the experience of parents whose children are on Child Protection plans not being able to internalise and make use of professional advice and support. It is likely that the step before this, the building of epistemic trust, is missing. Thus, information from professionals is perceived as irrelevant to that individual. Social services can represent forces of threat and control, and indeed parents may have had children taken away from them, or themselves have had unhelpful experiences of social workers growing up. This represents a difficult dynamic in which professionals are attempting to build

epistemic trust whilst also needing to use statutory powers when concerned about a child's safety. The process of building epistemic trust in the therapeutic relationship has been documented. Future research should consider how to build epistemic when children and families have often not 'opted in' to the service and may see the service as threatening and controlling rather than potentially supportive.

Throughout both parts of my thesis there has been an acknowledgement of needing to understand the finer details within the broader picture. Although isolating specific maltreatment types or areas of cognition is noted as potentially reductionistic, it is vital to balance the understanding broader concepts and more specific isolated areas. Mixed findings in childhood maltreatment and memory for example may be better understood by breaking down the numerous concepts within the "maltreatment" and "memory", as illustrated in paper 1.

Finally, considering differing clinical presentations between maltreated and non-maltreated individuals within the same diagnostic categories, research that moves away from samples grouped by diagnostic category may be helpful. Also, with acknowledgement that diagnostic criteria will continue to be used in clinical settings, researchers should seek to understanding the differing clinical profiles within diagnostic categories for individuals with and without maltreatment histories, in order to better make recommendations for suitable interventions for each group.

Future directions for my career

I have always recognised and highly valued the importance of promoting engagement in the clinical setting, particularly in the early phases of therapy. However, my work on the area of epistemic trust has made it even more pertinent. I recognise myself as drawn towards therapeutic models of 'being with' rather than

'doing to', an approach which I feel is embodied within the epistemic trust model which at its core focuses on truly 'seeing' an other as foundational to the therapeutic intervention. This is an approach I will continue to do as I move from my position of clinical trainee to qualified psychologist.

I anticipate working in general CAMHS before specialising in services working with Children in Social Care. This type of role involves working with the broader system of professionals, such as social workers and teachers. I look forward to employing my understanding of epistemic trust beyond a purely one to one therapeutic setting, and integrating it into systemic approaches when working with 'hard to reach' young people. For example, supporting professional networks to consider an individual, and family's ability to trust of social workers and professionals, based on their developmental history and resultant relationship to help. My work on epistemic trust has also made me consider how to support the development and sustained trust within the professional system. Countertransference processes such as splitting often arise when working with individuals with complex trauma histories. This can often bring about fragmentation in the professional network. I will consider opportunities to promote mentalising between different individuals and teams within the network, with the knowledge that this will result in the most helpful support for young people and their families.

I wish to embody a formulation driven professional and work in a setting in which dimensional approaches to understanding distress are valued. My literature review and empirical paper highlight the variety in maltreatment experiences as a result of a combination of factors, such as maltreatment subtype, time of onset, chronicity, gender and relationship to perpetrator. Inevitably, differing combinations of these factors result in different neurophysiological, cognitive, emotional and

behavioural profiles, some of which will be grouped together under one diagnostic profile. This points to the importance of considering developmental factors as well as current clinical presentation in assessment and formulation, as two individuals with the same diagnosis may respond differently to the same intervention.

Summary

Undertaking this research in the context of Covid-19 resulted in shorter than expected timeframes for completion, and the adaption of the original experimental paradigm. The findings from paper 1 contribute to understanding differences in maltreated and non-maltreated children's academic performance, whilst the findings from paper 2 highlight that chronicity of maltreatment, peer maltreatment and non-physical parental maltreatment may be particular risk factors for the emergence of borderline personality disorder symptomatology in adulthood. Thus, this research has implications for educational and mental health settings. My prior clinical experience contributed to my wanting to undertake a thesis in this academic area, and I will make use of my work and findings as I move into a career in NHS CAMHS services.

Appendices

Appendix A: Crombie Quality Appraisal Tool for studies meeting inclusion criteria

	1) Clearly stated aims	2) Appropriateness of design to meet the aims	3) Adequate specifications of subject group given	4) Justification of sample size
Marques, Belizario, Castonho, Castonho de Almeida Rocca, Saffi, Martins de Barros & de Padua Serafim (2020)	1	0.5	0.5	0
Jimeno, Latorre & Cantero (2020)	1	1	1	1
Demeusy, Handley, Rogosch, Cicchetti & Toth (2018)	1	1	1	0.5
Nooner, Hooper & De Bellis (2018)	1	1	1	0
Vasilevski & Tucker (2016)	1	1	0.5	0
Kirke-Smith, Henry & Messer (2014)	1	1	1	0
McWilliams, Harris & Goodman (2014)	1	1	0.5	0
De Bellis, Wooley & Hooper (2013)	1	1	1	0
Barrera, Calderon & Bell (2013)	1	1	1	0
Perna & Kiefner (2013)	1	0.5	0.5	0
Bucker, Kapczinski, Post, Cereser, Szobot, Yatham, Kapczinski & Kauer-Sant Anna (2012)	1	1	0.5	0
Cicchetti, Howe, Rogosch & Toth (2010)	1	1	1	0.5
De Bellis, Hooper, Spratt &Wooley (2009)	1	1	1	0
Valentino, Cicchetti, Rogosc & Toth (2008b)	1	1	1	0.5
Valentino, Cicchetti, Rogosch & Toth (2008a)	1	1	1	0.5
Nolin & Ethier (2007)	1	1	1	0
Pears & Fisher (2005)	1	1	1	0
Beers & De Bellis (2002)	0.5	1	1	0
Meesters, Merckelbach, Muris & Wessel (2000)	1	0.5	0.5	0
Lynch & Cicchetti (1998)	1	1	1	0.5

5) Likelihood of reliable and valid measurements	0.5	0.5	1	1	1	0.5	0.5	1	1	1	0.5	1	1	0.5	1	1	1	1	1	1
6) Sensitivity of outcome tool	1	0.5	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	1	1
7) Adequate description of statistical methods	1	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8) Adequate description of the data	1	0.5	0.5	1	1	1	1	1	1	1	0.5	1	1	1	1	1	1	1	1	1
9) Consistency in the number of subjects reported throughout the paper	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1
10) Assessment of statistical significance	1	0.5	1	1	0.5	1	1	1	1	1	1	1	0.5	1	1	1	1	1	1	1
11) Attention to potential biases	0.5	1	0.5	0.5	1	1	0.5	0.5	0.5	1	1	1	1	1	1	1	1	0.5	1	0.5
12) Meaningful main findings	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	1	1	1	1	1	1
13) Interpretation of null findings	1	0.5	0.5	1	0.5	1	1	0.5	1	1	0.5	1	1	1	1	1	1	1	1	0.5
14) Interpretation of important effects	1	0.5	0.5	1	1	1	1	1	1	1	0.5	1	1	1	1	1	1	1	1	1

15) Comparison of results with previous reports	1	1	0.5	1	1	1	1	1	1	1	0.5	1	1	1	1	1	1	1	1	1
16) Implications in real life	0.5	0	0	1	0	1	1	0.5	0.5	0	0	0.5	1	0	0.5	0.5	1	0.5	1	1
17) Overall quality score/16	**14**	**9.5**	**11**	**14.5**	**13**	**15**	**14.5**	**13.5**	**14.5**	**13.5**	**10**	**14.5**	**14.5**	**12.5**	**14.5**	**14**	**15**	**13.5**	**16**	**13**

Appendix B: Overview of memory paradigms used (as described in papers where applicable)

High interpersonal tasks

Mother-referent incidental recall task

Based on the depth- of-processing paradigm, this incidental recall task taps into children's organization and processing of mother-referent trait adjectives. Forty-four adjectives describing positive attributes (e.g., loving, patient, kind) and negative attributes (e.g., strict, mean, bad) were presented verbally one at a time while the child was shown a card on which each individual word was typed. Children were presented each word under one of two different encoding conditions presented in randomized order. After children were presented with each word, they were asked either "Does the word describe your mom?" (mother-referent encoding) or "Does the word have big letters?" (structural-encoding). Each question was asked for half of the adjectives, and two versions of the task have been developed to ad- minister randomly to children in order to counterbalance the encoding question asked about each word. After completing the ratings and without prior warning, children were asked to recall as many words as possible.

Children's self-schema incidental recall task

Children's representational models provide schemas that may guide attention and memory; these internalised cognitive structures may facilitate the encoding, storage, and retrieval of personally relevant information. Children's encoding of and memory for self-referent attribute words was assessed. 44 words (22 positive, 22 negative adjectives) with word frequency and length equalised, were verbally and visually presented one at a time to the children. Words were presented under one of two encoding conditions: structural ("Is this a long word?), or self-referent (Is this word like you?). Children's yes or no response was recorded for each item. An unexpected incidental recall period immediately followed. Children were asked to recite as many of the previously presented words as possible, in any order. The encoding conditions were randomised so that all words were presented equally under structural and self-referent instructions. Furthermore, the task involved two versions that were administered to children to counterbalance the encoding condition asked about each word. Thus, children were presented with a list that contained four groups of 11 words: positive structural, positive self-referent, negative structural, and negative self-referent. One word from each of these groups was presented as one of the first two or last two words; these four words were then excluded from analysis to minimise primacy and recency memory effects.

Episodic memory video test

Participants were exposed to a positive or negative emotion-evoking stimulus, namely a 5 minute video clip depicting a happy or negative home environment. After a delay, eyewitness memory was measured. An eyewitness memory questionnaire was created for the movie clip. The questionnaire consisted of four free recall questions (e.g. Tell me everything you can remember about what happened?)

followed by 20 direct (yes-no) questions including specific questions (e.g. Did the mom talk to the Dad about going to the son's baseball game?" and misleading questions (e.g. "There was an ice cream truck outside, wasn't there?"). Children were shown the video clip via computer screen, and the questionnaire was verbally presented to children by the experimenter after a 20 minute delay.

A Developmental NeuroPsychological Assessment (NEPSY)

The subtests included in the NEPSY–II Memory and Learning domain are List Memory, Memory for Designs, Memory for Faces, Memory for Names, Narrative Memory, Sentence Repetition, and Word List Interference. The subcomponents of learning and memory that are assessed include immediate memory for sentences; narrative memory under free recall, cued recall, and recognition conditions; repetition and recall of words presented with interference; and immediate and delayed memory for abstract designs, faces, names, and lists.

Memory for faces

This subtest is designed to assess encoding of facial features, as well as face discrimination and recognition. The child looks at a series of faces and then is shown three photographs at a time from which he or she selects a face previously seen. A delayed task assesses long-term memory for faces.

Memory for names

This subtest is designed to assess the ability to learn the names of children over three trials. The child is shown six or eight cards with drawings of children on them while being read the child's name. The cards are then shown again and the child is asked to recall the name of the child on the card. A delayed task assesses long-term memory for names

Narrative memory

This subtest is designed to assess memory for organized verbal material under free recall, cued recall, and recognition conditions. The child listens to a story and is then asked to repeat the story. The child is then asked questions to elicit missing details from his or her recall of the story.

Story recall test

The story recall test was derived from the Binet-Bobertag and is widely used in the Netherlands. It assesses a person's ability to encode and reproduce meaningful, verbal associative information. A neutral short story was read out to the subject, who was then asked to reproduce the narrative as accurately as possible (Story 1). Semantic long -term memory was measured by asking the subject to reproduce the short after a time interval of 15 min without reading the story again (Story 2). The story consists of 20 meaningful elements; accordingly, memory scores may vary between 0 and 20.

Medium interpersonal tasks

Three boxes scrambled/three boxes stationary

This task has proven to be a valid measure of spatial working memory. This task requires holding information in one's mind, while inhibiting a proponent response to reach to a previously correct box. At the beginning of the task, three boxes were placed in front of the child, each with a different colour and accompanying shape. Each box contained the reward of the child choosing while the child watched. The lights within closed and the boxes were pushed towards the child, as they were encouraged to find which contained a reward. After the child retrieved the reward or an empty box was opened, the experimenter placed the boxes out of reach. A cardboard petition was then placed between the child and the boxes as well as a five second delay was imposed. Following a delay the boxes were again presented to the child. The task continued until the child is found all three rewards, five consecutive errors occurred, following 15 attempts. The goal of the task was to find all three rewards in the least number of breaches. The Childs performance with measured using efficiency ratio, In which the number of awards retrieved it was divided by the total number of reaches.

Three boxes scrambled

This task has proven to be a valid measure of non-spatial working memory. This task is identical to the three boxes stationary task, except instead of the boxes staying stationary after each reach, they were scrambled while being hidden behind the partition. In addition, the shapes and colours of the boxes were different from those used in the stationary task. In the stationary version of this task, the child may maintain a place keep it in mind to guide reaching, where is the scramble version requires the child to maintain more specific information regarding the visual appearance of each box, therefore assessing object memory instead of spatial memory. Again, the task continued until the child had found all three rewards or five consecutive errors occurred. Three trials of up to 20 attempts were administered. Because these were three separate trials for this task, the chance performance was measured using the average efficiency ratio. In this case, the number of awards retrieved was divided by the total number of reaches for each trial, and then, and average was taken of the three efficiency scores. Previous research has found this task to exhibit hi intercoder reliability when conducted with children of a similar age. The goal of the task remains to find all three rewards and it the least number of reaches.

Listening recall task

The experimenter read a series of short sentences and the participant firstly judged whether each was true or false (processing), before being asked to recall the final word from each sentence in correct serial order (storage). Trials commenced with list lengths of one item and proceeded to longer lists up to a maximum of 5. There were four trials for each list length and participants needed to get a minimum of three of four trials correct before proceeding to the next level. Total trials correct (maximum score of 20) were scored.

California Verbal Learning Test for Children

This task assesses memory and verbal learning. It consists of a list of 15 words (List A) in three non-affective semantic clusters (i.e. things to wear, things to play with,

fruits) . The list is read five times to the child, who has to recall as many words as possible each time. An interference list of 15 words is then presented (List B). This is followed by immediate free recall of the words on List A, and then cued recall. Twenty minutes later, free and cued recalls are performed to assess retention of information over time. Finally, the child performs a recognition task, which involves identifying the 15 words from List A among distractors. This test is scored for accuracy.

Selective reminding test

The children's version of the selective reminding test contains a list of 12 words (high imagery nouns). The words are presented over eight trials, or until the child achieves perfect recall on three consecutive trials. The words are presented to the child at the rate of 1 per second, and the child is instructed to try and remember as many of the words as possible. Free recall trials are given after each presentation. The entire list is presented to the child on the first trial. With subsequent trails, the child is presented only those words that were not recalled during the previous free recall trial. The measure is scored for Total Recall (numbers of words recalled each trial), Long-term Storage (number of words recalled on two consecutive trials without a reminder), Long-term Recall (number of words recalled that had been transferred info long-term storage as indicated by recall on two consecutive trials without a reminder), and consistent long term retrieval (number of words recalled for all trials after transfer into long-term storage)

Rey Auditory-Verbal Learning Test

Participants are required to recall a list of 15 nouns over five trials; the numbers of words recalled for each trial were summed to produce a total learning score. It also has a recall-after-interference trial, a 20-min delayed-recall trial, and a recognition trial.

Swanson Sentence Span Task

This task consists of five levels. Each level includes two sets of unrelated sentences and two comprehension questions in relation to the sentences (one for each set). First, participants were instructed to listen to the set of sentences, second, they had to answer a question in relation to one of the sentences, and third they had to recall the last word of each sentence in the order in which they were read. A score of 1 is received for each set correctly answered; a total score was then calculated.

The Odd-One-Out Task

This is a spatially mediated test. Participants were presented with a series of cards containing two identical visual items, and one similar but slightly different item. Participants were asked to point to one which is different (processing), the card was then turned over, and a blank response board depicting the relevant number of 'empty' cards was then shown. The participant was then asked to recall the spatial location of the 'odd-one-out' by pointing to the response board (storage). Trials commenced with lists of one item and proceeded to lists of six items with four trials

per list lengths. A minimum of three of four trials correct were needed in order to proceed to the next level.

Test of learning and memory paired recall subtests

This paired-associate task requires the examinee to verbally recall a word when provided the word with which it was paired during learning trials. Examinees ages 5 through 8 must recall six-word pairs and examinees ages 9 years + must recall eight word pairs during four trials. The order of presentation of word pairs is randomized across trials. The manual suggests that performance on easy pairs (e.g., left-right) may reflect motivation, whereas true performance variation is most evident on hard pairs (e.g., animal–flower). Scores may be computed for easy versus hard pairs, and total pairs recalled.

Low interpersonal tasks

WISC – Digit Span Forward/ Digit Span Backward

In digit span forward, the examiner reads a list of numbers and the participant is required to repeat them in order. This involves attention and immediate verbal recall. In digit span backward, the examiner reads a list of numbers and the participant is required to repeat the number in the reverse order to the spoken sequence. This more closely involves working memory, so it is more sensitive to working memory deficits.

WISC Arithmetic

This task is used in the WISC as a complementary working memory test. The child is given a limited time to solve a series of orally administered arithmetic questions. The test involves mental manipulation of information, concentration, attention, short- and long-term memory, numerical reasoning ability, and mental alertness. It may also motivate the use of fluid reasoning, the ability to identify sequences, and logical reasoning.

Trail Making Test (B)

Both parts of the Trail Making Test consist of 25 circles distributed over a sheet of paper. In Part A, the circles are numbered 1 – 25, and the patient should draw lines to connect the numbers in ascending order. In Part B, the circles include both numbers (1 – 13) and letters (A – L); as in Part A, the patient draws lines to connect the circles in an ascending pattern, but with the added task of alternating between the numbers and letters (i.e., 1-A-2-B-3-C, etc.). The patient should be instructed to connect the circles as quickly as possible, without lifting the pen or pencil from the paper. Time the patient as he or she connects the "trail." If the patient makes an error, point it out immediately and allow the patient to correct it. Errors affect the patient's score only in that the correction of errors is included in the completion time for the task. It is unnecessary to continue the test if the patient has not completed both parts after five minutes have elapsed.

Symbol digit paired learning test

This is a test of non-verbal memory. Subjects were asked to learn a list of seven unfamiliar symbols, each paired with a single digit. The task began with the visual presentation of each symbol-digit pair for 3 seconds. Following study of the entire list, the subject was tested by showing the symbol alone and asking him to recall the number paired with it. Each response was followed by immediately by presentation of the correct symbol-digit pair for 3 seconds. Four such test trials were administered, with the order of symbols randomised across trials.

Rey-Osterrieth Complex Figure Recall

Participants are asked to copy the default figure with its 18 features as detailed as possible on a blank piece of paper. When copied correctly, participants can receive two points for each feature resulting in a maximum number of 36. After finishing the copy trial, participants are expected to reproduce the copy from memory on a new blank piece of paper (immediate recall), which is repeated 30 minutes later (delayed recall).

Interpersonal nature of task unknown

Children's Memory Test

Scant information of this test was provided in the study which administered it. A further review of associated literature did not provide any further details of this task either.

Appendix C: Joint thesis project contributions

This thesis was a joint project will fellow UCL Trainee, Christopher MacGregor. Development of the study paradigm, recruitment effort and administering the paradigm across the sample was a joint endeavour. The author of this paper lead the completion of the ethics process and it's amendments, as well as production of study adverts, participant information sheet, consent form and debrief sheet. Christopher MacGregor undertook the computer programming and construction of the online paradigm in the Qualtrics and Prolific platforms. Data collection took place together, whilst data analysis was conducted separately. The current paper used a measure of childhood maltreatment and considered links with social cognition and psychopathology, whilst Christopher MacGregor used measures lending themselves to a focus on ostensive cues, epistemic trust and reflective functioning.

Appendix D: Information sheet for participants

UCL Research Department of Clinical,
Educational & Health Psychology
1-19 Torrington Place
University College London
London
WC1E 7HB

Information Sheet for participation in Research Studies

Research Project Title: Ostensive cuing and implicit learning

Contact details of researchers

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Professor Peter Fonagy (Principal Investigator)
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Invitation

You are being invited to take part in this research project which is being conducted by researchers from the Research Department of Clinical, Educational and Health Psychology

at UCL. You should only participate in this research if you want to. Before you decide to take part, it is important for you to fully understand what the research involves. Please carefully read through the following information and discuss it with others if you wish.

If you have any questions about the research or anything in this information sheet is not clear, please contact one of the researchers or the principal investigator whose contact details can be found at the top of this document.

Who has ethically reviewed the project?

This study has been approved by the UCL Research Ethics Committee (Project ID Number: 19367/001).

Do I have to take part?

It is up to you to decide whether to take part or not; choosing not to take part will not disadvantage you in any way. If you do decide to take part you are still free to withdraw at any time during the research procedure without giving a reason by closing your internet browser. It will be difficult to near impossible to withdraw your results after you have completed the task, as we will not be able to link your results to your e-mail address.

Who are we recruiting?

We are recruiting English-speaking adults, aged 18-60.

Background to the research

This is a PhD project for the Doctorate of Clinical Psychology. We are interested in finding out what influences cognitive processes in adulthood.

What will be asked of me if I decide to take part?
Please inform others in your household that you will be taking part in an online study which will require privacy for the duration AND make them aware of this again, directly before the beginning of the study. You will need minimal distractions in order to focus on the study task.

If you agree to participate, you will be sent a link to an online system, where you will be asked to complete questionnaires about you as a person. Some of the questions ask about mental and emotional wellbeing, and whether you experienced trauma/adverse experiences in childhood.

There is a computer-based word sorting task after this. We want to see how quickly and accurately you can sort word lists. There will be more detailed instructions when you start to study.

The study will take place entirely online. It should take no longer than an hour in total.

What are the possible risks of taking part?

There are no major risks in participating. Some of the questionnaires ask about sensitive topics, such as mental and emotional wellbeing, and experiences of maltreatment and abuse during childhood. Some participants may find these questions upsetting or stress-inducing.

If you experience distress during or after taking part in the study and require support for this, please contact either of the researchers whose contact emails are at the top of this document. Additionally, you may wish to contact your GP, or one of the organisations below for support.

Organisation	Contact details
UCL Disability, Mental Health and Wellbeing Team (This service is available to UCL students only) The Disability, Mental Health and Wellbeing team are here to help by providing information and advice on issues around disability, mental health and wellbeing, and in doing so enhance your access to study. We are made up of a team of specialist advisers that sit within the wider Student Support and Wellbeing department, alongside counsellors and other support staff.	Monday – Friday, 9am-5pm Telephone: **020 7679 0100**
NHS direct (This service is available to all participants) NHS 111 are a 24-hour support line. A trained advisor will ask you some questions and direct you to the most helpful service.	24 hours, 7 days a week. Telephone: **111**
Samaritans (This service is available to all participants) Free listening and support service for anyone who needs to talk, no matter how big or small the concern.	24 hours, 365 days a year. Telephone: **116 123**
Mind (This service is available to all participants) A leading UK mental health charity with numerous information and self-help resources on their website. Information line provides mental health information and signposting to relevant services.	Monday – Friday, 9am-6pm. Information line: **0300 123 3393** Text contact: 86463 E-mail: info@mind.org.uk

Nightline (This service is available to London students only) London Nightline is an anonymous listening and information service run by students in London, for students in London. You can talk to us about anything – big or small – in complete confidence.	6pm-8am, open every night of term. Live chat also available online. Telephone: **(+44) 207 631 0101** Website (live chat): https://nightline.org.uk/

What are the potential benefits of taking part?

There are no direct benefits to you as the participant. Each participant will be entered into a draw to win one of 10 Amazon vouchers (2 x £100, 4 x £50, 4 x £25).

Your will participation will help to advance science in the field of individual differences in adult cognition. If you would like to know the overall outcome and impact of our experiment, please contact the researchers or principal investigator whose contact details are at the top of this document.

How will my data be stored?

All information collected about you during the course of the research (including questionnaires and your task data) will be kept strictly confidential and will be securely stored electronically, using a numbered code to ensure pseudo-anonymity so that you cannot be identified. No video or audio-recording data will be collected during this research. Only researchers directly involved in the study will have access to the data. The data will be used only for informing the research question in this study and the results of the research will be disseminated in peer-reviewed scientific journals, but you will in no way be identifiable from such publications. The data will be destroyed after five years.

All data will be stored in accordance with the Data Protection Act 1998.

What will happen to the results of the research project?

Results of this project will be written up and submitted to the UCL Department of Clinical, Educational and Health Psychology as part of the completion of the Doctorate of Clinical Psychology qualification. The results of the research may be disseminated in peer-review scientific journals, but you will in no way be identifiable in such publications. Participants can contact the researchers via-email to obtain anonymised summaries of the results.

Concerns and complaints

If you are concerned about any elements of this study, or wish to make a complaint relating to your experience of taking part in this study, please contact the Principal Investigator, Professor Peter Fonagy (contact details at top of this document) in the first instance.

If you are not satisfied with the response, please contact UCL Research Ethics Committee at ethics@ucl.ac.uk.

Thank you for considering taking part in this study.

Appendix E: Informed consent for participants

UCL Research Department of Clinical,
Educational & Health Psychology
1-19 Torrington Place
University College London
London
WC1E 7HB

Informed consent form for participation in research studies

Title of Project: Ostensive cuing and implicit learning

Contact details of researchers

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This study has been approved by the UCL Research Ethics Committee. Project ID Number: 19367/001.

Data Protection Privacy Notice:

The data controller for this project will be University College London (UCL). The UCL Data Protection Office provides oversight of UCL activities involving the processing of personal data.

UCL data protection officer: Alex Potts
E-mail: data-protection@ucl.ac.uk

Thank you for your interest in taking part in this research. Before you agree to take part, you must have read the information sheet on the previous page.

If you have any questions arising from the Information Sheet or explanation already given to you, please do not continue and contact the researchers via the e-mail addresses provided above before you to decide whether to join in. You may print screen or copy and paste this consent page, if you wish to have a copy to refer back to.

Participant's Statement

Please read each statement below and tick the circle at the start of the statement if you agree.

o I have read the notes written above and the Information Sheet and understand what the study involves.

o I understand that if I decide at any time that I no longer wish to take part in the study procedure, I can stop the task and withdraw immediately (by closing my internet browser).

o I understand that I can withdraw at any time from the study by closing my browser window but that it will be difficult or impossible to withdraw my data once the task has been submitted.

o I consent to the processing of my personal information (demographic information, information relating to mental health and childhood experiences) for the purposes of this research study.

o I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

o I agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study.

o I agree that my non-personal research data may be used by others for future research.

o I am assured that the confidentiality of my personal data will be upheld through the removal of identifiers.

o I understand that the information I have submitted will be published as a report and I will be sent a copy if requested. Confidentiality and anonymity will be maintained, and it will not be possible to identify me from any publications.

Print name:

Signed:

Date:

Appendix F: Debrief sheet for participants

UCL Research Department of Clinical,
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1-19 Torrington Place
University College London
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Participant Debrief Sheet

Research Project Title: Ostensive cuing and implicit learning

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Background and aims of the study

Thank you for participating in this study concerning individual differences in adult cognition. We are interested in whether subtle cues offered at the start of a learning task influence learning and memory, and whether these subtle cues interact with things like mental health and childhood experience when adults are learning new information.

Participants were allocated to one of four groups, which differed on the level of personalised cues participants received (i.e. some participants were referred to by name at the start of the study, others were not). All participants were then asked to complete an unexpected memory task recalling as many words as possible from the word lists at the start of the study.

You were in group:

1. **No Ostensive (personalised) Cueing** – Participants were not greeted by their name during e-mail correspondence with the researcher prior to the study procedure. They did not meet with a researcher before the task. Their instructions were given in written text from the computer programme. They completed the learning task without any choice around what they would like to be called, and they had no interaction with a researcher or computer character who showed an interest in them as an individual (i.e. asking them what they would like to be called, or asking about studies or work).

2. **Person Ostensive (personalised) Cueing** – Participants were greeted by name during e-mail correspondence with the researcher prior to the procedure. They met with a researcher on Microsoft Teams prior to the study. The researcher called them by their name and expressed an interest in them as an individual prior to the meeting, i.e. asking about their studies or work. The researchers maintained an engaged facial expression in this condition as another personalised cue. Participants in this condition then started the computer task. Their instructions were given in written text from the computer programme.

3. **Computer Ostensive (personalised) Cueing** – Participants were not greeted by name during e-mail correspondence with the researcher prior to the study procedure. They did not speak to the researcher on Microsoft Teams before the study. They received a link to the study, and a computer character gave personalised cues at the start of the study. For example, the computer character asked the person what they would like to be called for the study, and referred to them by their name throughout the study procedure.

4. **Combined Ostensive (personalised) Cueing** – Participants were greeted by name during e-mail correspondence with the researcher prior to the study procedure. They met with a researcher on Microsoft Teams prior to the study. The researcher called them by their name and expressed an interest in them as an individual prior to the meeting, i.e. asking about their studies or work. The researchers maintained an engaged facial expression in this condition as another personalised cue. Participants in this condition then started the computer task. A computer character gave personalised cues at the start of the study. For example, the computer character asked the person what they would like to be called for the study, and referred to them by their name throughout the study procedure.

We think that making interactions more personal may increase the potential for memory and learning. We want to understand more about whether childhood maltreatment influences memory and learning. Our findings will inform understanding about learning throughout the life course.

Participants were not told which group they were allocated to, or that there would be a memory test as this would have influenced results. We hope that this deception has not caused too much distress. There is information about what to do if you have found this study distressing towards the end of this document.

If you are aware of friends or acquaintances also taking part in this study, please do not discuss the study with them until they have also participated as this may bias study results.

Contacts for questions and study findings

If you have any questions further questions regarding the study, please contact the researchers whose contact details are at the top of this document.

If you would like any information about the study findings, please contact the Principal Investigator, Professor Peter Fonagy (contact details at top of this document).

Concerns and complaints

Every effort has been made in the planning and running of this study. If you are concerned about any element of this study or wish to make a complaint relating to your experience of taking part in this study, please contact the Principal Investigator, Professor Peter Fonagy (contact details at top of this document) in the first instance.

If you are not satisfied with the response, please contact UCL Research Ethics Committee at ethics@ucl.ac.uk.

If you found this study distressing

We hope you have not been upset by any of the subjects discussed. However, if any part of this experience has caused you to feel distress and you require support for this, please contact either of the researchers whose contact emails are at the top of this document. Additionally, you may wish to contact your GP, or one of the organisations in the table below for non-urgent support.

If you are in immediate danger of hurting yourself or others:

- Go directly to the **Accident & Emergency (A&E)** department of your local hospital to get help
- **UCLH** is the nearest A&E department to UCL's main campus
- Call **999** to request an ambulance if you are unable to reach the hospital yourself

Organisation	Contact details
UCL Disability, Mental Health and Wellbeing Team (This service is available to UCL students only) The Disability, Mental Health and Wellbeing team are here to help by providing information and advice on issues around disability, mental health and wellbeing, and in doing so enhance your access to study. We are made up of a team of specialist advisers that sit within the wider Student Support and Wellbeing department, alongside counsellors and other support staff.	Monday – Friday, 9am-5pm Telephone: **020 7679 0100**

NHS direct (This service is available to all participants) NHS 111 are a 24-hour support line. A trained advisor will ask you some questions and direct you to the most helpful service.	24 hours, 7 days a week. Telephone: **111**
Samaritans (This service is available to all participants) Free listening and support service for anyone who needs to talk, no matter how big or small the concern.	24 hours, 365 days a year. Telephone: **116 123**
Mind (This service is available to all participants) A leading UK mental health charity with numerous information and self-help resources on their website. Information line provides mental health information and signposting to relevant services.	Monday – Friday, 9am-6pm. Information line: **0300 123 3393** Text contact: 86463 E-mail: info@mind.org.uk
Nightline (This service is available to London students only) London Nightline is an anonymous listening and information service run by students in London, for students in London. You can talk to us about anything – big or small – in complete confidence.	6pm-8am, open every night of term. Live chat also available online. Telephone: **(+44) 207 631 0101** Website (live chat): https://nightline.org.uk/

Thank you for your participation!

Appendix G: Maltreatment and Abuse Chronology of Exposure scale (MACE)

Sometimes parents, stepparents or other adults living in the house do hurtful things.
If this happened during your childhood (first 18 years of your life) please provide your best estimate of your age at the time(s) of occurrence.
Please check all ages that apply.

For example item 1. Swore at you, called you names, said insulting things like your "fat", "ugly", "stupid", etc. more than a few times a year. ● Yes ○ No

If at ages 6-8 your father swore at you and at ages 8-10 your mother insulted you, and at age 17 your mother's new live-in boyfriend called you names; you would check off as follows:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
					✓	✓	✓	✓	✓							✓	

1. Swore at you, called you names, said insulting things like your "fat", "ugly", "stupid" etc. more than a few times a year. ○ Yes$_1$ ○ No$_0$
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

2. Said hurtful things that made you feel bad, embarrassed or humiliated more than a few times a year. e check all ages that apply. ○ Yes$_1$ ○ No$_0$
Pleas

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

3. Acte in a way that made you afraid that you might be physically hurt. ○ Yes$_1$ ○ No$_0$
Pleas check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

4. Thre atened to leave or abandon you. ○ Yes ○ No$_0$
Pleas e check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

5. Loc ed you in a closet, attic, basement or garage. ○ Yes$_1$ ○ No$_0$
Pleas e check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

6. Inte tionally pushed, grabbed, shoved, slapped, pinched, punched or kicked you. ○ Yes$_1$ ○ No$_0$
Pleas e check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

7. Hit you so hard that it left marks for more than a few minutes.
Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

8. Hit you so hard, or intentionally harmed you in some way, that you received or should have received medical attention.
Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

9. Spanked you on your buttocks, arms or legs.
Please check all ages that apply.

Yes1 ○ No ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

10. Spanked you on your bare (unclothed) buttocks.
Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

11. Spanked you with an object such as a strap, belt, brush, paddle, rod, etc.
Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

12. Made inappropriate sexual comments or suggestions to you.
Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

13. Touched or fondled your body in a sexual way.
Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

14. Had you touch their body in a sexual way.
Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Sometimes parents, stepparents or other adults living in the house do hurtful things to your siblings (brother, sister, stepsiblings).
If this happened during your childhood (first 18 years of your life) please provide your best estimates of your age at the time(s) of occurrence.
Please check all ages that apply.

15. Hit your sibling (stepsibling) so hard that it left marks for more than a few minutes.
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

○ Yes1 ○ No0

16. Hit your sibling (stepsibling) so hard, or intentionally harmed him/her in some way, that he/she received or should have received medical attention.
Please check all ages that apply.

○ Yes1 ○ No0

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

17. Made inappropriate sexual comments or suggestions to your sibling (stepsibling).
Please check all ages that apply.

○ Yes1 ○ No0

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

18. Tou :hed or fondled your sibling (stepsibling) in a sexual way.
Pleas e check all ages that apply.

○ Yes1 ○ No0

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Sometimes adults or older individuals NOT living in the house do hurtful things to you.
If this happened during your childhood (first 18 years of your life) please provide your best estimates of your age at the time(s) of occurrence.
Please check all ages that apply.

19. Had you touch their body in a sexual way.
Please check all ages that apply.

○ Yes1 ○ No0

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

20. Actually had sexual intercourse (oral, anal or vaginal) with you.
Please check all ages that apply.

○ Yes1 ○ No0

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Sometimes intense arguments or physical fights occur between parents, stepparents or other adults (boyfriends, girlfriends, grandparents) living in the household.
If this happened during your childhood (first 18 years of your life) please provide your best estimates of your age at the time(s) of occurrence.
Please check all ages that apply.

21. Saw adults living in the household push, grab, slap or throw something at your mother (stepmother, grandmother). ○ Yes1 ○ No0
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

22. Saw adults living in the household hit your mother (stepmother, grandmother) so hard that it left marks for more than a few minutes. ○ Yes1 ○ No0
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

23. Saw adults living in the household hit your mother (stepmother, grandmother) so hard, or intentionally harm her in some way, that she received or should have received medical attention. ○ Yes ○ No
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

24. Saw adults living in the household push, grab, slap or throw something at your father (stepfather, grandfather). ○ ○
Please check all ages that apply. Yes1 No0

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

25. Saw adults living in the household hit your father (stepfather, grandfather) so hard that it left marks for more than a few minutes. ○ Yes1 ○ No0
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Sometimes children your own age or older do hurtful things like bully or harass you.
If this happened during your childhood (first 18 years of your life) please provide your best estimates of your age at the time(s) of occurrence.
Please check all ages that apply.

26. Swore at you, called you names, said insulting things like your "fat", "ugly", "stupid", etc. more than a few times a year. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

27. Said hurtful things that made you feel bad, embarrassed or humiliated more than a few times a year. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

28. Said things behind your back, posted derogatory messages about you, or spread rumors about you. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

29. Intentionally excluded you from activities or groups. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

30. Acted in a way that made you afraid that you might be physically hurt. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

31. Threatened you in order to take your money or possessions. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

32. Forced or threatened you to do things that you did not want to do. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

33. Intentionally pushed, grabbed, shoved, slapped, pinched, punched, or kicked you. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

34. Hit you so hard that it left marks for more than a few minutes. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

35. Hit you so hard, or intentionally harmed you in some way, that you received or haveshould received medical attention. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

36. Forced you to engage in sexual activity against your will. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

37. Forced you to do things sexually that you did not want to do. Please check all ages that apply.

Yes1 ○ No ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Please indicate if the following happened during your childhood (first 18 years of your life). Please provide your best estimates of your age at the time(s) of occurrence.
Please check all ages that apply.

38. You felt that your mother or other important maternal figure was present in the household but emotionally unavailable to you for a variety of reasons like drugs, alcohol, workaholic, having an affair, heedlessly pursuing their own goals. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

39. You felt that your father or other important paternal figure was present in the household but emotionally unavailable to you for a variety of reasons like drugs, alcohol, workaholic, having an affair, heedlessly pursuing their own goals. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

40. A parent or other important parental figure was very difficult to please. Please check all ages that apply.

○ ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Yes1 ○ No0 ○

41. A parent or other important parental figure did not have the time or interest to talk to you. Please check all ages that apply.

Yes1 ○ No0 ○

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

42. One or more individuals in your family made you feel loved.
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

○ Yes1 ○ No0

43. One or more individuals in your family helped you feel important or special.
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

○ Yes1 ○ No0

44. One or more individuals in your family were there to take care of you and protect you. e check all ages that apply.
Pleas

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

○ Yes1 ○ No0

45. One or more individuals in your family were there to take you to the doctor or Emergency Room if the need ever arose, or would have if needed.
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

○ Yes1 ○ No0

Please indicate if the following statements were true about you and your family during your childhood, and your age at the time(s) you felt this to be true.
Please check all ages that apply.

46. You didn't have enough to eat.
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

○ Yes1 ○ No0

47. You had to wear dirty clothes.
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

○ ○ No0

48. You felt that you had to shoulder adult responsibilities.
Please check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

○ ○ No0 Yes1

49. You felt that your family was under severe financial pressure.
Pleas
e check all ages that apply.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

○ ○ Yes1 No0

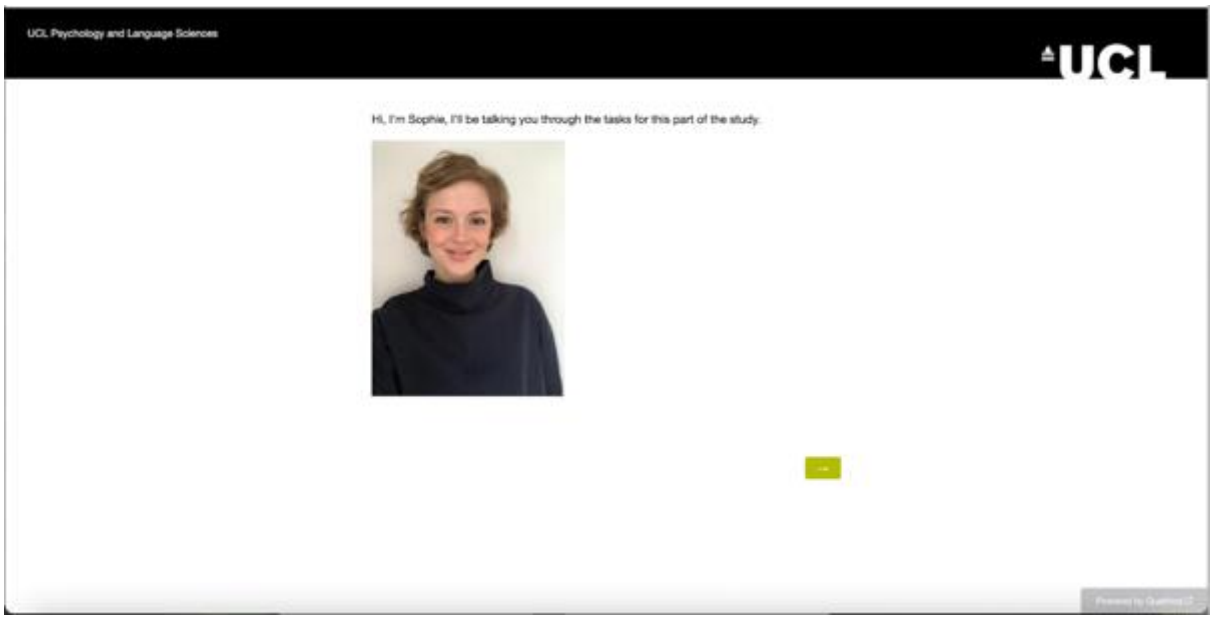
50.	One or more individuals kept important secrets or facts from you. Please check all ages that apply. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	○ Yes1	○ No0
51.	Peo ıle in your family looked out for each other. Please check all ages that apply. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	○ Yes1	○ No0
52.	You· family was a source of strength and support. Please che 1 ck all ages that apply. 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	○ Yes1	○ No0

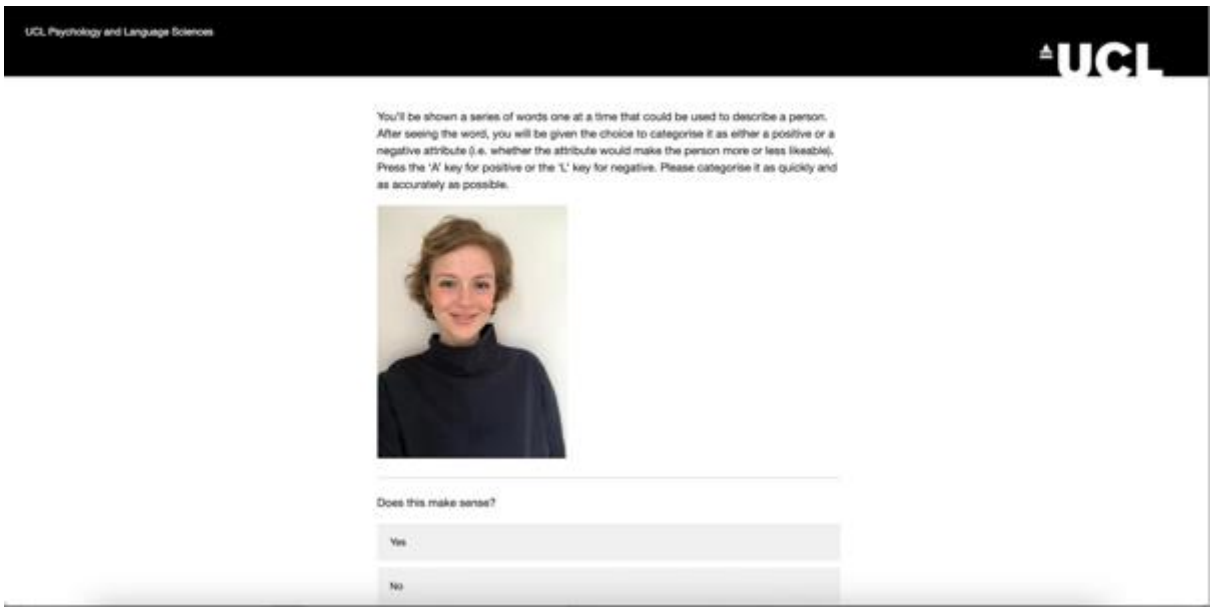
Appendix H: Word list for experimental task

Trial words	
Positive	Negative
Self-disciplined (Positive)	Underhanded (Negative)
Honourable (Positive)	
Earnest (Positive)	
Wise (Positive)	

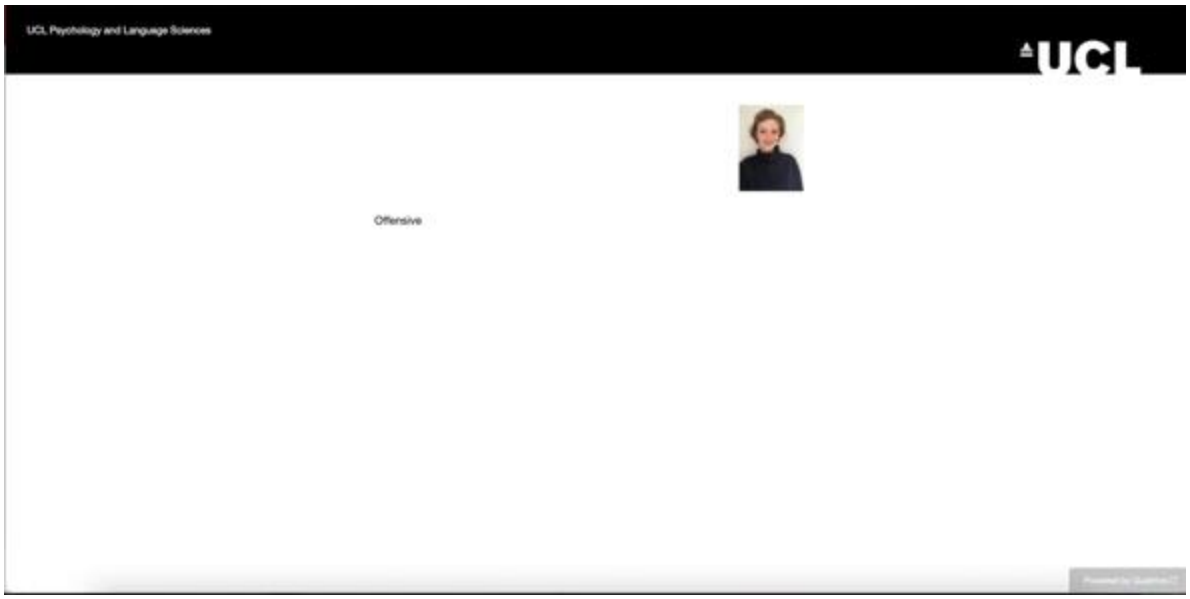
Test words	
Positive	Negative
Kind	Cruel
Brilliant	Spiteful
Happy	Insolent
Likeable	Offensive
Trustworthy	Dislikeable
Intelligent	Hostile
Mature	Abusive
Efficient	Greedy
Gentle	Liar
Unselfish	Thoughtless
Loyal	Cold
Dependable	Phony
Understanding	Unfriendly
Polite	Obnoxious
Good	Rude
Warm	Dishonest
Sly	Selfish
Friendly	Vulgar
Truthful	Unkind
Kind-hearted	Narrow-minded
Honest	Mean
Admirable	Ill-tempered
Reliable	Malicious
Thoughtful	Unethical
Sincere	Nosey

Appendix I: Avatar providing word task instructions for all participants

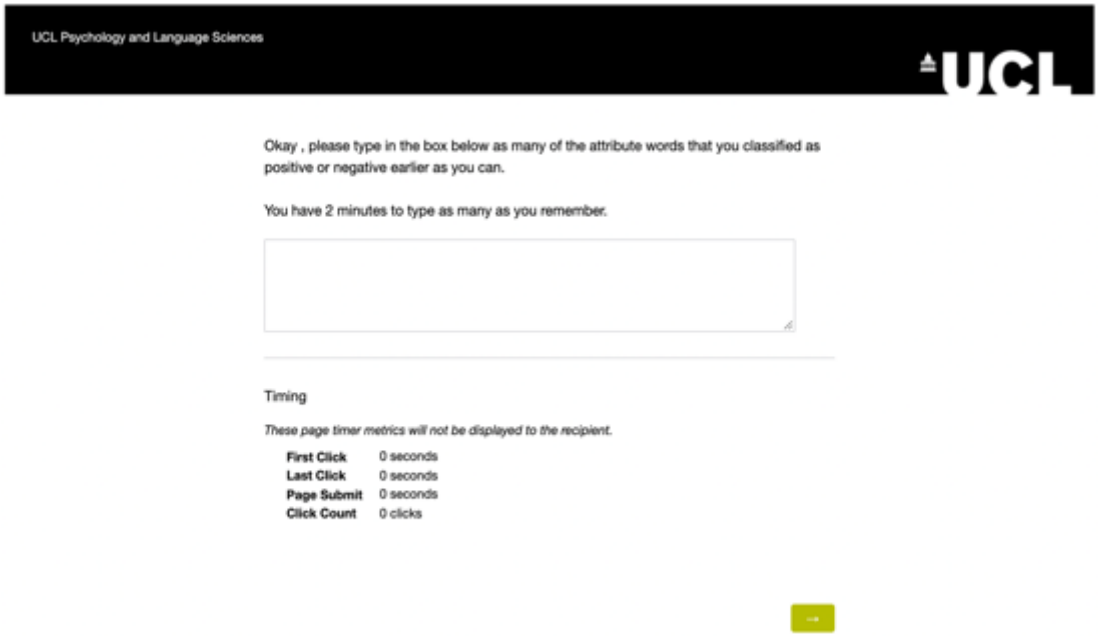




Appendix J: Word presentation followed by keyboard response options



Appendix K: Incidental recall instructions



Appendix L: Script for person ostensive cue conditions

- Hi, how are you?

- My name is Sophie, I'll be running through the research project with you for about 5-10 minutes, and then I'll give you the link in the chat to access the survey. What would you like me to call you? PARTICIPANT NAME1? Okay, brilliant.

- PARTICIPANT NAME, where are you in the world? It's strange not being able to meet people in person [smile]!

- PLACE? Ah okay. Are you studying or working there or? [comment on studying/working, how're you finding it?]

- Okay PARTICIPANT NAME, I'm going to give you a brief rundown of the study now, if that's okay?

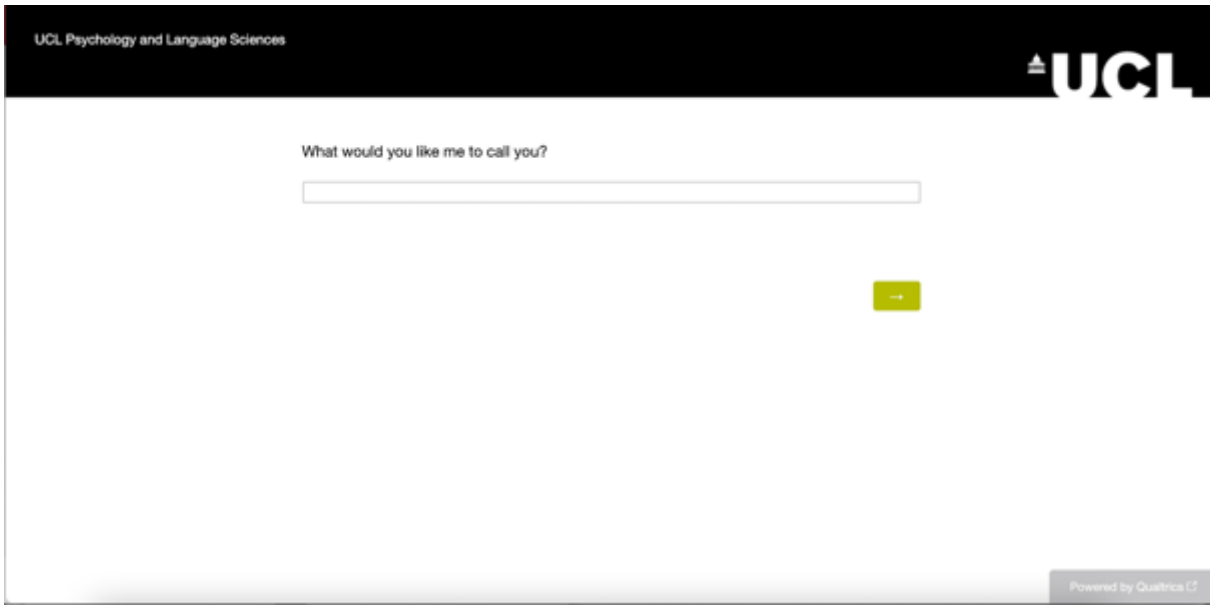
- So all of this is in the information sheet we sent out, but I'm going to give you a link in the chat box after we're done to Qualtrics, which is the survey platform we use. Once you open it up, you'll be asked to complete some demographics at the start, so questions like your age and education level. But [PARTICIPANT NAME] this is all anonymous, so the survey is not linked to this meeting.

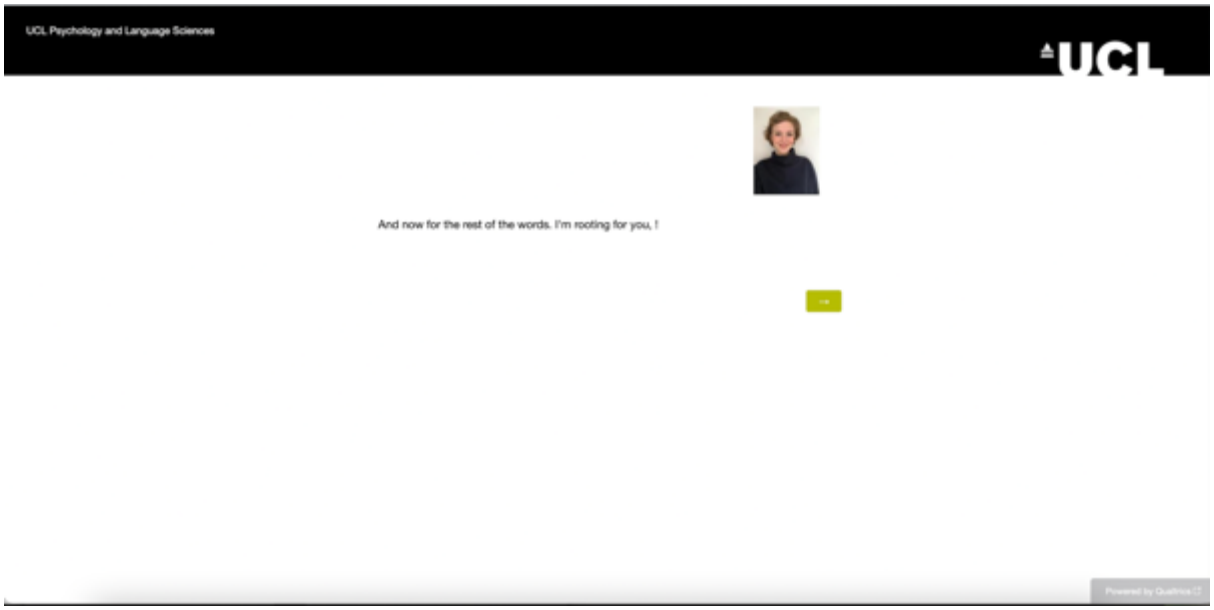
- You will then have to complete some questionnaires which ask about you as a person, and afterwards there will be a short word sorting task. This will all be explained in the survey once you get there.

- At the end of the survey there will be a debrief form with some further resources and a bit more of an explanation of the study. In total it should take about 30 minutes. How does that sound? Do you have any questions?

- Okay, I'm going to put the link into the chat now and make sure you access it from a computer or laptop. Okay, thanks for your time, hope it goes well PARTICIPANT NAME!

Appendix M: Examples of computer ostensive cues





Appendix N: Maltreatment and PAI_Total Spearman's Rho

Table 1:

Spearman's Rho correlations for global scores of childhood maltreatment and psychopathology scores without controlling for age and education level

	Variable	1	2	3	4
1.	BSI_GSI	-			
2.	PAI_Total	.734	-		
3.	MACE multiplicity	.241	.262	-	
4.	MACE severity	.278	.318	.911	-

Note: All correlations significant at the 0.01 level (2-tailed)

Table 2:

Spearman's rho correlations for subtypes of childhood maltreatment and psychopathology scores (without age and education as covariates)

	Variable	1	2	3	4	5	6	7	8	9	10
1.	BSI_GSI	-									
2.	PAI_Total	.734|**	-								
3.	Parental physical maltreatment	.179**	.184**	-							
4.	Parental verbal abuse	.229**	.249**	.535**	-						
5.	Parental non-verbal emotional abuse	.206**	.232**	.276**	.445**	-					
6.	Emotional neglect	.023	.148*	.243**	.415**	.449**	-				
7.	Physical neglect	.108	.182**	.099	.240**	.272**	.424**	-			
8.	Peer physical bullying	.160*	.138*	.339**	.282**	.344**	.074	.60	-		
9.	Peer emotional abuse	.299**	.281**	.252**	.391**	.356**	.147*	.053	.593**	-	
10.	Sexual abuse	-.002	.049	.106	.198**	.164*	.120	.105	.094	.118	-

Note:
**Correlation significant at the 0.001 level (2-tailed)
*Correlation significant at the 0.05 level (2-tailed)