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Understanding the Impact of Trauma on Executive Function in Care
Experienced Children: Neurodevelopment, Staff Training and
Attributions.

Louise Hendry

Submitted in part fulfilment of the degree of Doctorate in Clinical Psychology

DClinPsychol

The University of Edinburgh

May 2019

Declaration of Own Work

Name: Louise Hendry

Title of Work: Understanding Trauma and Executive Function in Care Experienced Children: Neurodevelopment, Staff training and Attributions.

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Portfolio Thesis Abstract

Background

Children who are cared for away from their biological families represent a highly vulnerable population where early childhood trauma, abuse, and neglect are highly prevalent. As technology and theory have advanced it has now been recognised that traumatic experiences in early life can lead to a variety of neurodevelopmental differences, deficits, and delays. Importantly, executive function - a set of cognitive abilities which allow individuals to plan, monitor and adjust their behaviour in order to interact with their environment effectively - has been shown to be particularly sensitive to the impact of traumatic experiences in youth. The core skills in executive function are recognised as cognitive flexibility, working memory, and inhibitory control, skills which have been evidenced to be significantly reduced in children and young people in care, even in comparison with other traumatised youth. However, the specific mechanisms and variables which influence this vulnerability for children within the care system have yet to be understood.

Aims

This thesis therefore aims to explore the combined impact of trauma and experience of alternative care on the development of executive function. This will include a systematic review of the evidence around executive function difficulties in children in alternative care, and two empirical articles, looking at the impact of an online training course for residential childcare workers which is focussed on the developmental impact of trauma on the executive function of children in care and how this can be supported. The two papers present the acceptability and feasibility of the course, as well as the effect of the course on knowledge gain and the attributions of staff towards challenging behaviour.

Methods

In Chapter One, a systematic search for papers relating to the executive function of children in care who have experienced trauma was conducted across eight bibliographic databases. Sixteen papers were quality assessed and their results were synthesised in a narrative format. Chapters Two, and Three, describe the development and evaluation of an online training course in executive function for residential workers working with children in care. In

Chapter Two, the course is evaluated for acceptability, feasibility and its impact on knowledge gain. In Chapter Three, the course is evaluated for its impact on the attributions of residential childcare workers towards challenging behaviour.

Results

It was not possible to draw definitive conclusions from the systematic review due to heterogeneity in the papers included. However, the overall direction of results, indicate that children within the care system are not only highly vulnerable to executive functioning difficulties due to their early experiences, but that their specific experiences within the care system may further impact upon the development of these skills. The empirical papers demonstrated that online training around the neurodevelopmental impact of trauma on executive function was feasible and acceptable to residential support workers. The course significantly increased knowledge of executive function after completion and altered staff attributions towards challenging behaviour, by significantly reducing perceptions that the causes of challenging behaviour are internal to the child and within their control, and significantly increasing perceptions that the causes are global and stable across the child's life. Implications for clinical practice, future training, and ongoing research are discussed.

Lay Portfolio Thesis Summary

Children who are cared for away from their biological families have often experienced negative events in their early life, such as emotional and physical neglect, and physical and sexual abuse. These negative experiences are known to be traumatic for those who experience them. When people go through traumatic experiences as children, it can have an impact on how they develop, because the brain is focussed on responding to the difficult event, rather than developing more complicated skills such as planning their actions, maintaining attention, and solving problems. They may also find it difficult to learn to manage their emotions. These complex skills are collectively known as executive function. Recently we have been able to study executive function more closely, using advanced brain scanning techniques and specific assessments for the skills affected. Although we now know more about the impact of traumatic experiences on development, there has not been very much research looking at this issue specifically for children in care.

This project will look at the evidence for executive function difficulties for children who are cared for by local services over three separate chapters. Chapter One describes a systematic search for all the evidence to date and looks at how this can be combined to explain the relationship between traumatic experiences, time spent in the care system, and executive function skills. The remaining part of the project will describe the creation and delivery of an online training course that has been produced for residential childcare workers about executive function skills and how they are affected by trauma. The course will also look at how these workers can learn to recognise these difficulties and support the children in their care if they struggle with these skills. There are two sections of this part of the project which explore how successful the course has been.

The first part (Chapter Two) looks at whether it was possible to develop the training, whether support workers reported that they liked and needed the training, and finally whether the course successfully increased their knowledge. This was achieved by asking residential workers to complete the course, as well as testing their knowledge before and after they completed the training to compare any change over time. Residential workers were also asked about their job role, how long they have worked in this area, and their qualifications, to see if these have any impact on their knowledge both before and after the course. The workers who completed the course were also asked to give feedback about how they found the course, what went well and what could be different in future. The results of this work

show that residential childcare workers liked the course and successfully gained knowledge from it.

The second part (Chapter Three) looks at whether increasing this knowledge led to any change in the beliefs that residential care staff hold about children in care, in particular, when children behave in ways their carers consider to be a problem. Carers' beliefs have been gathered using questionnaires which look at what someone believes about problematic behaviour, which were completed both before and after the training course. The types of skills children may struggle with can sometimes look like the child is misbehaving. For example, if they do not follow an instruction because they cannot work out how to complete the task, it can look like a deliberate action which may lead to arguments between the young person and those who look after them. However, if the carers know that children and young people might struggle with things like this, it may lead to them thinking differently. After the course, we hoped that carers would be able to consider that the child might not be behaving badly but perhaps require more support to achieve success. Changing carers' beliefs like this could lead to children feeling happier and staying with their carers for longer, which is important for them to have the best opportunity to develop. Looking at the beliefs before and after the course, it was found that completing the course changed the carer's attitudes, by making them less likely to think the cause of challenging behaviour is to do with something internal to the child or that the child is in control of their behaviour, and making them more likely to think that they may experience the same cause of challenging behaviour in lots of areas of their life.

1 CHAPTER ONE: Trauma and Executive Function in Care Experienced Children: A Systematic Review of the Evidence

Authors: Louise Hendry ^{a, b}, and Dr. Emily Taylor ^a

Affiliations:

- a) The School of Health in Social Science, University of Edinburgh, Edinburgh, Scotland, UK, EH8 9AG
- b) Looked After Children’s Psychology Department, NHS Forth Valley, Falkirk, Scotland, UK, FK1 4HA

Corresponding Author:

Louise Hendry – Looked After Children’s Psychology Department, NHS Forth Valley, Camelon Education Centre, Abercrombie Street, Camelon, Falkirk, Scotland, UK, FK1 4HA.
Louise.Hendry1@nhs.net

This chapter is written according to ‘Child Neuropsychology’ author guidelines for review articles, with the exception of tables and figures which are included in the text for clarity (see Appendix A).

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Abstract

Background: Children in care represent a population where early childhood experiences of trauma, abuse, and neglect are highly prevalent. These experiences are known to be associated with reduced executive functioning in childhood and into adulthood. Previous reviews have identified that the executive functioning of children in care may be reduced, even in comparison with other traumatised youth. However, there is little evidence that explores the specific profile of difficulties demonstrated by children in local care services, or how the experience of being in care may increase or decrease the risk of these difficulties.

Aims: This review aims to consider the prevalence of executive function difficulties in maltreated children in care and explore the impact of the care experience on the development of these difficulties.

Method: A systematic search for papers relating to the executive function of children in care who have experienced trauma was conducted across eight bibliographic databases. Sixteen papers were quality assessed and their results were synthesised in a narrative format.

Results: Overall, the results support the existence of a relationship between abuse, neglect and trauma, care experience and reduced executive functioning. The evidence indicates that, not only are children in care highly vulnerable to executive function difficulties due to their pre-care experiences but that their experiences within the care system, such as high levels of placement instability, may further impact upon these difficulties.

Keywords: Executive Function, Alternative Care, Systematic Review, Neurodevelopment, Trauma.

1.1 Introduction

Previous meta-analyses have shown that exposure to traumatic circumstances during childhood is linked to a wide number of emotional, physical and psychological difficulties. Most notably, trauma exposure is associated with short-term effects such as post-traumatic stress, internalising and externalising problems in childhood (Fowler, Tompsett, Braciszewski, Jacques-Tiura, & Baltes, 2009), as well as more pervasive effects in adulthood such as depressive symptoms, suicidal behaviour, increased use of narcotics, sexually transmitted diseases (Norman, et al., 2012) and a range of physical health problems (Wegman & Stetler, 2009). In addition, previous reviews have identified that trauma exposure impacts on cognitive functioning, more specifically on a range of skills known as Executive Function (EF; Kavanaugh, Dupont-Frechette, Jerskey, & Karen, 2017; Malarbi, Abu-Rayya, Muscara, & Stargatt, 2017). This review aims to consider the prevalence of EF difficulties in maltreated children in care and explore the impact of the care experience on the development of these difficulties.

1.1.1 Executive Function

EF is the collective name for a set of metacognitive capacities responsible for guiding, directing, and managing, cognitive, emotional, and behavioural functions (Gioia, Isquith, Guy, & Kenworthy, 2000a; Lezak, Howieson, Loring, & Fischer, 2004). Together these skills allow an individual to perceive and respond to their environment, formulate future goals, and consider the consequences of an action, to respond in an integrated way to achieve a particular purpose (Baron, 2004). Developed EF also promotes the ability to understand another perspective and respond appropriately based on this information (Strauss, Sherman, & Spreen, 2006). In contrast, impaired EF has been linked with the development of problem behaviour in children. Specifically, the poor response inhibition, low reactive control, and low resiliency associated with impaired EF has been hypothesised to contribute to the development of internalising and externalising problems (Martel, Nikolas, & Nigg, 2007) which are in line with the typically described difficulties following trauma.

The skills which comprise EF are multiple and complex, including response inhibition, organisation, cognitive flexibility, memory, attention, and regulation of emotion. The pre-frontal cortex, which has been shown to be particularly sensitive to the effects of trauma (De Bellis, 2005), has been identified in the use of these skills. However, different regions of the

prefrontal cortex are activated for different tasks and distinct developmental pathways are identified for the varied executive processes (Anderson, 2002; Best, Miller & Jones, 2009). Therefore, these skills cannot arguably be subsumed into one overarching EF. Most research suggests that EF processes in youth are distinct, yet moderately associated skills (for e.g. Best et al., 2009; Miyake et al., 2000). Empirical neuropsychological research differentiates primarily between three EFs, inhibition, working memory and cognitive flexibility, which are considered to be the core EFs from which higher-level functions such as reasoning and planning develop (Op den Kelder, Van den Akker, Geurts, Lindauer, & Overbeek, 2018). Therefore, this review will focus primarily on exploring these concepts.

1.1.2 Trauma and Executive Function

The development of executive function is likely to be affected by a variety of factors including genetic, hereditary and environmental components. Indeed, evidence suggests that individual differences in executive function may be strongly driven by genetic differences (Barnes et al., 2011). Evidence from twin studies has highlighted that components of executive function including sustained attention, error processing and response inhibition, are highly heritable and influenced by individual genetic differences (e.g. Polderman et al., 2006; Albrecht et al., 2008; Friedman, et al., 2008). However, genetics alone has been unable to explain all variation observed within individual development. One notable environmental component that has been a focus of recent research is exposure to developmental trauma.

Trauma exposure is believed to influence EF by impacting underlying neurobiological mechanisms. Commonly, the most affected brain regions in maltreated young people are the prefrontal cortex, orbitofrontal cortex, anterior cingulate cortex, and amygdala (Cowell, Cicchetti, Rogosch, & Toth, 2015; De Bellis & Thomas, 2003; Teicher & Samson, 2016). All of these are also activated during inhibition, working memory and emotional regulation tasks, indicating these neural networks are associated with EF and likely to be affected by trauma exposure (Teicher & Samson, 2016). Previous reviews have also shown that trauma-exposed and maltreated young people perform more poorly on tasks of EF than controls (Kavanaugh et al., 2017; Malarbi et al., 2017). Op den Kelder et al. (2018), completed a meta-analysis of trauma and EF which sought to identify moderators of this relationship. They identified that within a trauma-exposed youth population, those who had been exposed to violence/ abuse and adopted/fostered young people demonstrated lower levels of inhibition and

adopted/fostered youth showed lower levels of cognitive flexibility. They hypothesised that this was likely to be due to the prolonged nature of abuse experienced by children in these categories, as the earlier the onset and the more prolonged exposure to trauma has been, the stronger the impact is (e.g. Cook et al., 2005; Bruce et al., 2013; Cowell et al., 2015; Teicher & Samson, 2016).

1.1.3 Development of Executive Function

The nature, onset, and duration of traumatic experiences are logical mediators for the brain's developmental response, as the development of the systems in the brain, including those associated with EF, are known to be experience dependent. The connections between the orbitofrontal cortex, the anterior cingulate and the amygdala, which are essential for EF, are actively formed during the first 18-months of a child's life and continue to develop as they mature, including well into early adulthood (see Grossmann, 2013 for a review). The orbitofrontal cortex and the anterior cingulate are also involved in the modulation of the amygdala, which governs the body's stress response, the hypothalamic–pituitary–adrenocortical (HPA) axis (Hughes & Baylin, 2012, p27). As such they are influenced by early experiences of physiological arousal.

Early regulation of the HPA axis relies heavily on the presence of an attuned and responsive primary caregiver (Gerhardt, 2004 p.39; Silver, 2013, p193). Children who experience this type of care have their stress-responses soothed in a consistent way, which maintains the balance of cortisol within the brain and develops mechanisms for stress regulation which are protective for later development. In the absence of a responsive attachment figure or presence of an inconsistent one, children's HPA-axis may become chronically over-activated or under-responsive (Frodl & O'Keane, 2013; McCrory et al., 2011; McEwen, 2012; McLaughlin, Sheridan, & Lambert, 2014). The dysregulation of this system is then associated with elevated or blunted cortisol production (Kertes, Gunnar, Madsen, & Long, 2008), which primes the child's responsiveness to stress in their environment. Children, who cannot regulate their stress response often present with anxious or aggressive behaviour, and they may struggle to use appropriate avenues to get their need for soothing met (Silver, 2013). These patterns of behaviour are often unaccepted by caregivers, who remain distant or unreliable which reinforces the child's experience of the care experience and subsequently their neurodevelopmental difficulties (National Scientific Council on the Developing Child,

2012; Perry, 2009; Stinehart, Scott, & Barfield, 2012). This type of repeated poor care experience leads to a particular presentation known as developmental or complex trauma (van der Kolk et al., 2009).

1.1.4 Children in Care and Executive Function

Notably, for children whose developmental experience of trauma leads to the child being removed from their biological home, the impact of these difficulties may be even more pronounced. Care experienced children's pre-care experiences are typically characterised by trauma and neglect, which, as outlined above, are likely to influence their development. In addition, the experience of entering the care system is associated with an increased likelihood of insecure or disorganised attachments (Howe & Fearnley, 2003; Aldgate & Jones, 2006) which are associated with dysregulation of the HPA-axis. Therefore, due to the combination of early trauma experience and care-experience, these children appear to be more vulnerable to the development and perpetuation of EF difficulties (Op den Kelder et al., 2018).

Care away from home includes many formal and informal variations, internationally this is known as "alternative care", in either family-based (foster care or kinship care) or residential care settings (United Nations Guideline, 2009; UN). When exploring the potential mediators of the relationship between trauma and EF, one meta-analysis recognised that children who have been adopted or placed in foster care have also demonstrated reduced EF in comparison with other trauma-exposed youth (Op den Kelder et al., 2018), demonstrating a specific vulnerability within this population. However, the mechanisms of increased vulnerability to EF difficulties within children in care are yet to be explored, as these variables were missing in a large percentage of the review sample and care experience was not a primary focus of the paper. Notably, the impact of trauma on EF for children in non-institutional residential care, an arguably more complex group of young people, has also not yet been considered.

Residential care has been defined by the UN as care provided in "any non-family-based group setting, such as places of safety for emergency care, transit centres in emergency situations, and all other short and long-term residential care facilities, including group homes." (UN, Guidelines, 2009). In a consultation by the Children's Right International Network (Cantwell, 2010) it was acknowledged that this is a wide-ranging definition which can include other

kinds of care, including both family-like residential care settings and large institutions, which allows for a large amount of variance between provisions. The consultation recommended separating institutional care - meaning homes with more than 10 children and residential care. They refined the definition of residential care to be “a group-living arrangement in a specially designed or designated facility where salaried staff or volunteers ensure care [on a shift basis] for children who cannot be looked after by their family due to the latter’s inability or unwillingness to do so” (Cantwell, 2010. p.11). The latter definition shall be used by this review.

Generally, care services have begun to prioritise the provision of kinship or foster care, which often means residential care is considered as a last resort, used in only the most complex of cases (Berridge, Biehal, & Henry 2012). Children in residential care are also likely to have experienced multiple placement breakdowns (Hart, La Valle, & Holmes, 2015). The loss of any caregiver relationship can be considered a traumatic experience within itself (Van der Kolk et al., 2009), and it is frequently the most troubled children who move most often, which diminishes their chances of developing a trusting carer relationship and compounds their vulnerability for difficulties (McAuley & Davis, 2009). Despite this EF difficulties for children in residential care have not been explored in any previous review.

The Present Study

This review therefore aims to consider the relationship between trauma and EF in the care experienced population. In order to inform clinical approaches and diagnostic practices in this population, the review will focus on the relative level of difficulty within this population in comparison to community controls and other maltreated youth, the specific profile of difficulty among the core EF skills and the factors associated with the care experience which may contribute to any reduction in EF skills for this population.

1.2 Method

A systematic review of published and grey literature sources was conducted with guidance from relevant sources (Charrois, 2015; University of York Centre for Reviews and Dissemination, 2009; Jahan, Naveed, Zeshan, & Tahir, 2016). Prior to conducting the review, a preliminary search of the current evidence base and the International Prospective Register of Systematic Reviews (PROSPERO) was conducted, to identify any previous or in-progress

reviews of a similar nature. None were identified and the intended protocol for this review was registered with PROSPERO in March 2018 (Appendix B).

1.2.1 Search Process

The review process followed PRISMA guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009). The electronic databases: PsycINFO, MEDLINE, EMBASE, PSYCARTICLES, OVID full Journals, ERIC, and PILOTS were searched from 23rd October 2018 to the earliest available dates, additionally the electronic COCHRANE library and database of theses was also searched. Search terms relating to the population and phenomena of EF and trauma were identified and included as follows:

(Trauma or Abuse or Neglect) AND (Executive Functio* or Cognitive Abili* or Cognitive Functio* or Cognitive Def*) AND (Looked After Chil* or "Child Care" or LAC or LAAC or institutio* or residential or Foster).

These terms were searched for in titles, abstracts, research tags and subject headings in each database. Only English language databases were searched, so although English was not always the primary language, only articles available in English were included. The search strategy was the same for all databases, except for small changes of syntax where necessary. The truncation '*' was used to improve the sensitivity of the search. No records which proceeded beyond de-duplication or initial screening were identified in MEDLINE, PSYCARTICLES or the Cochrane Library.

1.2.2 Study Selection

Based on pilot searches, it was predicted that quality published research would be minimal. Therefore, the inclusion criteria have been designed to be inclusive of any relevant evidence to the primary research questions, with this in mind, non-peer reviewed papers have been included throughout. During initial abstract and title screening, all studies which potentially included a care population and an assessment of cognition were included regardless of care setting or type of assessment completed. Full-text screening then took place and studies were excluded against the below criteria. Only empirical research has been included within the final sample, Reviews, book chapters, guidelines, and position papers, where identified, have been hand searched for appropriate references which have then been considered against the inclusion and exclusion criteria outlined.

Population Inclusion Criteria

The term 'alternative care' may include a variety of settings with a large amount of heterogeneity across international settings (United Nations, 2009). Although this may pose a challenge for coherence of evidence, research which explicitly states an out-of-home population of participants has been included, as exploration of the characteristics of various care settings can be supported in data synthesis if required. This includes kinship care, foster care, and residential care. Papers where individuals have been adopted from these settings are also included, as it is likely this represents an equivalent population sample. However, studies where participants were adopted from, or residing in, international institutional care have been excluded, due to expected differences in care experience and replication of prior research. A recent systematic review has summarised the evidence regarding EF for post-institutionalised children (Merz et al., 2016), during the current systematic search only three further papers, each published in 2018, were identified, therefore a further review of this evidence was deemed unlikely to further the collective understanding.

Children may be taken into care at any age between 0-18 years-old, although in some countries this is capped at 16 or extended to 21-years-old. Therefore, studies with participants aged 0-18 years old were included in the scope of this review; studies where participants had historical experience of care but who were over the age of 18 at the time of the research were excluded.

Although children in care across the UK are likely to have experienced traumatic experiences such as neglect and abuse, this may not be the case across international locations. However, all children cared for away from their biological parents may be considered to have experienced a traumatic loss. Therefore, corroboration of trauma experience through formal or informal assessment was not required for inclusion in this review, providing maltreatment was considered by the authors as being present in the population sample. Characteristics of the trauma experience or lengths taken by the researchers to confirm maltreatment are included in the results. Focus will also be on the experience of trauma as opposed to diagnostic labels, as despite the high level of trauma experienced by youth in care, Post-Traumatic Stress Disorder (PTSD) and trauma-related diagnoses are rarely considered for children in care, with Conduct Disorder the most commonly received diagnosis (McCann, James, Wilson, & Dunn, 1996; Meltzer et al., 2003; Meltzer et al., 2004)

EF Outcome Inclusion Criteria

EF is the collective term for a set of cognitive abilities, which could encompass a wide range of individual cognitive abilities and skills. In order to capture EF difficulties, as opposed to deficits in the individual skills which make up EF, three core EF abilities have been identified based on previous reviews in this area (Malarbi et al., 2017; Merz et al., 2016; Op den Kelder et al., 2018). These are working memory, cognitive flexibility and inhibitory control. Studies where an identified measure of overall EF, individual measure of working memory, inhibitory control and/or cognitive flexibility, or subscale of an overall cognitive ability test which relates to any of these three skills are therefore included. Studies where only overall cognitive ability is recorded or an alternative cognitive construct is measured, with no EF measure reported will be excluded. For example, a study reporting the use of the Wechsler Intelligence Scale for Children (WISC, Wechsler, 1949) would be included, only where the Working Memory Index is specified within the results. Research which includes parent- or carer-rated measures of executive dysfunction has also been included.

1.2.3 Methodology

Data Synthesis

Due to the varied nature of the research and since the statistical combination of studies should not form a prominent part of synthesising observational studies, there was no indication for the completion of a meta-analysis of data (Egger, Davey-Smith, & Altman, 2008). Information regarding the characteristics, measurement tools, and key findings of each paper have been identified and synthesised into a narrative review focussing on the profile of EF difficulties, the impact of care experience and any mediating factors. All studies were reviewed by the lead author and no studies were eliminated from this review if they met the above outlined criteria, see Figure 1-1. for an outline of the search protocol. Included papers were also quality assessed by the lead author and then 30% were assessed by a second researcher for corroboration. Any discrepancies were discussed, and a consensus reached.

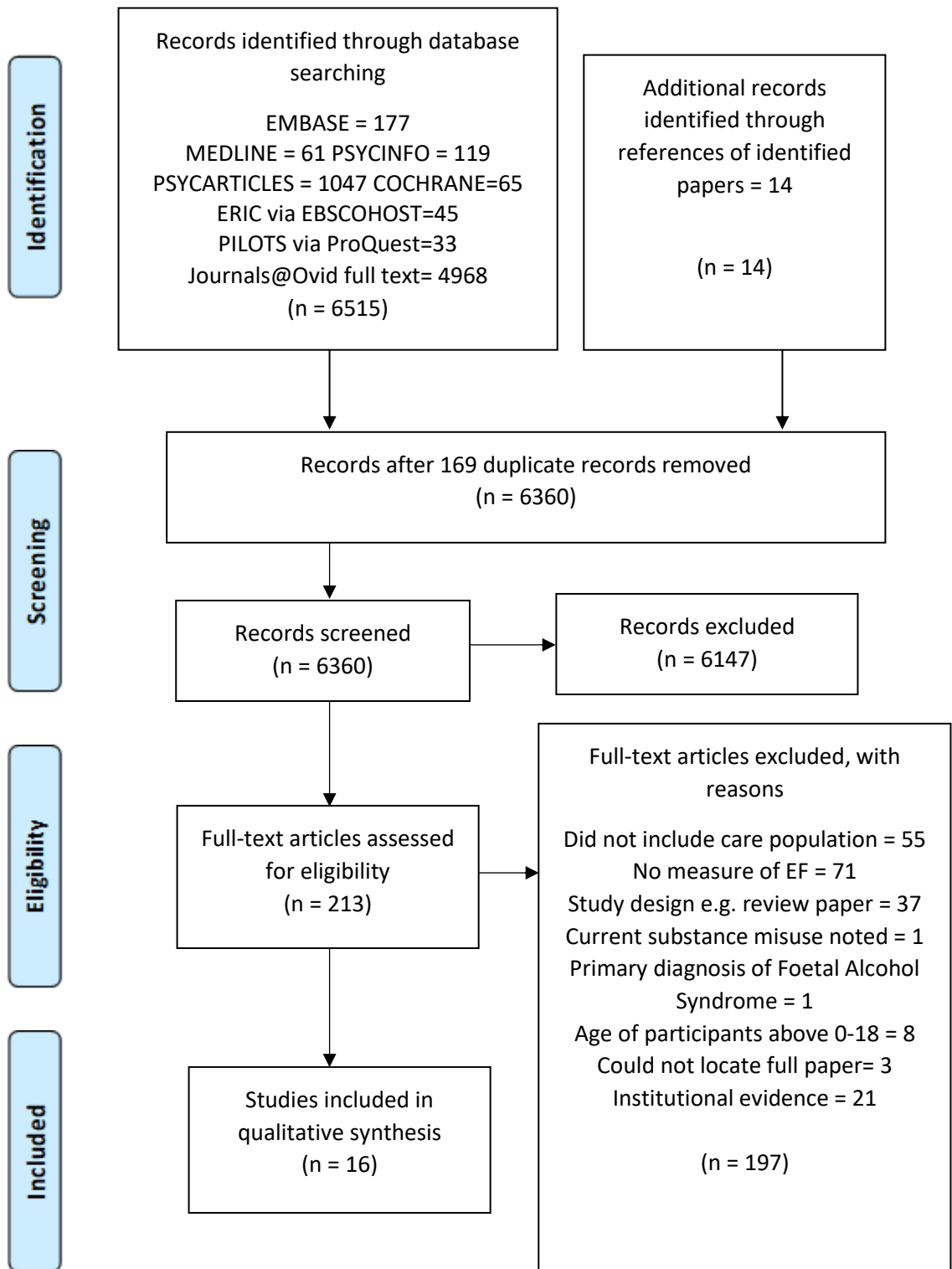


Figure 1-1. PRISMA flowchart for search and selection protocol.

1.2.4 Quality Assessment

Included papers were reviewed for their quality using an adapted version of the NHLI Quality Assessment tool for observational and Cross-sectional studies (National Heart, Lung, and Blood Institute. 2014; NHLI). The NHLI tool was designed to measure observational and cross-sectional studies however, many of the items on the tool were not applicable to this sample of papers. For example, the exposure variable in this case is trauma, which by its nature cannot be controlled, measured or introduced in the same way as other variables. Therefore, several of the items routinely scored as not applicable were removed for clarity. Each item on the tool has been scored as “yes”, “partial” or “no” to reflect the quality for that item. These descriptors are not assigned numerical values as this tool recommends a judgement-based decision as opposed to numerical score and this has been reported for all studies (NHLI. 2014). Assessments of quality have been made on the level to which limitations in design may have impacted on the findings, therefore failure to control for or consider confounding variables have been given high priority (see Appendix C for the quality assessment guidelines).

1.3 Results

1.3.1 Characteristics of the Studies

Sixteen papers ranging from 2005 to 2018 were included in the final sample. Twelve studies were conducted in the United States of America (USA), three were conducted in Australia and one in Brazil. All 16 studies used variations of descriptive cross-sectional designs except for Lind, Lee Raby, Caron, Roben, & Dozier, (2017) who used a prospective cohort design and Horn et.al. (2018) who performed a secondary analysis of a longitudinal randomised trial looking at a foster care parenting intervention MTFC-P (Multidimensional Treatment Foster Care for Pre-schoolers). The MTFC-P cohort was also utilised for four further studies, using a variety of cross-sectional analyses (Pears et.al. 2010; Heywood 2009; Pears & Fisher 2005; Bruce et.al. 2009). However, the intervention MTFC-P itself was only considered in one study (Bruce et al., 2009) and this along with Lind et al., (2017), were the only studies exploring an intervention. All other studies utilised a variety of populations relevant to their research question and international location. Two studies utilised correlational designs (Cromer, Stevens, DePrince, & Pears, 2006; Hodgdon, et al. 2018), one study used Principal

Component Analysis (Octoman, McLean, & Sleep, 2014), and the remaining studies used between-group comparisons, to isolate differences between groups on the specified outcome measures. Two studies, Bruce et.al. (2009) and Bruce et.al. (2013) used psychophysiological evidence, neuroimaging or Event Related Potential (ERP) designs. For a full breakdown of study characteristics please see Table 1-1.

1.3.2 Sample Population

Accounting for repetition, the review identified a combined total of n=1674 unique child participants, with samples ranging from n=22 (Bruce et al., 2013) to n=672 (Hodgdon, et al., 2018), including, n=1281 maltreated children from alternative care backgrounds and n=393 comparison children who live with their biological families. Across the studies all children ranged between 0 and 18-years-old and were equally split between genders with 49.95% female and 50.05% male. This was representative of the gender split between care (49.81% female, 50.19% male) and comparison groups (50.39% female, 49.61% male). A total of n=600 adults, all identified as foster-carers were also included in the review, n=123 of which were included as part of carer-child dyads (Cromer et al., 2006; Lind et al., 2017) and n=201 were respondents to a carer-reported measure (Octoman et al., 2014).

1.3.3 Measurement of Trauma/Maltreatment

Fourteen of the sixteen papers included in the review sought to confirm exposure to trauma/maltreatment experience. Cromer et al. (2006) cited the limitations of the study as an exploratory pilot and Octoman et al. (2014) asked foster carers to respond generally about difficulties they observe in children in their care, as opposed to one individual child, so corroboration of previous history was not possible. Children's case records were consulted for trauma confirmation in 11 studies (68.75%), of which five used the Maltreatment Classification System (MCS; Barnett, Manly, Cicchetti, & Toth, 1993) one used the Take Two Harm Consequences Assessment Referral Tool (T2 HCA; Thomas et al., 2004) and one used the Trauma History Profile (THP) of the UCLA Posttraumatic Stress Disorder Reaction Index (Steinberg, Brymer, Decker, & Pynoos, 2004) to classify maltreatment experiences. Marr (2014) uses the diagnosis of Reactive Attachment Disorder as evidence of a traumatic disrupted attachment and two studies used informant interviews. For full details of the measures used in each included study, please see Table 1-1.

Table 1-1. Characteristics of included studies

Author Year Country	Care Setting	Sample size Gender Age Range	Design / Analysis	EF Assessment Used (subtest if applicable)	EF Skill(s)/ Concept(s)	Other Assessment Used	Intervention (if any)	Control Group	Trauma Confirmation
Bruce et.al. (2013). USA (Oregon)*	Foster Care	22 11 FC f5 m6 11 CC f5 m6 9-12 years	Descriptive psycho- physiological neuroimaging Study, ERP fMRI Repeated Measures ANOVA	Go/No go task	Inhibitory control	None	N/A	Yes - Matched on age, sex, ethnicity, parental education, and SES	Coded from child welfare services records,
Bücker, et.al. 2012. Brazil	Kinship Care (5) and Foster Care (25)	60 30 FC/KC f13 m17 30 CC f14 m16 6 years-11 years	Cross- sectional between- groups comparison t-test or Chi Square	WISC-III (Digit Span) Wisconsin Card Sort	Working Memory Cognitive Flexibility	Continuous Performance Test	N/A	Yes age and gender matched	Child Protective Services record review and informant interview

Cromer, et. al 2006	Foster Care	24 FC f3, m11 4 years-8 years	Correlational design Spearman's Rho	NEPSY (Tower, Visual Attention Faces, Auditory Attention, Auditory Response Set)	Cognitive Flexibility, Inhibitory Control	Child Dissociative Checklist Remainder of NEPSY	N/A	No	Limited due to constraints of study
Gray et. al. 2016.	Foster Care	75 51 FC 27 UMM f11 m16 24 MM f13 m11 24 CC f13 m11 age range not reported, mean age = 13 in all groups.	Cross- sectional between- groups comparison ANOVA	Non-emotional attention control task Modified visual probe task	Inhibitory/ Attentional Control	State-Trait Anxiety Inventory for children Children's Depressive Inventory	N/A	Yes	Presence/ absence and severity coded from file records using the MCS

Hodgdon et.al. 2018	Residential Care	672 f320 m352	Cross-sectional correlational design	Behaviour Rating Inventory of Executive Functioning--(BRIEF) Teacher Report Form	Inhibitory Control, Working Memory, Cognitive Flexibility	CBCL	N/A	no	THP	
USA (New England)		11 years - 18 years	Structural equation modelling							
Lewis et.al. 2007	Adopted from Foster Care	102 33 AMP f20 m13 42 ASP f23 m19 27 CC f15 m12	Cross-sectional between-groups comparison	Day/Night Task working memory task (the squiggle/checkerboard task)	Inhibitory Control	CBCL III WPPSI-R; (Vocabulary)	PPVT-Revised	N/A	Yes- not matched	Case file review
USA (Utah)		5 years-6 years	One Way ANOVA							

Lind et.al. (2017). USA (Utah)	Foster Care	173 FPCD 99 Parents 121 FC f57 m64 52 CC f27 m25 0-4.5 years	Prospective cohort experimental design One Way ANOVA	Dimensional Change Card Sort	Cognitive Flexibility	CBCL	ABC-T	Yes - Matched on child's age and gender of children and parents	Interview with Foster carers and review of children's Division of Family Services records
Marr. 2014 USA (Colo- rado)	Foster Care and Adoption	71 45 RAD f29 m 16 26 CC f5 m21 9 -18 years	ex post facto quantitative analysis, quasi- experimental design MANOVA	Stroop Colour/Word Trail Making Task B	Inhibitory Control and Cognitive Flexibility	None	N/A	Yes- Non- Reactive Attachment Disorder children living at home	Reactive Attachment Disorder diagnosis

Octoman et al. 2014	Foster Care (Carers)	201 Foster Carers	Cross-sectional survey	Combined Behaviour Checklist observer rating scale	Cognitive Flexibility Working Memory		N/A	No	none
Australia		child gender not specified	Principal Component Analysis						
		children 4-12 years							
Vasilevski & Tucker 2016	Residential Care	82	Cross-sectional	CAFT COWAT	Inhibitory Control, Cognitive Flexibility	Rey Auditory Verbal Learning Test PPVT	N/A	Yes, matched by age, gender, FSIQ, and SES	Case file review T2 HCA
Australia (Melbourne/Victoria)		39 RC f29 m10 43 CC f27 m16	between-group comparison	Trail Making Task B The WISC-IV WMI (Digit Span, Letter Number Sequencing) SSST					
		12-16years	MANOVA						

Viezel, K. et.al. 2015	Foster Care	240 120 FC f67 m53 120 CC m53 f67	Cross-sectional Between-group comparison	WISC-IV -WMI (Digit Span Letter Number sequencing)	Working Memory	Remaining WISC-IV indexes	N/A	Yes age, race, and gender matched	Child Protective Services record review
USA (New York)		6 years, 0 months - 16 years, 11 months	MANOVA/ ANOVA						
Bruce et.al. (2009). USA (Oregon)	Foster Care	34 23 FC f11 m12 11 CC f6 m5 4-7 years	Randomised cohort, between-group comparison	Flanker	Inhibitory Control	None	MTFC-P	Yes- age and sex matched	Case file review and coded using the MCS
Heywood 2009. USA (Oregon)	Foster Care	35 FC f15 m20 10-12 years	Pre-experimental descriptive, correlational design	NEPSY (Tower, Visual Attention Faces, Auditory Attention, Auditory Response Set)	Cognitive Flexibility, Inhibitory Control	Parenting Scale (PSCAL) Placement History Family Events Checklist (FEC) Parent Attachment Diary (PAD)	No, but part of MTFC-P	No	Child protective case records coded using the MCS

Horn et.al. 2018 USA (Oregon)	Foster Care	177 117 FC f54 m63 60 CC f28 m32 3years -4 years	Secondary data analysis of cross- sectional cohort data Bivariate Correlation	NEPSY (Visual Attention/ Statue)	Inhibitory Control, Cognitive Flexibility	CBCL, Polyvictimisation count	No, but part of MTFC-P	Yes - Age and socioeconomic matched	Case file review and coding for type of maltreatment using the MCS
Pears et.al. 2010 USA (Oregon)	Foster Care	177 117 FC f56 m61 60 CC f28 m32 3 years -6 years	Cross- sectional between- group comparison Path mediator analysis	Modified Stroop Task (Day & Night) Dimensional Change Card Sort task, NEPSY, (Visual Attention and Statue)	Inhibitory Control	CBCL	No, but part of MTFC-P	Yes - age and socioeconomic matched	Child protective case records coded using the MCS

Pears & Fisher 2005. USA (Oregon)	Foster Care	153 99 FC f48 m51 54 CC f26 m28 3 years -6 years	Cross-sectional between-group comparison Correlation	NEPSY (Tower, Visual Attention Faces, Auditory Attention, Auditory Response Set) Stroop Dimensional Change Card Sort task.	cognitive flexibility, inhibitory control	Height, Weight & Head Circumference WPPSI-R Preschool Language Scale-Third Edition	No, but part of MTFC-P	Yes – unmatched	Case file review and coding for type of maltreatment using the MCS
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PARTICIPANT ABBREVIATIONS: f=Female, m=Male FC=Foster Care, KC= Kinship Care, CC=Community Comparison (Control Group), UMM= Unmatched Maltreatment Group MM= Matched Maltreatment Group, AMP=Adopted multiple placement, ASP=Adopted Stable Placement, EF= Executive Function, FPCD= Foster Parent and Child Dyads

TASK ABBREVIATIONS: WISC= Wechsler Intelligence Scale for Children, WMI= Working Memory Index, NEPSY= A Developmental NEuroPSYchological Assessment PPVT- Peabody Picture Vocabulary Test, WPPSI-R = Wechsler Preschool and Primary Scale of Intelligence-Revised, SSST=Swanson Sentence Span Task. CAFT=Controlled Animal Fluency Test, COWAT=Controlled Oral Word Association Test.

TRAUMA TOOL ABBREVIATIONS: CBCL= Child Behaviour Checklist, MCS=Maltreatment Classification System, T2 HCA= Take Two Harm Consequences Assessment Tool. THP= Trauma History Profile.

COHORT ABBREVIATIONS: MTFC-P =Multidimensional Treatment Foster Care for Pre-schoolers, ABC-T= Attachment and Biobehavioural Catch-up for Toddlers

1.3.4 Study Quality

A summary of the quality assessment completed for each paper is outlined in Table 1-2. The majority of papers ranged from 'Fair' to 'Good'. The primary author rated all included studies and then a second researcher rated 30% of all studies, with an agreement rate of 91%, (Cohen's Kappa = .75); any discrepancies were discussed until a consensus was reached. The most common methodological issue was in relation to the sample sizes used in each study. No study reported an a priori justification for the sample size used and very few sought to confirm that the sample size was large enough to provide suitable statistical power for their analysis. Sample sizes varied greatly and although a number of papers were underpowered many included adequate sample sizes for the statistical methods used. Where studies were underpowered, the issue of sample size was considered by the authors, either as part of their planned analysis or as a limitation of their findings, and many specified that replication or longitudinal research was required to corroborate their conclusions. This implies that issues of power and sample size have been considered and accounted for in the findings. Furthermore, it is representative of the difficulties of research in this area that experimental and robust work has not yet occurred. The care population is a difficult one to access and frequent changes in placement, catchment area, and care status make longitudinal research problematic. Similarly, many of these descriptive and preliminary studies have been published within the last one to two years, which does not allow sufficient time for replication studies to be conducted, written up and made available for consumption. Therefore, although sample size should be borne in mind, it does not limit the quality of the research significantly.

Another issue was blinding of the outcome assessors to the exposure status of the participants, which was unreported in most cases. The majority of papers (n=14) did not report on blinding and it is likely no blinding took place. This is made more likely by the nature of cross-sectional research as all measures are administered across a short time frame, making it probable that the researchers conducting the study administered all measures, which may increase bias for scoring the outcome measures. Only one study, (Lind et al., 2017) reported the use of blinding to minimise this issue and four studies (Cromer, et.al., 2006; Hodgdon, et.al. 2018; Octoman et. al., 2014, Heywood, 2009) did not use a control group and so blinding was not applicable. This is particularly difficult as cross-

sectional descriptive studies cannot rely on the process of randomisation to minimise potential bias or variation effects.

Positively, the outcome measures utilised in the majority of studies, are well validated, and reliable tools which have been normed against large samples for the child and adolescent population. All studies scored highly for this. Similarly, most studies made efforts to confirm the exposure of children to trauma and maltreatment using validated measures or reported on the strong nature of the inter-rater reliability of their coding scheme, with the exception of Cromer et al. (2006), and Octoman et al. (2014). Many studies also utilised statistical methods to minimise the interference of confounding variables, for example, age at first placement, type and severity of maltreatment, and number or length of placements. Studies also reported on all analyses of primary, indirect and mediating/moderating effects with appropriate effect sizes.

Overall, the quality of the papers selected is of an adequate standard for the design and methodology used. However, there are several limitations to using these methods which affect most if not all the papers, meaning any conclusions drawn should be interpreted carefully. However, this is representative of the research in this area and should not preclude the completion of the review.

Table 1-2. Summary of quality ratings for included studies

Author(s)	Peer Review	Research question or objective clearly stated? And design is appropriate	Study population clearly specified and defined?	Sample size justification, power description or variance and effect estimates provided?	Exposure measures (IV) clearly defined, valid, reliable and used consistently?	Measures suitable for a child and adolescent population?	Outcome measures (DV) clearly defined, valid reliable and used consistently?	Key potential confounding variables measured and adjusted for? Stats are appropriate	Outcome
Viezel, et.al. (2015).	Yes	Yes	Yes	No	Partial	Yes	Yes	Partial	Fair
Bücker, et.al. (2012).	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	Good
Cromer, et.al. (2006).	Yes	Yes	Partial	No	NA	Yes	Yes	No	Fair
Pears, et.al. (2010).	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Good
Hodgdon, et.al. (2018).	Yes	Yes	Partial	No	Yes	Yes	Yes	Yes	Good
Marr (2014).	No	Yes	Yes	No	Yes	Yes	Yes	No	Fair
Octoman et. al. (2014).	Yes	Yes	Yes	No	NA	Yes	Yes	No	Good
Heywood (2009).	No	Yes	Partial	No	Yes	Yes	Yes	Yes	Good
Pears & Fisher (2005).	Yes	Yes	Partial	No	Yes	Yes	Yes	Partial	Fair
Gray et.al. (2016).	Yes	Yes	No	Yes	Yes	No	Partial	Partial	Fair
Vasilevski & Tucker (2016)	Yes	Yes	Yes	Partial	Yes	Yes	Yes	Yes	Good
Lewis et.al. (2007).	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Good
Horn et.al. (2018).	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Good
Bruce et.al. (2013).	Yes	Yes	Yes	Partial	Yes	Yes	Yes	Yes	Good
Lind et.al. (2017).	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Good
Bruce et.al. (2009).	Yes	Yes	Partial	No	Yes	NA	Yes	Partial	Fair

Abbreviations: P= partial, NR = not reported NA = not applicable

Table 1-3: Summary of measures used to assess executive function by cognitive domain

	Composite Score			Cognitive Flexibility		Working Memory		Inhibitory Control				
	NEPSY EF	BRIEF-T	Behaviour Checklist	DCCS/WCS	TMTB	WISC (WMI)	SSST	Stroop	Knock & Tap	Go/No go	Flanker	Visual Probe Task
Bruce et.al. (2013).										x		
Bücker, et.al. (2012)				x		x						
Cromer,et.al (2006)	x								x			
Gray et.al. (2016)												x
Hodgdon et.al. (2018)		x										
Lewis et.al. (2007)								x				
Lind et.al. (2017)				x								
Marr (2014)					x			x				
Octoman et. al. (2014)			x									
Pears, et.al. (2010)	x			x				x				
Vasilevski & Tucker (2016)					x	x	x					
Viezel, K. et.al. (2015)						x						
Bruce et.al. (2009).											x	
Heywood (2009)	x											
Horn et.al. (2018)	x											
Pears & Fisher (2005)	x			x				x				

ABBREVIATIONS: WISC= Wechsler Intelligence Scale for Children, WMI= Working Memory Index, NEPSY= A Developmental NEuroPSYchological, Assessment SSST=Swanson Sentence Span Task, DCCS= Dimensional Card Change Sorting Task, WCS= Wisconsin Card, Sort TMTB= Trail Making Task B, BRIEF-T= Behaviour Rating Inventory of Executive Functioning Teacher Version.

1.3.5 Measurement of Executive Function

EF was measured through a variety of neuropsychological, self-report and observer-reported measures. Six studies chose to use combined composite scores to represent overall EF outcomes. Neuropsychological testing was the most common measure of EF and was utilised in fifteen of the studies, with neuroimaging techniques used in two (Bruce et al., 2009; Bruce et al., 2013) and observer and self-report measures used in two (Hodgdon, et.al., 2018; Octoman et. al., 2014). See Table 1-3. for an overview.

1.3.6 Children in Care and Executive Function

Six studies presented composite scores for EF and the results demonstrate a medium to large association between maltreatment, care status, and EF difficulties, whereby increased maltreatment, particularly caregiver maltreatment (Hodgdon et al., 2018), and variation in care experiences were linked with increased EF difficulties.

This association has been noted on composite measures of EF, where maltreated children in foster care were reported to have significantly lower average scores for the EF/Attention subdomain of the NEPSY (Korkman, 1998; Brooks, Sherman, & Strauss, 2009) (Horn et.al. 2018; Pears & Fisher, 2005) and Stroop C/W; (Stroop, 1935) (Vasilevski & Tucker, 2016) than controls, as well as across care settings including, foster care (Horn et.al. 2018; Pears & Fisher, 2005), and residential care (Hodgdon et al., 2018). In line with this, the behaviours that most closely reflect the characteristic cognitive, language, and memory problems found in children with EF deficits were also reported by foster carers to be problematic in the children they care for (Octoman et al., 2014). EF difficulties in early childhood are also linked to difficulties in emotion regulation in middle childhood (Heywood, 2009), and externalising behaviours (Horn et.al. 2018). This association was evidenced across age ranges from 0-18.

One study, Pears and Fisher (2005), reported a non-significant difference between community controls and foster children who had experienced maltreatment on overall measures of EF. However, within this study, several significant correlations relating to care experience were noted, which may explain variation within the care-experienced group, more about this is discussed below.

1.3.7 Children in Care and Inhibitory Control

Nine studies reported significant differences between non-maltreated children and maltreated children within the care system (Cromer et al., 2006; Gray, Baker, Scerif, & Lau, 2016; Hodgdon et al., 2018; Heywood, 2009; Horn & Fisher, 2018; Lewis, Dozier, Ackerman, & Sepulveda-Kozakowski, 2007; Octoman et al., 2014; Pears, Kim, & Fisher, 2008; Vasilevski & Tucker, 2016). This represents a strong link between trauma and time spent in care services with reduced inhibitory control, which is identifiable on neuropsychological measures and using neuro-imaging techniques. Poorer inhibitory control was also associated with other difficulties including indiscriminate friendliness (Pears et.al., 2010), dissociation (Cromer et.al., 2006), and higher levels of oppositional behaviour towards carers (Lewis et al., 2007). However, there was some variation across results, three studies reported non-significant differences for inhibitory control between community comparison and care experienced groups (Bruce et al., 2009; Bruce et al., 2013; Marr 2014). Although, two (Bruce et al., 2009; Bruce et al., 2013) did report other subtle differences in neural networks between the two groups, which supports the existence of a developmental difference between groups. Overall, the evidence that combined maltreatment and care-experience is associated with reduced inhibitory control remains substantial.

1.3.8 Children in Care and Cognitive Flexibility

One study provides evidence of an association between maltreatment, care experience, and reduced cognitive flexibility supported by neuropsychological assessment, (Lind et al. 2017). However, two studies found no significant difference between control and care-experienced groups (Bücker et al., 2012; Marr, 2014). Cromer et al. (2006) also demonstrated no significant association between dissociation and cognitive flexibility, showing a high level of variation. However, no assessment was used consistently across this group, which makes it difficult to make direct comparisons between findings. Marr, (2014) also used diagnostic criteria to define the comparative groups which was problematic for a number of reasons which are discussed in more detail below.

1.3.9 Children in Care and Working Memory

Two studies reported non-significant findings using the WMI of the WISC IV (Wechsler, 2003). Viezel et al. (2015) reported that maltreated foster children did not present with significantly

different working memory abilities against a control sample, instead noting a pattern of verbal and processing speed deficits in comparison to controls, and Vasilevski & Tucker (2016) also found no significant difference between children in residential secure care and controls. In contrast, Bücker, et.al. (2012), found that a sample of children in kinship and foster care presented with significantly worse performance on the digit span subtest of the WISC-III (Wechsler, 1991), than non-maltreated controls ($F_{1,51} = 8.55, P = .005$). Despite reporting non-significant findings on the WMI, Vasilevski & Tucker (2016) note a significant difference on the Swanson Sentence Span Test (SSST; Swanson, 1992) and Viezel et al. (2015) noted that their results approached, but did not reach, significance indicating the potential for some level of working memory difficulty. Notably, Viezel et al. (2015) analysed clinical data which included a high level of missing information for possible confounding factors and did not provide consistent information regarding the participant exposure to maltreatment, which may have affected the results. Vasilevski and Tucker (2016) also concluded from their results that there was evidence of a working memory deficit for care-experienced children. Therefore, evidence trends towards indicating a deficit.

1.3.10 Interventions for Executive Function

Two studies considered interventions designed to improve EF, the Attachment and Biobehavioral Catch-up for Toddlers (ABC-T) intervention (Lind et al., 2017) and Multidimensional Treatment Foster Care for Pre-schoolers (MTFC-P; Bruce et al., 2009). Both involved delivering training and support packages to children and their foster carers. ABC-T consisted of 10 sessions of coaching for parents of toddlers aged 0-53 months, focussed on increasing parents' nurturing behaviours and responsiveness in response to children's distress and encouraging parents to serve as co-regulators for the children. MTFC-P is designed to reduce behavioural difficulties and increase regulatory abilities by providing a consistent, contingent environment (Fisher et al. 1999). It involved training for foster carers prior to placement, continued support, a 24-hour crisis team available post placement and aligned behavioural input for the children at home and school and a weekly therapeutic playgroup. Following the interventions, both studies reported that children in foster care performed comparatively with community controls on behavioural measures of cognitive flexibility and inhibitory control. MTFC-P has also been shown to reduce the risk of disruption in subsequent permanent placements and increase secure attachment-related behaviours

(Fisher et al. 2005; Fisher and Kim 2007). This indicates that with intervention, the effects of early adversity may be partially ameliorated.

1.3.11 Causes of Variance

There are a number of factors to consider which may explain the variance across all domains, for example, the key variables identified as mediators of EF development, such as placement instability, and severity, number and type of maltreatment were not attended to, or could not be examined due to sample size in many studies. Therefore, the confounding effects of these variables cannot be explored. In the two studies which considered placement instability, the lack of a stable placement after entry into the care system significantly reduced EF, particularly inhibitory control (Pears & Fisher, 2005; Lewis et al., 2007). It also increased the risk of oppositional behaviour from young people who experience instability, compared with those placed in long term placements, adoption or who remain with their family. Therefore, the nature of the care experience itself may lead to heterogeneity within the care-experienced population. If the care-experienced sample had experienced consistent care, it is possible that their EF may be preserved to such a level that no significant differences with non-maltreated children are observed. Furthermore, it is difficult to draw comparisons across care settings internationally given the level of variation, and this may contribute to the spread of results.

There may also be issues of design and sampling. There is evidence that type, severity, and number of traumatic experiences are linked with EF skills. For example, entering the care system due to neglect or emotional abuse increases the risk of EF difficulties (Hodgdon et al., 2018). Although fourteen studies sought to confirm the experience of trauma for children within the care system, many did not explore the subtle differences of experience and the role these variables play in the development of EF and two made an assumption of trauma based on diagnosis (Marr, 2014) or care status (Cromer et al., 2006; Octoman et al., 2014). Notably, using diagnosis to determine trauma status was problematic. Marr (2014), acknowledged that many of the non-Reactive Attachment Disorder (RAD) participants were experiencing emotional, behavioural and mental health difficulties and most had experienced trauma or abuse irrespective of care status. However, no consideration was provided to the alternative diagnoses of the non-RAD group, it is known that EF skills can be affected by other mental health difficulties such as depression (see Fossati, Ergis, & Allilaire,

2002 for a review), and Obsessive Compulsive Disorder (OCD; e.g. Basso, Bornstein, Carona, & Morton, 2001). Therefore, the lack of other factors considered in relation to EF difficulties in this sample is a design flaw.

Studies which reported no significant differences also consistently demonstrated that maltreated children in care, performed at a lower level than their non- maltreated counterparts, albeit not at such a level as to reach significance (Bücker et.al., 2012; Marr, 2014; Viezel et.al., 2015). Two of these studies were also using small sample sizes, which the authors recognise may limit their ability to report significant results (Bücker et al., 2012; Marr, 2015).

Table 1-4. Key findings of included studies.

Author Year (Country)	Care Setting	EF Skill/concept(s)	Statistical Results	Effect Size Range	Summary of Key Conclusions
Executive Domain: Composite EF					
Hodgdon et.al. 2018 USA (New England)	Residential Care	Inhibitory Control, Working Memory, Cognitive Flexibility	A structural equation model demonstrated direct associations between caregiver trauma and PTSS, $\beta=.15$; non-caregiver trauma and externalizing problems, $\beta=.14$; gender and PTSS, $\beta=.26$, externalizing problems, $\beta=.12$, and internalising problems, $\beta=.26$; and age and externalising problems, $\beta=-.11$. Indirect effects via deficits in EF between caregiver trauma and PTSS, $\beta=.04$ and externalising problems, $\beta=.19$ also observed.	Small- medium	Results indicate for screening for executive dysfunction among trauma-impacted youth is needed, as it represents a critical therapeutic target.
Octoman et. al. 2014 Australia	Foster Care (Carers)	Inhibitory Control, Working Memory, Cognitive Flexibility	Component 1 accounted for 40.5% of the variance in responses. Items on this component related to behavioural difficulties underpinned by cognitive-, language-, attention-, and memory-related deficits.	Medium- large	The first group of behaviours that pose a problem for carers were behaviours that most closely reflect the characteristic cognitive, language, and memory problems found in children with EF deficits.

<p>Heywood 2009. USA (Oregon)</p>	<p>Foster Care</p>	<p>Cognitive Flexibility, Inhibitory Control</p>	<p>Early childhood scores from all five domains on the NEPSY demonstrated statistically significant negative correlations with the Lability/Negativity subscale Attention/EF, $r = -.71$, $p < .05$, Language $r = -.41$, $p < .05$, Sensorimotor $r = -.55$, $p < .05$, Visuospatial $r = -.39$, $p < .10$, Memory $r = -.54$, $p < .05$. The Emotion Regulation subscale of the ERC was positively correlated with the Attention/EF domain on the NEPSY, $r = .36$, $p < .01$. A significant correlation was also found between early experiences of family stress in the foster family and later emotional lability and negativity ($r = .33$, $p < .10$). Early experiences of family stress were also negatively associated with emotion regulation in middle childhood $r = -.36$, $p < .05$. A significant negative correlation was found between the percentage of secure attachment behaviours demonstrated in early childhood with the foster parent and later emotion regulation $r = -.33$, $p < .10$.</p>	<p>Medium- large</p>	<p>Higher levels of attention and EF in early childhood were significantly associated with higher levels of emotion regulation in middle childhood. Higher levels of attention and EF in early childhood were associated with increased emotion regulation in middle childhood. Family stress in early childhood is associated with decreased emotion regulation in middle childhood.</p>
<p>Pears & Fisher 2005. USA (Oregon)</p>	<p>Foster Care</p>	<p>Cognitive Flexibility, Inhibitory Control</p>	<p>The groups did not differ significantly on weight for height, sensorimotor function, memory, or EF. There was a moderately positive correlation between age at first placement and EF, $r = .30$, $p < .01$. There were significant negative correlations between being removed primarily because of neglect or emotional abuse and height $r = .25$, $p < .05$, visuospatial processing $r = .27$, $p < .05$, memory $r = .36$, $p < .01$, EF $r = .26$, $p < .05$, and language $r = .21$, $p < .05$. There was a trend showing that children who had more than the average number of transitions prior to the study start (i.e., 4) had lower scores on EF ($M = 0.18$, $SD = 0.76$) than those with fewer transitions ($M = 0.06$, $SD = 0.69$).</p>	<p>Small- medium</p>	<p>There were significant positive associations between a number of maltreatment types and visuospatial processing, language, and EF. Removal based on neglect or emotional abuse is associated with reduced EF. Increased placement stability is associated with increased EF.</p>

Horn et.al. 2018 USA (Oregon)	Foster Care	Inhibitory Control, Cognitive Flexibility	Children in the foster care sample had a significantly lower average EF NEPSY scores of 93.11 (SD = 15.02) compared to the community sample average score of 99.24 (SD = 12.75) ($t(128) = -2.34, p = 0.021$). Externalising problems were significantly related to polyvictimisation only when EF was below the mean ($\beta = 1.06, SE = 0.42, p = .01$).	Small-medium	Findings highlight that EF may serve as a resilience factor indicating that individual differences in polyvictimised children's EF skills help to predict variability in externalising problems. Future research on designing and optimising intervention programs that target EF skills may mitigate the development of maladaptive outcomes for polyvictimised children.
Lind et.al. (2017). USA (Utah)	Foster Care	Cognitive Flexibility	There was a main effect for group, $F(1, 162) = 7.00, p = .01, h^2 = 0.08$. Follow-up tests indicated that children in the ABC-T group ($M = 2.73, SD = 2.11$), $F(1, 114) = 5.26, p = .02, d = 0.42$, and in the low-risk comparison group ($M = 2.10, SD = 2.02$), $F(1, 101) = 13.85, p = .01, d = 0.75$, had significantly lower attention problems scores than children in the DEF group ($M = 3.63, SD = 2.13$). There were no significant differences in attention problems between the ABC-T and low-risk comparison groups at post-intervention, $F(1, 109) = 2.49, p = .12, d = 0.32$.	Medium-large	Results indicate that an attachment-based intervention implemented among toddlers in foster care is effective in enhancing children's EF capabilities.
Vasilevski & Tucker 2016 Australia (Melbourne/ Victoria)	Residential Care	Inhibitory Control, Cognitive Flexibility	A MANOVA revealed significant group differences. With alpha at .01, follow-up univariate analyses showed that the two groups differed significantly, with medium to large effect sizes on a measure of cognitive shifting, flexibility, and inhibitory control (Stroop C/W; Stroop, 1935). No differences were found between the SW and CO groups on the verbal fluency measures including CAFT size, CAFT RDS (Monti, 1984; Tucker et al., 1996), TMTB (Reitan, 1955) and the COWAT.	Medium-large	Using multivariate analyses, the maltreated group showed significant impairments on measures of EF and attention, working memory, learning, visuospatial function, and visual processing speed. Effect sizes ranged from medium to large. The FSIQ indicated that these adolescents were performing comparably with their non-maltreated peers, though this was not the case when specific cognitive functions were measured. This demonstrates that maltreated adolescents are more likely to have a range of cognitive deficits

that can only be identified with thorough neuropsychological assessment.

Executive Domain: Working Memory

Viezel, K. et.al. 2015	Foster Care	Working Memory	Children who experienced maltreatment had lower scores on the FSIQ than did comparison children, $F(1,238)=7.321, p < .01$. Children who experienced maltreatment had lower scores on the VCI than did comparison children, $F(1,238)=7.940, p < .01$. A similar finding was revealed on the PSI, $F(1, 238) = 9.102, p < .01$. Scores on the WMI approached, but did not reach, significance, $F(1, 238)=3.695, p > .05$. Scores on the PRI did not differ, $F(1, 238)=.135, p > .05$. Neither the WMI, nor the PRI score significantly differed between groups,	N/A	This study suggests that maltreated children may have relatively intact perceptual reasoning and working memory. They may, however, present with a pattern of verbal and processing speed deficits.
(Bücker et al., 2012)	Kinship Care (5) and Foster Care (25)	Working Memory Cognitive Flexibility	Those with trauma showed worse performance than those without on the Digits Span Test of the WISC-III ($F_{1,51} = 8.55, P = .005$), including both digits forward ($t_{51} = 2.29, P = .02$) and digits backward ($t_{51} = 2.35, P = .02$) and the CPT (commission errors; $F_{1,49} = 5.63, P = .022$).	Small	Results indicate working memory, attention and immediate verbal recall are affected by experiencing trauma in care-experienced children. There is a high prevalence of subsyndromal symptoms in school children who have experienced trauma and have an attention impairment, which may contribute to a cumulative deficit in cognitive development.
Vasilevski & Tucker 2016	Residential Care	Inhibitory Control, Cognitive Flexibility	MANOVA revealed significant group differences. Follow-up univariate analyses, with alpha at .03 showed that the groups differed in performance on the SSST (Swanson, 1992) with a medium effect size. There were no significant differences on WISC-IV WMI (Wechsler, 2003) scores.	Medium	The maltreated group showed significant impairments on measures of EF and attention, working memory, learning, visuospatial function and visual processing speed. The FSIQ indicated that these adolescents were performing comparably with their non-maltreated peers, though this was not the case when specific cognitive functions were measured. This demonstrates that maltreated adolescents are more likely to have a range of cognitive deficits
Australia (Melbourne/Victoria)					

that can only be identified with thorough neuropsychological assessment.

Executive Domain: Inhibitory Control

Bruce et.al. (2013). USA (Oregon)*	Foster Care	Inhibitory Control	<p>The main effect of group was nonsignificant, for accuracy on the test $F(1, 20) = 1.07$, ns. There were no significant group differences on behavioural performance on the task.</p> <p>Activation in the right lingual gyrus was greater for the CC group compared to the FC group for correct no go trials, $t(21) = 2.65$, $p = .015$.</p> <p>Activation in the right anterior cingulate cortex region during correct no go trials was greater for the CC group compared to the FC group, $t(21) = 3.98$, $p = .00$.</p> <p>Activation in the left inferior parietal lobule region was significantly greater for the FC group compared to the CC group during incorrect no go trials relative to rest, $t(21) = 4.17$, $p < .001$.</p>	Small-medium	<p>Patterns of brain activation differed by group. The non-maltreated children demonstrated stronger activation than did the foster children across several regions, including the right anterior cingulate cortex, the middle frontal gyrus, and the right lingual gyrus, during correct no go trials, whereas the foster children displayed stronger activation than the non-maltreated children in the left inferior parietal lobule and the right superior occipital cortex, including the lingual gyrus and cuneus, during incorrect no go trials.</p>
Cromer,et.al 2006 USA (Oregon)	Foster Care	Cognitive Flexibility, Inhibitory Control	<p>Dissociation was negatively related to performance on the Knock and Tap. Spearman's $\rho = -.58$, $p = .003$.</p> <p>Dissociation also had an impact on Auditory Attention part A in the NEPSY, which requires inhibition and selective attention, Spearman's $\rho = -.45$, $p < .01$.</p>	Medium-large	<p>Higher levels of childhood dissociation were associated with deficits in tasks requiring inhibition, but not with tasks requiring primarily planning, strategy, or multiple rule sets.</p>

Pears, et.al. 2010	Foster Care	Inhibitory control	Indiscriminate friendliness was higher for the FC children (M = 2.33; SD = 1.33; range = 0– 4) than for the CC children (M = 1.55; SD = 1.23; range = 0 – 4), $t(144) = 3.55, p < .01$ Inhibitory control was negatively associated with indiscriminate friendliness $r = -.32, p < .01$. Additionally, number of foster caregivers was negatively associated with inhibitory control $r = -.27, p < .05$.	Medium	Results suggest an indirect path from number of foster caregivers to indiscriminate friendliness through its negative effect on inhibitory control.
USA (Oregon)					
Marr. 2014	foster care and adoption	Inhibitory control and cognitive flexibility	The results of the MANOVA indicate there is no significant difference in the EF test scores on the Stroop Colour-Word test between the group of children diagnosed with RAD and the group of children without RAD.	N/A	Results demonstrate no difference between those with care experience and a diagnosis of RAD with controls who have experiences trauma associated difficulties in the care of their biological families.
USA (Colorado)					
Gray et.al. 2016.	Foster Care	Inhibitory/Attentional Control	A main effect of group was also observed ($F(1, 46) = 4.073, p < 0.05$, partial $\eta^2 = 0.081$), with maltreated participants responding in general more slowly than their non-maltreated peers. All other main and interaction effects were not significant ($p = n.s.$).	Small	The data suggest difficulties exercising attention control following early maltreatment. These may contribute to the emergence of psychiatric disorders and other difficulties for those exposed to maltreatment.
Australia (New South Wales)					
Lewis et.al. 2007	Adopted from Foster Care	Inhibitory Control	There was a significant main effect of placement instability on children's inhibitory control $F(1, 59) = 17.5, p < .01$. (Children in the multiple placements group showed significantly poorer inhibitory control abilities compared with children in the stable placement group. After we co-varied the effects of the control and risk variables, a significant effect of placement instability was obtained, $F(1, 60) = 14.9, p < .01$. Children in the multiple placements group were rated by caregivers as exhibiting significantly greater oppositional behaviour than were children in the stable placement group. Calculation of effect size indicated that this was a moderate difference between the two groups (partial $\eta^2 = .16$).	Small-medium	Children who had experienced placement instability showed poorer inhibitory control abilities and higher levels of caregiver-rated oppositional behaviour compared with both non-adopted and adopted children who had experienced more stable caregiving. These deficits appear to be specific to children's inhibitory control abilities and behavioural regulation rather than to working memory problems or cognitive deficits more generally.
USA (Utah)					

Bruce et.al. (2009). USA (Oregon)	Foster Care	Inhibitory Control	<p>There were no group differences on the behavioural measures of cognitive control or response monitoring. $F(2,31)=0.47$ $p>.05$.</p> <p>Notably, group differences were observed on the electrophysiological measures of response monitoring. Specifically, the foster children who received services as usual were significantly less responsive to performance feedback about errors than the foster children who received the intervention and the non-maltreated children.</p>	N/A	<p>The results suggest that targeted preventive interventions might impact the neurobiological functioning of at-risk children.</p> <p>Additionally, the results emphasise the importance of assessing behavioural and electrophysiological performance together to reveal subtle differences in cognitive processing.</p>
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Executive Domain: Cognitive Flexibility

(Bücker et al., 2012) Brazil	Kinship Care (5) and Foster Care (25)	Working Memory Cognitive Flexibility	<p>There were no significant differences in the block design, vocabulary, FSIQ, or Wisconsin Card Sorting Test measures. In addition, there was no significant relationship between the cognitive test scores and clinical variables.</p>	N/A	<p>Results indicate working memory, attention and immediate verbal recall are affected by experiencing trauma in children in care. There is a high prevalence of subsyndromal symptoms in school children who have experienced trauma and have an attention impairment, which may contribute to a cumulative deficit in cognitive development.</p>
Cromer,et.al 2006 USA (Oregon)	Foster Care	Cognitive Flexibility, Inhibitory Control	<p>There was no significant association between dissociation and cognitive flexibility on the auditory attention of the NEPSY part B $r=.16$, $p>.05$.</p>	N/A	<p>Higher levels of childhood dissociation were associated with deficits in tasks requiring inhibition, but not with tasks requiring primarily planning, strategy, or multiple rule sets.</p>

Marr. 2014 USA (Colorado)	foster care and adoption	Inhibitory Control and Cognitive Flexibility	The results of the MANOVA indicate there is no significant difference in the EF test scores on the Trails B between the group of children diagnosed with RAD and the group of children without RAD.	N/A	Results demonstrate no difference between those with care experience and a diagnosis of RAD with controls who have experienced trauma associated difficulties in the care of their biological families.
Lind et.al. (2017). USA (Utah)	Foster Care	Cognitive Flexibility	There was a main effect for group, $F(1, 142) = 6.15, p = .01, h^2 = 0.06$. Children whose parents received the ABC-T intervention performed significantly better on the DCCS ($M = 23.67, SD = 13.06$) than the children whose parents received the DEF intervention ($M = 18.54, SD = 12.88$), $F(1, 91) = 4.14, p = .04, d = 0.40$, but not significantly differently from the low-risk comparison group ($M = 28.26, SD = 13.00$), $F(1, 98) = 2.92, p = .09, d = 0.36$. Children whose parents received the DEF intervention performed more poorly than children in the low-risk comparison group, $F(1, 93) = 12.12, p < .01, d = 0.76$.	Medium - large	These findings indicate that ABC-T enhances EF skills among toddlers in foster care.

ABBREVIATIONS: PARTICIPANTS & DIAGNOSES: FC=Foster Care, CC=Community Comparison (Control Group), PTSS =Post Traumatic Stress Syndrome, EF= Executive Function, RAD= Reactive Attachment Disorder, ABC-T= Attachment and Bibehavioural Catch-up for Toddlers. ASSESSMENTS: NEPSY= A Developmental NEuroPSYchological Assessment, CAFT=Controlled Animal Fluency Test, COWAT=Controlled Oral Word Association Test, TMTB-Trails Making Task B, FSIQ= Full-Scale IQ, WMI= Working Memory Index, PRI= Perceptual Reasoning Index, WISC= Wechsler Intelligence Scale for Children, SSST=Swanson Sentence Span Task

1.4 Discussion

The pattern of findings indicates a relationship between the development of EF, maltreatment, and time spent in the care of local services. However, the link between these factors is not a linear relationship, whereby maltreatment and accommodation away from home, leads indiscriminately to reduced EF. Although evidence is mixed, the overall direction of results indicates that children within the care system are not only highly vulnerable to EF difficulties due to their early experiences, but that their experiences within the care system may also further impact upon the development of these skills. Several factors pertaining to the care experience are indicated as mediators of EF skills development, for example, the presence of placement instability or caregiver trauma, are likely to reduce EF capacity (Pears & Fisher 2005; Hodgdon et al., 2018). EF skills are also proposed to be related to a variety of other difficulties. The findings highlight potential protective or risk factors which services should consider in their assessment and provision of services.

1.4.1 Pattern of Difficulties and Issues of Assessment

One of the complicating factors for understanding the pattern of difficulty in this area is the conflation of multiple varying skills under the umbrella term of EF. This results in an array of assessments being used to examine varying subset skills related to the overall concept. However, it is unclear if these assessments truly capture the construct intended. This may be due to interference from similar but alternate constructs, such as attachment difficulties and emotional dysregulation, from complications regarding the developmental trajectory of EF itself or from difficulty assessing a complex set of skills in combination. For example, it is possible that current behavioural assessments are not accurately capturing the difficulties that children have been evidenced to experience on a neuronal level (Bruce et al 2009; Bruce et al., 2013). Given the developmental trajectory of EF, which continues to develop into early adulthood, it may be that current assessments are unable to capture variation in the development of each sub-skill, as the rate of development for each may vary. Although, EFs are largely considered to be distinct but inter-related skills, further research is required on each domain in order to consider a reliable pattern of difficulties for children in this population.

Furthermore, it may be that composite scores of EF are so broad as to capture similar but alternate constructs, such as attachment difficulties or emotional dysregulation. This is

particularly relevant when we consider the evidence of placement instability. According to this review, children who experience high levels of placement instability following entrance to the care system, experience lower EF abilities than other care experienced youth. This may be due to the additional trauma of experiencing placement change during care, particularly as caregiver trauma experiences are more strongly associated with reductions in EF. Alternatively, there are also potential links with attachment theory (Bowlby, 1958) where organised attachment styles are created through consistent care, something which cannot be realistically provided by many changing caregivers, given the natural individual differences in the approach, ability, and environment of each carer. Therefore, it may be that placement instability increases physiological stress and decreases measured EF, due to the impact on overall attachment. However, in studies where measures of secure attachment behaviour were taken, no significant association was seen between level of secure attachment behaviours and measures of inhibitory control (Pears et al., 2010). Indicating that for measures of inhibitory control a separate construct is captured, which may explain the strength of evidence for this subskill. Further consideration of attachment behaviours as part of EF research in this area is recommended.

The accuracy of assessment is important, as Lewis et al. (2007), and Pears and Fisher (2005), each concluded that EF should be assessed routinely for children within the care system, something which does not currently take place. They specify that due to EFs association with other presenting difficulties, identification of difficulty is essential to support provision of services. For example, EF has been associated with the development of other presenting difficulties such as indiscriminate friendliness (Pears, et.al., 2010), dissociation (Cromer et.al., 2006), and reduced emotional regulation in later life (Heywood, 2009). It remains unclear whether these are related issues or direct expressions of EF difficulties. Importantly, assessment may also be beneficial to support placement stability, as providing an explanation for the difficulties encountered by care-experienced children, which considers deficits in learning, organisation, and memory, can empower foster carers to continue providing care in the face of challenging behaviour (McLean, 2016). Were these to be considered, inhibitory control assessments may be particularly relevant, as low ability in this area, has been shown to mediate the relationship between polyvictimisation and externalising problems, which highlights the importance of these skills for resilience and

adjustment following trauma. However, executive function assessments in isolation can only go so far, other difficulties such as language difficulties and motor difficulties may also be important to consider.

Alternatively, there could be an argument for the assumption of EF difficulties in this population, as evidenced neural differences (Bruce et al. 2009; Bruce et al., 2013) may indicate that although children in care at times appear to have intact EF, the neural pathways which underlie these skills, particularly inhibitory control, may be altered. This implies that children must work harder, or develop different strategies, to reach the same outward appearance of skill as typically developing children. Furthermore, children are most likely to enter the care system based on caregiver trauma, such as abuse and neglect, which is most highly associated with EF difficulties (Lind et al., 2017). In this scenario, it is arguable that all children would be supported by care which prioritises the development of these functions. This is further supported by evidence of the success of interventions based on parenting styles which did not assess EF prior to commencing (Bruce, et al., 2009; Lind et al., 2017). However, further research on the neural differences presented is required for corroboration of previous findings, for further subskills of EF, and between those who experience different types, severity, and duration of trauma.

1.4.2 Placement Instability and Clinical Intervention

Placement instability is also indicated as a key variable in the variation of EF difficulties amongst care experienced youth. However, given that the results are correlational, it is difficult to identify the direction of causation. Lewis et al. (2007) reported that oppositional behaviour or challenging behaviour was mediated by inhibitory control abilities as opposed to cognitive deficits more generally, and Hodgdon et.al. (2018) and Horn et al. (2018) demonstrated an indirect link between EF and externalising problems, which are often a component in placement instability. Therefore, it remains unclear whether placement instability leads to increased EF problems or problems with EF leads to increased placement breakdowns. Given the relationship between trauma and EF, it is likely that care experience is not the primary cause of EF difficulties, but that placement instability perpetuates or compounds a pre-existing vulnerability. Arguably, placement instability could also be considered a form of caregiver trauma, which is predominantly associated with reduced EF (Lind et al., 2017) and this may be the mechanism through which the relationship occurs.

Importantly, assessment, intervention or improved placement stability may be most important for children with this type of historical experience. Overall, it is indicated that service providers should continue to consider changes to a child's home environment carefully and seek to provide long term and stable placements as a priority to minimise further difficulty. Longitudinal research which considers the causal and mediating factors of these relationships would also be beneficial.

The importance of stable and consistent care is also highlighted by the focus of the two interventions included as part of the review. Attachment and Biobehavioral Catch-up for Toddlers (ABC-T; Lind et al., 2017) and Multidimensional Treatment Foster Care for Preschoolers (MTFC-P; Bruce et al., 2009) both focus on training foster carers in attachment approaches to support responsive care, and both resulted in care-experienced young people performing comparatively with community controls. Therefore, there is evidence that training foster carers, or caregivers, in parenting styles which promote EF can enhance these skills in young children. Training for foster carers may also reduce placement instability (McGuinness, 2007) which may be an important factor in supporting the development of EF. This is significant, as the ability to improve or reduce the effects of maltreatment on EF, could be crucial for later development. However, much of this work provides preliminary results and further corroborating research is required. Extending this type of intervention into an older age group would also be important to explore.

1.4.3 Limitations and Future Research

The current review has several limitations due to the varied nature of the studies included. There is a relatively small number of studies available that explicitly explore all the concepts identified for this review. Notably, there were no UK studies identified and direct comparisons of the care systems across international locations is not always possible given the alternative systemic approaches. There were also very few residential placements represented, with the majority of evidence coming from foster care. In part, this is due to the exclusion of international institutionalised evidence, where work with populations that might be labelled as residential care has been conducted. This is likely to relate to the relative recency of developments in neurodevelopmental research and the expanding evidence base for neuro research. However, the lack of included papers in this review

emphasises the need for further efforts to access the population, as the implications for clinical practice may be significant.

Similarly, given that the exposure of interest is trauma, the papers are almost exclusively cross-sectional and correlational in nature. It is therefore difficult to infer causation or direction within the relationship and the potential for bias within the studies is quite high. However, given the unethical nature of more rigorous experimental designs, this is an appropriate research method. Research in this area could be strengthened by corroboration of findings or prospective cohort studies where children are followed over a longer timeframe. Furthermore, while many studies looked at individual constructs of EF these were often in isolation as opposed to explored simultaneously. This makes it difficult to identify an overall pattern of difficulties which emerge, as the variety of measures, age of participants, locations and timeframes makes comparison between studies problematic. Future research could combine a focus on simultaneous exploration of multiple skills with longitudinal research to build a more predictable pattern of difficulties, monitoring changes over time and identifying specific protective factors and interventions which would maximise development of these skills. Similarly, further reviews of the increasing evidence base may be required to capture the increasing knowledge in this area.

Finally, many of the papers explore the difference between maltreated children in care and non-maltreated controls, which provides limited insight into the impact of the care system itself upon the development of EF skills. Routine assessment of EF upon entry to the care system and longitudinal data over time would allow for exploration of critical time points or required inputs for the development of EF within the confines of the care system. There is also the possibility of using new electrophysiological evidence to provide nuanced testing and improve the standard behavioural assessments in order to account for differences within this population and between maltreated and non-maltreated children. There is also a close link with the development of attachment. Both interventions described identify improving attachment as one of their outcomes or goals, therefore exploration of the links between EF and attachment styles would be beneficial for this group.

1.4.4 Conclusion

The overall pattern of results indicates that care-experienced children are at increased risk of EF difficulties due to their experience of developmental caregiver trauma, coupled with

the potential impact of their experiences after entering the care system. In order to reduce the risk of EF difficulties, services should be considering early intervention in cases of emotional abuse and neglect, EF assessment as part of routine practice, as well as prioritising placement stability and working with foster carers to provide consistent and attuned care.

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2 CHAPTER TWO: Neuro Trauma Training: Exploring the Feasibility and Acceptability of Online Training in Executive Function for Residential Childcare Workers Supporting Children in Care.

Authors: Louise Hendry^{a,b}, Dr. Emily Taylor^a, and Dr. Lucie Mackinlay^b (2019)

Affiliations:

- a) The School of Health in Social Science, University of Edinburgh, Edinburgh, Scotland, UK, EH8 9AG
- b) Looked After Children’s Psychology Department, NHS Forth Valley, Falkirk, Scotland, UK, FK1 4HA

Corresponding Author:

Louise Hendry – Looked After Children’s Psychology Department, NHS Forth Valley, Camelon Education Centre, Abercrombie Street, Camelon, Falkirk, Scotland, UK, FK1 4HA.

Louise.Hendry1@nhs.net

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Abstract

Background:

Staff in residential childcare roles are working with a complex and vulnerable population where trauma is highly prevalent. Experiencing trauma and neglect at a young age is likely to lead to adaptive alterations in brain development, due to over or under activation of the body's stress response. As a result, children in care with trauma backgrounds are likely to experience a number of neurodevelopmental difficulties. This can include memory difficulties, language impairment, and difficulties with executive function, a set of higher-level cognitive abilities, which support individuals to interact with the world around them. However, residential staff working with this population do not always receive adequate training and it can be difficult to reach residential childcare staff using traditional training methods. A recent push towards improving training for residential staff has resulted in a pathway of formal qualifications, however, these courses do not tend to focus on the neurobiological impact of trauma, instead focussing on promoting a behavioural understanding alongside related management techniques.

Aims:

This paper explores the feasibility and acceptability of an online training course for residential workers with children in care, which focusses on the impact of trauma on the development of executive function. The development of the course and an evaluation of its outcomes are described.

Method:

Residential childcare workers across the UK were recruited to complete the training course and provide pre- and post-course responses to a knowledge questionnaire. Responses of those registered were used to assess the pre-existing level of knowledge across this staff group, and pre- and post-course scores were compared to explore the level of knowledge gain. Evaluative feedback was also provided following course completion.

Results:

The results evidence that the course was feasible and acceptable to residential childcare workers. There was a high level of subscription and a high completion rate. Feedback for the course was generally positive and there was a significant level of knowledge increase

following the course. There were however some technological limitations which would be resolved in future.

Keywords: Children in Care, Residential Care Staff, Online Training, Knowledge Transfer, Executive Function.

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2.1 Introduction

Children who are cared for away from home, represent children and young people who have been placed into the care of their Local Authority either by court order or voluntarily in agreement with their parents (Department of Health, 1989). This includes a variety of formal and informal care settings including, kinship care, foster care, and residential care. Recently across the UK there has been a notable shift to prioritise the use of kinship or foster care wherever possible (Nissim, 2006), and in the UK this is currently the most common kind of placement (Scottish Government (2016); Department for Children, Schools, and Families; DCSF, 2016). This has now led to residential care often being considered as a last resort, used in only the most complex of cases (Berridge, Biehal, & Henry, 2012), with approximately 10% of children under the care of local services placed in residential care (Scottish Government, 2018). Although the research is scarce and sometimes historical, there is evidence that residential care staff are now working with children who are older, more challenging, and more complex than they may have been previously (Delfabbro, Osborn, & Barber, 2005; Heron & Chakrabarti, 2003; Stuck Jr, Small, & Ainsworth, 2000). Despite this, care staff often receive inadequate training and supervision, and understaffing is common (Krueger, 2007). This paper will evaluate the development and delivery of a new online training course for residential childcare workers, focussed on the impact of trauma on Executive Function (EF).

2.1.1 Profile of Children in Residential Care

Children may be taken into care for many different reasons, but a large proportion of children are accommodated because of neglect and abuse, with 60-62% accommodated for these reasons (DCSF, 2016). In Scotland, 36-38% of child protection case conferences reported emotional abuse and neglect, and 27% reported concerns about physical, sexual and domestic abuse (Scottish Government, 2018). This is indicative that children in care are often a highly traumatised population. In line with this, there is extensive evidence from the US, the UK, and Europe, that children in care may experience difficulties in response to exposure to trauma in their early lives (Fisher, 2015). They experience higher rates of psychopathology than the general population (Burns et al., 2004), higher levels of internalising and externalising problems (Ford, Vostanis, Meltzer, & Goodman, 2007; Lawrence, Carlson, & Egeland, 2006), poorer academic achievement (Pears, Fisher, Bruce, Kim, & Yoerger, 2010) and difficulty with peer relationships (Hodges & Tizard, 1989). They are also at higher risk

for encountering the youth justice system by engaging in high-risk behaviours such as substance misuse and crime (Jonson-Reid & Barth, 2000). Developmentally, there is also evidence of significant delays among children in care (Judge, 2003). Research, primarily conducted with children in foster care, has shown delays in cognitive development, language development, and emotional development (Fisher, 2015). This is likely to occur as a result of dysregulation to the body's stress response system – the hypothalamic–pituitary–adrenocortical (HPA) axis, or changes in the corticolimbic networks of the brain (De Bellis, 2001; De Bellis et al., 1999; Gunnar & Quevedo, 2007). The exact form of this dysregulation is unclear (McLean, 2016), as research has evidenced both chronic over-activation and chronic under-responsiveness of the HPA axis over time (Frodl & O'Keane, 2013; McCrory et al., 2011; McEwen, 2012; McLaughlin, Sheridan, & Lambert, 2014). It is therefore likely that the pattern of difficulty experienced is dependent on a variety of complex factors, including timing, chronicity, and type of abuse experienced.

As research in this area has expanded, there has been a natural progression towards considering the impact of these different variables. Interestingly, this type of research has consistently highlighted that neglect, often considered a less traumatic experience than physical abuse or maltreatment, can also be a toxic stressor with similar pervasive and negative effects (Fisher, 2015). This is important for the care population, as caregiver trauma, such as neglect - the most commonly experienced by children in the care system (Lind, Lee Raby, Caron, Roben, & Dozier, 2017) - is associated with neurobiological changes in the HPA axis and pre-frontal cortex. For example, children in care have been shown to exhibit blunted cortisol production, with care-experienced children recording lower levels of cortisol in the morning and throughout the day in comparison with non-maltreated controls (Kertes, Gunnar, Madsen, & Long, 2008). This is notable, as it is in contrast with the typically high levels of cortisol production observed in toxic stress. This is hypothesised to be a protective response to the absence of responsive care experienced in neglect and caregiver maltreatment (van der Vegt, Van Der Ende, Kirschbaum, Verhulst, & Tiemeier, 2009). Atkinson (2013), suggests that in this context, brain development becomes altered as survival becomes the primary aim, rather than focusing on mechanisms of learning.

These changes are also linked with alterations in the corticolimbic networks (De Bellis, 2001; De Bellis et al., 1999; Gunnar & Quevedo, 2007). For example, the pre-frontal cortex,

described as the area of the brain primarily responsible for the development of EF, has been shown to be particularly sensitive to the effects of trauma (De Bellis, 2005). EF is the collective term for a set of metacognitive capacities responsible for guiding, directing and managing cognitive emotional and behavioural functions (Gioia, Isquith, Guy, & Kenworthy, 2000; Lezak, Howieson, Loring, & Fischer, 2004). Notably, the brain regions most commonly affected in maltreated youth, the pre-frontal cortex, the orbitofrontal cortex, anterior cingulate cortex, and amygdala (Cowell, Cicchetti, Rogosch, & Toth, 2015; De Bellis & Thomas, 2003; Teicher & Samson, 2016), are the same regions which are activated during tasks requiring EF. This suggests that the neural networks which support EF are sensitive to the effects of trauma exposure.

2.1.2 Trauma and Executive Function

In line with this, caregiver trauma types, such as abuse and neglect, are strongly associated with reduced EF (Hodgdon et al., 2018). Therefore, the care population is likely to be particularly vulnerable to deficits in this area. Indeed, in their meta-analyses of EF in traumatised children, Op den Kelder, Van den Akker, Geurts, Lindauer, & Overbeek (2018) demonstrated that children in foster care or adoption, demonstrated lower levels of EF, primarily inhibition and cognitive flexibility, even in comparison with other traumatised youth.

Most studies looking at EF in care settings take place within the foster care system. Neuropsychological tests with children in foster care have demonstrated deficits in working memory, inhibitory control and cognitive flexibility (Bucker et al., 2012; Lewis, Dozier, Ackerman, & Sepulveda-Kozakowski, 2007; Pears & Fisher, 2005). These three key areas of EF underpin the development of reasoning and problem-solving skills (Op den Kelder et al., 2018). These observed differences are also evidenced by neuroimaging studies that identified altered neural pathways for children in foster care when presented with tasks requiring inhibition (Bruce et al., 2013; Bruce, McDermott, Fisher, & Fox, 2009). Furthermore, behaviours that foster carers identify as being problematic for the children in their care, are qualitatively similar to difficulties with EF (Octoman, McLean, & Sleep, 2014). Although this research is still in a preliminary stage, it is nonetheless important that a variety of experimental approaches have demonstrated similar results. Many of these difficulties have also been demonstrated when differences in overall cognitive ability are controlled for

(Bücker et al., 2012) indicating that EF difficulty is a specific issue separate from overall cognitive function and as such is worthy of consideration.

2.1.3 Executive Function in Residential Care

Although EF has not been extensively studied in residential care populations, it is likely that this is problematic for children in these settings. Children in residential care, have typically experienced similar backgrounds of abuse and neglect to those in foster care settings, but additionally are likely to have experienced multiple placements prior to being placed in a residential setting (Hart, La Valle, & Holmes, 2015). In England, it is estimated that 29% of children in residential care have had six or more placements. Frequent changes in residential placement also occur, with only 21% of placements in England (White et al., 2015) and 20% in Scotland (McPheat, Milligan, & Hunter, 2007) lasting more than 12-months. This type of placement instability and caregiver breakdown is associated with further reductions in EF abilities, as those in the care system who experience placement instability, have been shown to experience a higher level of EF difficulties than those who are placed in a single stable placement (Pears & Fisher, 2005; Lewis et al., 2007). This indicates that as the number of transitions increases, so does the likelihood of negative outcomes (Newton, Litrownik, & Landsverk, 2000), a relationship that occurs reliably, regardless of whether these transitions are considered positive, for example, to a more appropriate placement (Fisher, 2015). This is particularly important as EF difficulties have been linked with externalising problems such as aggressive or challenging behaviour, which may, in turn, lead to an increase in placement changes (Hodgdon et al., 2018). This indicates a circular link between placement instability, EF difficulties, and oppositional or externalising problems. Although much of this research is cross-sectional and as such the direction or causal nature of this relationship has not yet been established, it is likely that children in residential care have accumulated multiple risk factors which increase the likelihood of EF difficulties.

2.1.4 Staff Training in Residential Care

Given the complex nature of this client group, there has been an increasing focus on introducing minimum standards of education and training for workers in this area. Since 2009, there have been various reports and guidelines for the training and education of care staff, beginning with *The Higher Aspirations, Brighter futures: National Residential Child Care Initiative Overview* (NRCCI; Davidson, Wilkinson, Docherty, & Anderson, 2009). The NRCCI

paper set out the aim of changing the culture of residential care and recognising the value of its strategic role. It focussed on increasing the knowledge, skills, value, and status of residential staff, to bring them in line with other professionals in the social care workforce (Davidson et al., 2009). As recently as 2015, the Scottish government prepared the 'Standard for Residential Child Care', (2015), which outlined the aim of introducing a Scottish Qualification and Competency framework (SQCF) Level 9 qualification for all residential childcare workers and managers. However, this has yet to be implemented due to the ongoing independent care review. In a report compiled by the Centre for Excellence in Looked After Children's Services in Scotland (CELCIS; McMeeking et al., 2016) it was acknowledged that four-fifths of the residential childcare workforce have now gained the SQCF level 7 qualification required for registration with the Scottish Social Services Council (SSSC).

However, while many of the above qualifications explore the symptoms and behaviours experienced by young people who have experienced trauma, very few detail the potential neurodevelopmental limitations which may underly these behaviours. To date, there is limited evidence that cognitive factors are being considered as a contributing factor for the kinds of behaviours children demonstrate in care (Morison, 2018). This is despite evidence that providing an explanation for the difficulties encountered by care-experienced children, such as considering deficits in learning, organisation, and memory, can be empowering for both children and carers. For example, linking pre-care experiences with poorly developed cognitive skills can support foster carers to persevere in the face of challenging behaviour (McLean, 2016). Training programs in foster care settings have also been linked with carer retention, improved placement stability and more positive outcomes for children (Dumaret et al., 1997; McGuinness, 2007). However, the overall effectiveness of training in care settings is somewhat mixed (Everson-Hock et al., 2012) and there is little to no evidence regarding the impact of training for residential support staff.

In a review by the Department of Education in England (White et al., 2015) residential staff self-identified gaps in their knowledge, which included psychological, behavioural and developmental issues. Importantly, residential staff outlined that improved knowledge in these areas was required to help them understand what lay behind the children in their care's psychological state and/or behaviour (White et al., 2015). However, training alone has

not always been evidenced as leading to better outcomes. Other organisational factors, such as an ongoing culture of learning, organisational support, and adequate resources (Nolan & Keady, 1996) are also required for individual training packages to be most effective. Despite these challenges, it is recognised that the specialist nature of residential childcare work, requires a rolling programme of comprehensive training to support staff to meet the needs of the children and young people in their care (White et al., 2015). Training for residential care staff is therefore generally viewed as favourable, with staff and managers expressing that they felt more able to take a broader view of children and their presentations (White et al., 2015). The inclusion of practical information and specific modules aimed at the care population are also recognised as being beneficial as opposed to generic training packages (White et al., 2015). It is further recommended that to be effective, training needs to be informed by relevant theories, appropriate to the day to day tasks of residential childcare and transferable into practice (Clough, Bullock, & Ward, 2006). Therefore, tailored interventions relevant to the daily practice of residential staff are indicated as being most acceptable and desirable to staff.

2.1.5 Online Training

In the modern age, where resources are in high demand, there has been an expansion in the use of online learning tools (Ellis & Kuznia, 2014) and online training has become a favoured option amongst industries, educational institutions, and organisations (Paranal, Thomas, & Derrick, 2012). When used for Continuing Professional Development, the use of online tools may be a more efficient use of training resources and eliminate the need for employee travel (Donavant, 2009). This is beneficial for a 24-hour industry like residential childcare, where opportunities for whole staff training are limited. In these settings, training needs to provide convenience and flexibility regarding the time and place for learning. Increasingly, technology is promoted as an enjoyable and relatively cost-effective way of reaching staff who may have difficulty in attending formal sessions (Irvine, Ary, & Bourgeois, 2003; Walker & Harrington, 2004). Online approaches to training for residential care staff have been successfully trialled for carers of older-adults experiencing dementia (Hobday, Savik, Smith, & Gaugler, 2010). In this pilot, more than 85% of care staff who completed the training agreed or strongly agreed, that the training protocol improved their competency and sense of mastery regarding the care they provided (Hobday et al., 2010). Online packages have also been delivered and positively evaluated for areas such as the detection and reporting of

child maltreatment (Kenny, 2007) and palliative care (Pelayo-Alvarez, Perez-Hoyos, & Agra-Varela, 2013), demonstrating that this type of learning can be effective even with sensitive subject matter. Currently, there is also a push towards trauma-informed approaches locally, nationally, and internationally, in part through initiatives based on the Adverse Childhood Experiences project (ACES; for example, Edwards et al., 2003; Felitti et al., 1998). However, evidence of the implementation of online training for trauma is limited.

2.1.6 Current Course Development and Aims

It therefore appears, that there is an evidenced need for ongoing, relevant, and tailored training amongst residential staff working with children in care, alongside a potential lack of cognitive factors being acknowledged with regards to children's behaviour. This highlights an opportunity to evaluate the effectiveness of training for residential staff in this area. Given the importance of EF and the high likelihood of difficulties in this area for children in residential care, this has been identified as a key area of focus. The increased use of technology to provide flexible and convenient learning for staff groups who may find it difficult to attend more traditional training programmes also provides an opportunity to evaluate online training with residential care staff. The current study therefore aims to consider, whether it is feasible and acceptable to residential staff to undertake online training centred around understanding the potential impact of trauma on EF abilities for children in care and how children may be supported with these difficulties in a residential setting.

2.2 Method

2.2.1 Design

To explore the study aims, an online training course for residential care staff was developed and evaluated using a pre-and post-test within group design. Residential childcare staff were recruited from council units and privately-run companies, to complete a training course outlining the neuropsychological impact of trauma and neglect on the EF of children and young people in care. Participants completed a bespoke knowledge-based assessment, designed to measure learning, and a measure of attributions towards challenging behaviour, prior to undertaking training, immediately upon completing the training and where possible at three-month-follow up, (See Appendix E. for an overview of measures administered at each time point).

2.2.2 Participants and Recruitment

Participants were recruited from residential childcare units across the UK in private and council-run facilities. Direct links with nine local provisions were identified and recruitment agreements were put in place with six local councils and private care providers, a success rate of 67% for councils and companies approached. Appendix F. provides a summary of the approaches made and their outcomes. Once initial contact had been made, the principal researcher met with the care provider to discuss the recruitment strategy. All care providers chose to distribute the course materials through their internal email distribution, and regular feedback was provided on the level of uptake for each provider, so managers could gauge the success of their approach. The principal researcher also offered to visit individual units, or care providers to discuss the project with staff but this was not taken up in any case.

A secondary pathway utilised social media and online platforms. As the training was delivered remotely, participants were not limited by geographical areas. Facebook and Twitter accounts were set up under the moniker of “Neuro Trauma Training”. The Twitter account sent direct messages and public tweets to identified care providers, and also tweeted information about the course at regular intervals. Please see Appendix F. for a summary of the online recruitment strategy.

Any individual currently working within a registered provider of residential care for children was eligible to take part in the study. Details of the person’s role, length of service in this area and level of training were collected during participant registration. Individuals from alternative professions or designations were not discouraged from taking part, however, they were informed that their data may be excluded from the final analysis in line with the project’s aims.

2.2.3 Materials

The course materials were delivered across four modules, each requiring approximately one hour’s completion time. Each module covered a different area of interest including, the brain and behaviour, EF, difficulties with EF and supporting young people with tasks requiring EF. Each module was designed to build on previous modules by using case examples and sequential information; as such it was recommended that they be completed in sequence. Within each module were scenario, and knowledge-based, multiple-choice questions to encourage the participants learning. This is based on evidence that interactive learning

strategies are more effective than didactic methods (Thomson, 2001) and that problem-based learning enhances knowledge acquisition and problem-solving skills (Gijbels, Dochy, Van den Bossche, & Segers, 2005). The knowledge-based questionnaire was designed to assess the identified learning objectives, which were as follows:

1. To understand the basic physiology and systems of the frontal and pre-frontal cortex.
2. To understand the basic principles of EF.
3. To understand why EF is important in relation to care-experienced children's prenatal and early experiences.
4. To consider a variety of reasons for the described presenting behaviours and to attend to these during their work.

Once developed, the materials were reviewed by a specialist alternative care clinician within NHS Forth Valley and an independent academic with an interest in this area. A small pilot using three lay individuals was conducted to identify and resolve any issues prior to the wider roll-out of the training. Previous online- training programmes have successfully used small focus groups and independent review during the creation of their course (Hobday et al., 2010). Piloting before initial data collection is also acknowledged to hold benefit for developing the multiple aspects included in a technology assisted intervention (Carswell, van Ommeren, & Tol, 2016).

During the pilot, the individuals were able to access the materials in the same manner as when live recruitment was taking place. They completed all the measures and the evaluative tool as described. The principal researcher also met with this small group to discuss any feedback received directly. This allowed for consideration of the acceptability of the training, the ease of use, and any barriers to participation. Feedback from this pilot was used to refine the functionality of the course rather than the content, which was adapted based on the expert reviews described above. Developing interventions using a carefully phased systematic approach is part of best practice as recommended by the Medical Research Council (Craig et al., 2013).

The course was released live online on the 16th October 2018 and remained active and recruiting participants until the 31st March 2019.

Platform & Access

The training materials were hosted on a webpage designed using WordPress.org and hosted by servers at the University of Edinburgh. It was remotely accessed by the participants at a time of their choosing. A number of potential platforms were considered and ultimately deemed unsuitable due to cost, availability, or inappropriate functionality. These included Articulate 360, Pebblepad, LEARN and Moodle. Given that the course is currently in the pilot phase, the restrictive cost of the most highly functioning programmes for online learning proved prohibitive. The need to measure learning outcomes by linking pre- and post-questionnaire responses also proved problematic, as responses were collected anonymously to reduce social desirability factors and to comply with current data protection legislation. As a result, two separate systems were used, and data pre- and post- was collected by Qualtrics Online Survey Software. During the initial registration survey, each participant created a unique identifying code to identify and link their data throughout the collection process. Once the registration measures were collected, an automated email was sent after a seven-day delay, detailing the website address for the course materials. When accessed through the website address, no additional registration information was collected, or additional requirements made. This was beneficial to support access, but also provides a limitation in that no identifiable data regarding time spent on the course, or the number of times someone visited the course page, is available for comparison with their learning outcome. Future iterations would likely make changes to this platform to provide a higher level of functionality to participants.

Pedagogy

The course content was developed in line with, and with consideration for, a variety of theories of learning. The identified learning objectives are predominantly based on knowledge gains. Therefore, cognitive theories were considered to support the participant to engage with the information and adopt it into their pre-existing knowledge (Yilmaz, 2011). However, one of the overall aims of the course, although not a specified learning objective, was to influence potential practice change within the participant's care-giving role. Therefore, it was expected that the knowledge gained would be transferred from the course and applied within the participant's professional setting, a process generally known as knowledge transfer. However, knowledge transfer is understood to be a multifaceted process which requires the interaction of active strategies including regular feedback,

reflective discussion, and ongoing support, which were not available within the course delivery. Therefore, to promote knowledge transfer within individual learners, Kolb's Experiential Learning Theory (Kolb & Fry, 1974) (see Figure 2-1.) was chosen to support the course design, as it centres primarily on the cognitive process within the learner (McLeod, 2013), and can therefore support learning in the absence of the multiple ongoing supports required for knowledge transfer methods.

This theory informs a model where knowledge can be transformed from concrete experiences, into the understanding of an abstract concept, that can be experimented with and applied across multiple settings, thereby supporting the process of turning knowledge gain into behavioural change. Importantly, the cyclical nature of this process also supports the acquisition of new learning that is built upon prior knowledge, which is aligned with the modular nature of this course. This method has also previously resulted in positive outcomes, where active student involvement has optimised learning (Smart & Csapo, 2007).

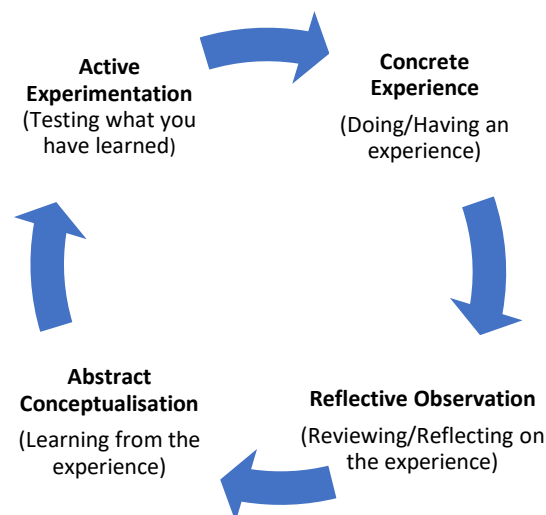


Figure 2-1. Kolb's (1984) Experiential learning cycle.

Fully effective educational tools should include the full cycle of learning experiences to support the learner to fully adopt the new information (McCarthy, 2010). Therefore, various design elements have been included to encourage movement around this cycle.

As knowledge transfer occurs most effectively within an active process (Menon, Korner-Bitensky, Kastner, McKibbon, & Straus, 2009), interactive and educational activities were included throughout the course, for example, drag and drop exercises, interactive diagrams,

and case examples. These types of interactive elements are believed to increase clinicians self-reported evidenced-based knowledge and produce a change in practice behaviours (Davis, Thomson, Oxman, & Haynes, 1995; Menon et al., 2009). These interactive tasks, multimedia examples, and readings, also serve as the basis of concrete experience (Svinicki & Dixon, 1987) where the user must engage with the information beyond watching and reading alone (Kolb, 1984). Due to the unavailability of peer discussion, the interactive elements also incorporated feedback, to simulate the benefits of group learning experiences.

Reflective discussion between participants was notably absent from the course. This was largely due to the process of rolling recruitment, which limited the potential for simultaneous progression of participants through the course, and therefore the opportunities for spontaneous reflective discussion. However, there was also concern that discussion between participants might lead to the sharing of potentially confidential information from their areas of practice, which would be in a public forum accessible by any internet user. Therefore, to encourage reflection, thought-provoking questions and problem-based scenarios were included at regular intervals throughout the presentation of text information. These questions were posed both as prompts for reflection and activities requiring a response. Where a response was required, this provided a further opportunity to provide formative feedback and where a response was not required, these questions aimed to encourage the participant to relate the information to their own situation and provide the opportunity for experiential learning within what is, at times, a necessarily directive framework.

Abstract conceptualisation is the stage where the learner draws upon new theories, ideas, and discussions to assimilate the new learning with previous knowledge (Kolb, 1984). Svinicki and Dixon (1987) suggest that instructors can foster abstract conceptualisation by providing relevant papers and delivering specialised information. Therefore, links to further information, relevant reading, and alternate materials were signposted to support this process in the absence of group discussion. Finally, to support active experimentation, case-based scenarios were considered throughout the course, and the final knowledge-based questionnaire included opportunities for the participants to consider how they might respond to a given scenario, based on the knowledge and skills they have been considering. Problem-based learning of this type is in line with the cognitive principles of learning which

guide the course and is evidenced to enhance knowledge acquisition and problem-solving skills (Gijbels et al., 2005).

Ausburn's (2004) desirable design elements for adult learning were also incorporated where possible to encourage completion and acceptability to participants. Given the heterogeneous nature of the staff group completing the course and the lack of previous academic requirements, universal design principles, were also considered to support access to the course. It was expected that in combination these elements would foster knowledge, encourage skills gain and support recruitment.

2.2.4 Measures

Participants were invited to complete the initial measures and register for the course using an online survey powered by Qualtrics, an online survey software. On registration, the participant was presented with the participant information and asked to provide informed consent to take part in the study (see Appendix G.). This information also informed the participant of their right to withdraw at any time. Once consent was provided, the participant provided demographic information and assigned themselves a unique identifying code, which was then used to link their responses at each time point. As part of registration, the participants also completed a knowledge-based questionnaire and a modified version of the Attributional Style Questionnaire (ASQ; Peterson et al., 1982 as used in McGuinness, 2007). Please see Chapter Three for an analysis of the ASQ data. After registration, participants were required to wait for seven-days, at which point an automated email was sent which provided details of how to access the course materials. This was designed to prevent unnecessary fatigue at repeating the measures and limit the impact of immediate recall of previous answers. Participants also completed the ASQ and knowledge-based questionnaire upon completion of the course and at three-month follow up. Upon completion of the course, participants were also asked for evaluative feedback. A summary of each measure analysed in this paper is outlined below (see Appendix H. for examples).

Knowledge-Based Questionnaire

To assess the comprehension and retention of the knowledge presented in the training course a short, bespoke, knowledge and skills-based questionnaire was developed. This included multiple choice questions relevant to the information contained within the modules of training, scenarios in which potential hypotheses for behaviour are considered, and short

free-text questions. The responses to these questions were measured using a points-based system, which included both positive and negative scales, with the aim of providing qualitative information about the participant within a quantitative scoring system. This was presented both pre-and post-training to measure increased knowledge following completion, as well as at a three-month follow up, in order to provide consideration of whether any increase in knowledge is maintained. As the questionnaire is linked directly to the learning objectives identified for the course and serves as a measure for knowledge increase, the internal validity of this measure is not required to be considered.

Evaluation and Feedback

Once the training was complete participants were asked to provide feedback regarding the training so that improvements could be made in future. This evaluation was bespoke for this training. Each participant was asked to rate their overall experience, and their experience of each module, on a scale of one to five stars, where five stars was entirely positive, and one star was entirely negative. Similarly, each participant rated each module for its relevance to their current role, ranging from “not at all relevant” to “totally relevant”. The participants were also asked to identify the most and least helpful aspects of the course, and any changes they would make in future, using a free text response question. Also included in the knowledge questionnaire was the opportunity for participants to rate their knowledge on each of the four module topic areas, so that comparisons about self-identified knowledge could be compared before and after the course. Pre-, post-, and follow-up data was also used to evaluate engagement, completion rates, and participant attrition.

2.2.5 Planned Analysis

A repeated measures t-test was used to examine the difference between the participant’s responses pre- and post-training, while Friedman’s Repeated Measures ANOVA was intended to examine the results in comparison to three-month follow up. The a priori calculation for a repeated measures t-test, using an alpha level of 0.05 (Cohen, 1992), effect size of 0.6, and statistical power of 0.8 (Cohen, 1992; Tabachnick & Fidell, 2001) was computed via G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) an online statistical calculator. This calculation stipulated a minimum of 24 participants was required for pre- and post-test comparisons.

2.2.6 Ethical Considerations

The study was approved through the University of Edinburgh ethical process, and was also screened by Glasgow, Lanarkshire and Falkirk Councils using their internal ethics process. Given the level of participant commitment required, effort was made to highlight to participants that this was a pilot study and as such the course had not yet demonstrated beneficial effect. Participants were also awarded a certificate of completion, as opposed to a certificate of achievement, for this reason. This was important as delivering a training programme which does not reach its desired aims could have created a false belief about competence in the staff teams taking part.

2.3 Results

2.3.1 Participants

Participants were recruited from residential childcare units across the UK between October 2018 and March 2019, a period of just over five months. In total, there were 318 responses to the registration questionnaire, 98.4% of which provided consent for participation. Incomplete or partial responses accounted for 107 (33.6%) of the total responses, and five participants did not provide consent to continue. A further 21 participants reported a professional role other than those included in the project and were therefore excluded, meaning 185 complete registrations were provided. 104 responses were provided for the post-course questionnaire, of which 5 were incomplete, six participants data was excluded due to their professional role, and 2 were duplicate responses, meaning 91 participants fully completed the course, a completion rate of 49.2% amongst those fully registered and 29.1% of the total consenting registrations including partial responses. Of the 97 completed post-course questionnaires, 13 participants did not provide their unique identifying number, and could not be matched to their pre-course questionnaire data. The final sample therefore included 78 sets of complete pre-post data. See Figure 2-2. for a pictorial representation of included participants.

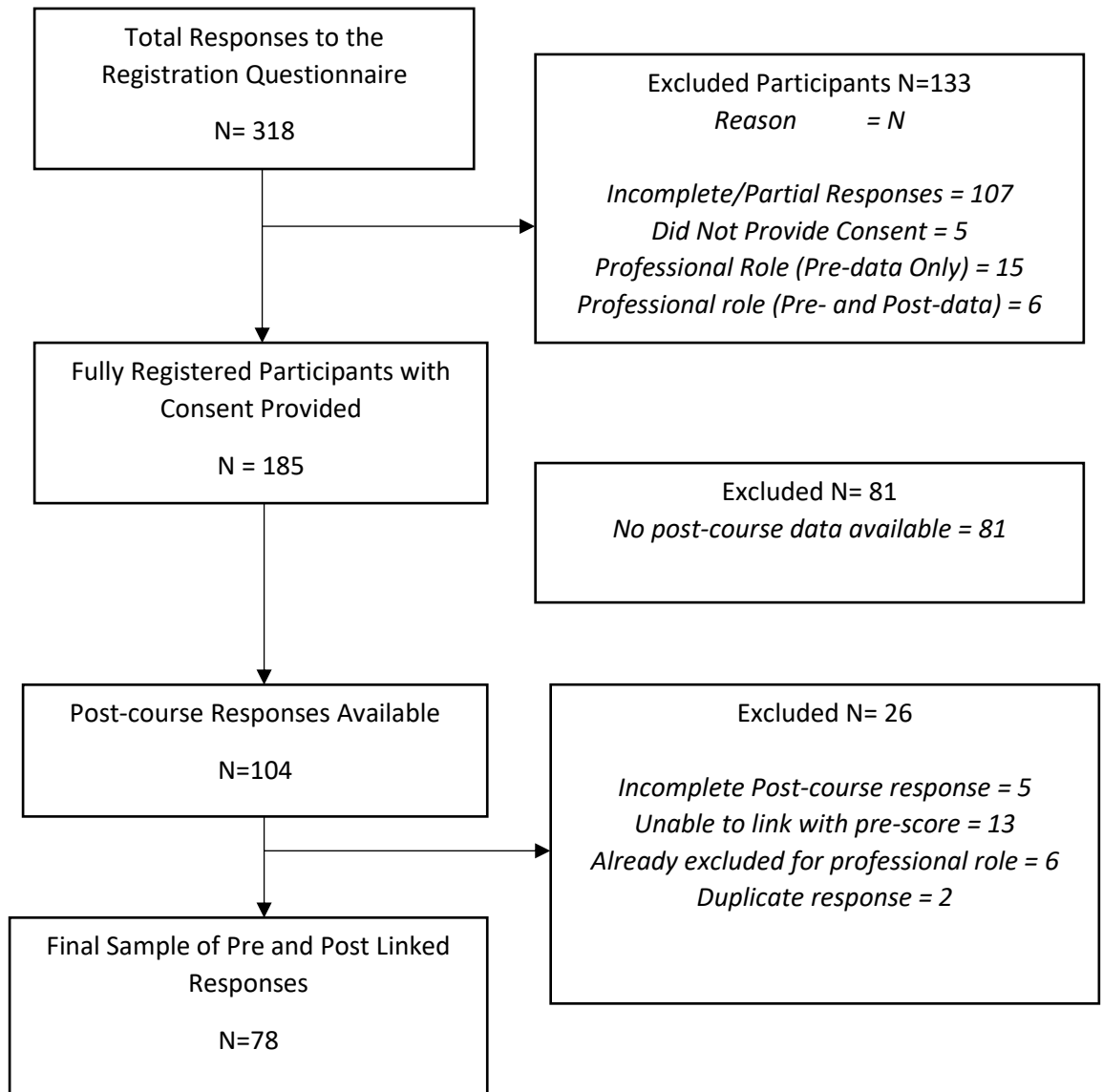


Figure 2-2. Flowchart of included participants, with reasons for exclusion identified.

Follow-up invitations were issued after three-months, 23 participants completed the course in a time scale allowing for the completion of the follow up measures, of which 16 provided their email details and were issued the follow-up questionnaires. Of these 16, five completed the follow-up questionnaires providing an attrition rate of 68.8% from completion to follow-up. The follow-up data has therefore not been analysed further at this stage.

2.3.2 Demographics

In total there were 185 registered participants who had completed the full set of pre-course measures and who were not excluded based on job role. Registered participants ranged in age from 20-65 years old, this was normally distributed across the ages and covers the entire working life span. The mean age of registered participants was 42.89 years old. Registered participants included 122 females (65.9%) and 63 males (34.1%). Most participants, 180 (97.3%) were from white ethnic backgrounds, with 5 (2.7%) participants reporting mixed or multiple ethnic groups, black, African, Caribbean or Black British ethnicity. Participants predominantly worked full-time, with only 23 (12.4%) working part-time. Participants worked across the UK, most commonly in Scotland with 176 participants (95.1%) working in this region, 9 (4.9%) worked in England and outside of the UK. Participants tended to be experienced staff with the majority 36.8%, stating that they had been in their role for more than 10 years, for a full description of length of service see Table 2-1.

Length of Service Indicated	Registered Participants		Course Completers	
	Frequency of Responses	Percentage of responses	Frequency of responses	Percentage of responses
Less than 6 months	17	9.2	8	10.3
Less than 1 year	9	4.9	3	3.8
1-2 years	29	15.7	14	17.9
2-3 years	25	13.5	12	15.4
4-5 years	12	6.5	6	7.7
More than 5 years	25	13.5	13	16.7
More than 10 years	68	36.8	22	28.2
Total	185	100.0	78	100.0

Table 2-1. Length of service for all registered participants who fully completed the pre-course measures and provided consent for the project and course completers included in the final sample.

2.3.3 Profile of Prior Knowledge

Amongst those registered, the most common level of educational attainment was A Levels, SVQ level 3 or NVQ level 3 equivalent, with 94 (59.8%) of participants reporting this. Participants with undergraduate degrees were second most frequent with 51 (27.6%), followed by those with master's level degrees with 14 (7.5%). Five participants (2.7%)

reported no formal qualification or GCSE or equivalent qualifications, while 21 (11.4%) reported a professional qualification.

The majority of registered participants, 126 (68.1%) worked as residential support workers, 33 (17.8%) were senior support workers, 16 (8.6%) were registered managers and 10 (5.4%) responded other but identified roles with alternate titles within residential care, such as “House Manager” or “Assistant Team Leader”.

Registered Participants reported a low to moderate level of prior awareness of EF, but most reported some or more knowledge of the impact of trauma on development. See Figure 2-3. for details.

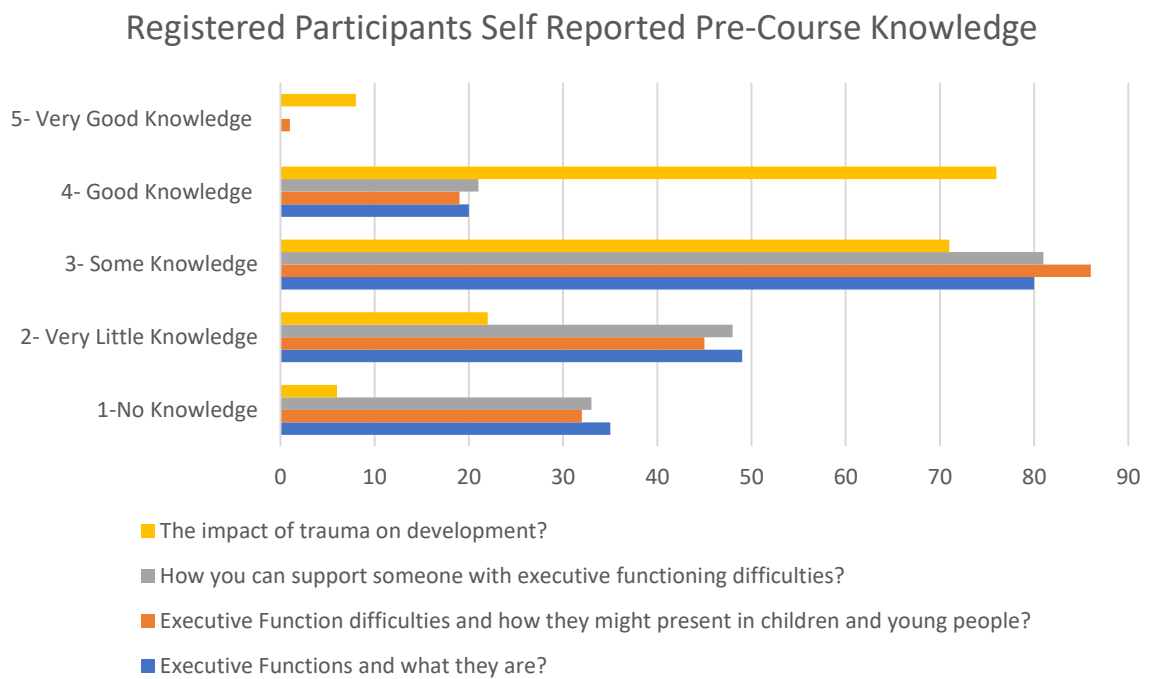


Figure 2-3. *The self-reported knowledge for each learning outcome, of participants who fully completed the pre-course measures and provided consent.*

2.3.4 Course Completers

The 78 participants who completed the course ranged in age from 22-65 years old, with an average of 42.29 years-old. This included 55 females (70.5%) and 23 males (29.5%). Most course completers, 75 (96.1%) were from a white ethnic background, 3 (3.9%) were from black, African Caribbean or mixed ethnic backgrounds. Part-time workers accounted for 9 (11.5%) of completed responses. The spread of length of service was also reflective of the overall registered participant group. See Table 2-1. Participants worked across the UK, most

commonly in Scotland with 73 participants (93.6%) working in this region, while 5 (6.4%) worked in England.

2.3.5 Post Course Learning

To evaluate post course learning a paired samples t-test was conducted between participants overall score on the knowledge-based questionnaire before and after the course was completed. There was a significant difference in the scores between the pre- (m=10.79, SD=2.25) and post- (m=12.95, SD 1.22) conditions, $t(77) = -9.833$, $p = .000$. This is indicative that participants overall knowledge was higher at the end of the course and showed less variation, suggesting that those who performed least well prior to the course improved and those who performed well before the course maintained their knowledge during the course.

Participants self-reported knowledge also improved, a direct comparison of course completers self-reported knowledge before and after the course is shown in Figure 2-4. and Figure 2-5.

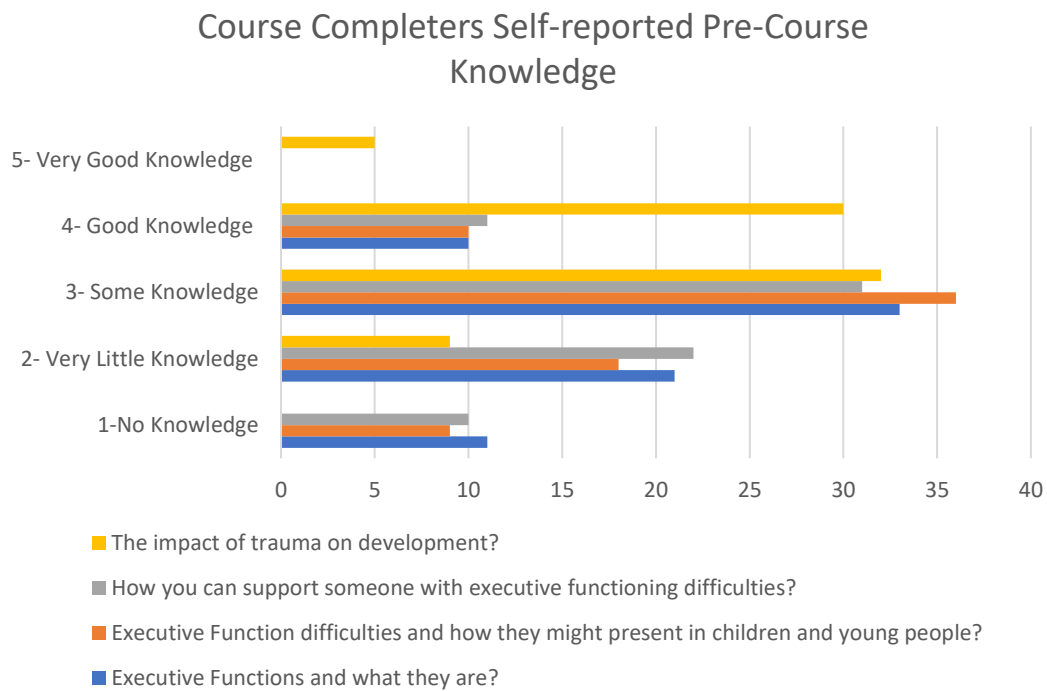


Figure 2-4. The self-reported pre-course knowledge for each of the learning objectives recorded by participants who completed the course. Horizontal axis represents the number of participants who reported this category.

Course Completers Self-Reported Post-Course Knowledge

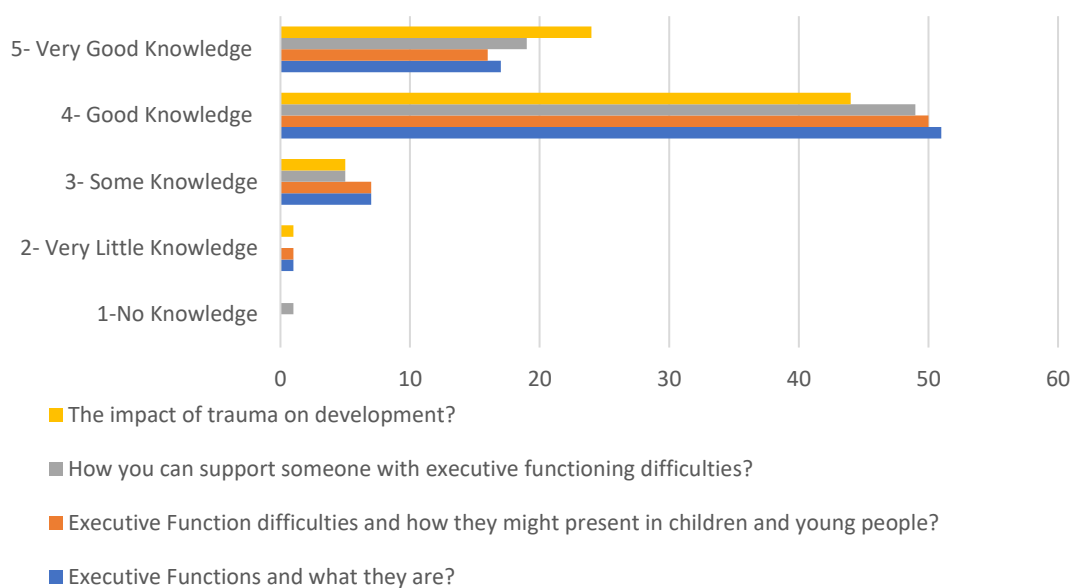


Figure 2-5. *The self-reported post-course knowledge for each learning objective recorded by participants who completed the course.*

A one-way ANOVA identified that there were no significant differences, between the pre- or post-course scores based on the participant's role, length of service, or level of education, see Table 2-2. A visual analysis of the means identified that those who had been in service for less than one year performed most highly on the pre-course assessment and those in service for 4-5 years performed the least highly, however those in service 4-5 years scored most highly at the post-course assessment, indicating a significant increase of knowledge for this group. Similarly, although residential support workers demonstrated the highest mean for pre-course score, senior support workers and registered managers both scored higher on the post-course score. Indicating a noticeable change for those who scored lowest. Overall, this appears to indicate a learning benefit across the range of residential care workers.

Score	Factor	ANOVA (F)	DF		Sig.(p)
			between	Within	
Pre	Role	.704	3	74	.553
	Length of Service	.697	6	71	.653
	Highest Education	1.357	5	72	.251
Post	Role	1.073	3	74	.366
	Length of Service	.631	6	71	.705
	Highest Education	.785	5	72	.564

Table 2-2. One-way Analysis of Variance (ANOVA) results for comparisons based on participants role, length of service and highest level of education for both pre- and post-course scores. DF= degrees of freedom.

2.3.6 Evaluation & Feedback

Participants responded positively to the course materials, rating it as an average of 4.6 out of 5, where five is entirely positive and one is entirely negative. Participants also used the same scale to rate each module based on overall experience and relevance to their current role, outlined in Table 2-3. Overall, the modules were awarded an average of 4.52 out of 5 for experience and 4.83 out of 5 for relevance. Participants also rated that on average they would be 6.52 out of 7 likely to recommend the course to their colleagues, where 7 is very likely and 1 is not at all likely to recommend the course.

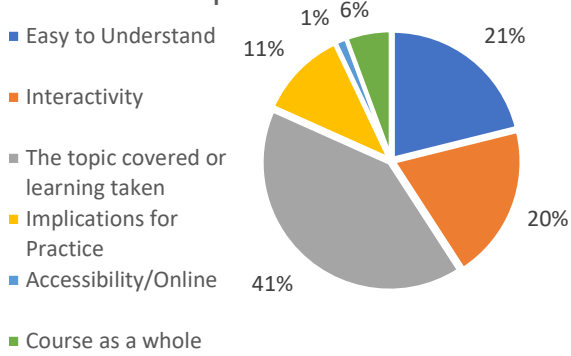
	Experience of Module			Relevance to Current Role		
	Min	Max	Mean	Min	Max	Mean
Mod 1. Brain & Behaviour	3	5	4.50	3	5	4.80
Mod 2. Executive Function	3	5	4.55	3	5	4.84
Mod 3. Difficulties with Executive Function	3	5	4.58	3	5	4.86
Mod 4. Strategies to help	2	5	4.46	3	5	4.82

Table 2-3. Participants rating of their overall experience of each module, and each modules relevance to their current role. Overall experience is rated on a rating scale of 1-5 where 1 is entirely negative, and 5 is entirely positive. Relevance is rated on a scale of 1-5 where 1 is entirely irrelevant and 5 is entirely relevant.

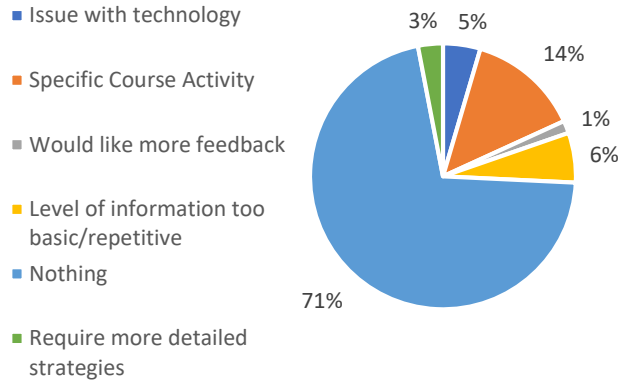
Participants also provided qualitative feedback regarding their assessment of the most helpful and least helpful elements of the course. These were considered using content

analysis, the themes identified, and frequency with which they were reported are shown in Figure 2-6. and Figure 2-7. A second researcher corroborated a sample of the thematic code with a Cohen's Kappa interrater-reliability of .93 which shows near perfect agreement and supports the application of themes in this interpretation.

Participant Feedback: Most Helpful



Participant Feedback: Least Helpful



Participant Feedback: Changes in Future

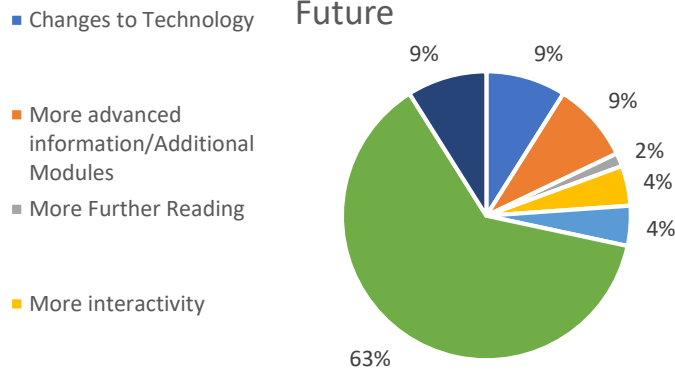


Figure 2-6. Pie charts representing the identified themes in the participant responses to each of the qualitative evaluative questions and their respective frequencies.

In what way will you use the knowledge and skills you gained on the course in your current professional role?

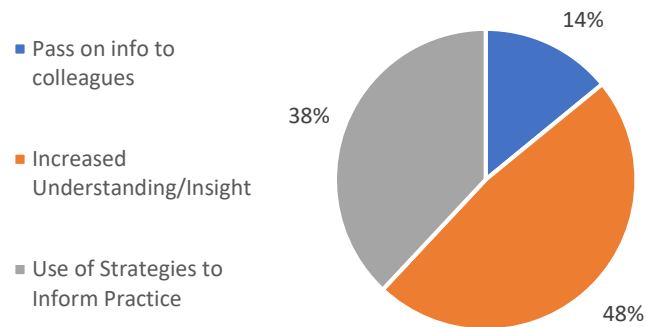


Figure 2-7. Pie chart representing the identified themes for participants' responses about how they will use the knowledge they gained on the course in their role, with accompanying frequencies of response.

2.3.7 Follow Up

Due to the limited availability of follow-up data, these have not been analysed further at this stage. The descriptive statistics for the follow up data suggest that they are most similar to the post-course scores. See Table 2-4 for an overview.

	Pre (N=78)	Post (N=78)	Follow-up (N=5)
Mean	10.79	12.95	12.50
Range	4-14	9-14	11-14

Table 2-4. The mean scores for knowledge at pre-post- and follow-up time points. The maximum score is 14. N= number of participants. The range of scores is also noted.

2.4 Discussion

The results of the course demonstrate support for the acceptability and feasibility of online training for staff working with children in residential care settings. There was a high level of subscription to the course, a good rate of course completion, and generally positive feedback from course users. Furthermore, there was a statistically significant increase in knowledge in this area following the course and qualitative feedback that the information had supported reflection on participants' current practice. However, there is limited information about those who exited the course, which makes it difficult to speculate on the reasons for non-completion. Therefore, it may be that the self-selecting sample of course completers are

those who most identify with and support the course aims, which provides a bias towards positive outcomes.

2.4.1 Acceptability

One key aim of this project was to explore the acceptability of online training for residential care staff and the service providers they work with. Where direct approaches were made to service level managers, most provided positive responses and during discussions with managers about the course, verbal feedback indicated that there was support for further training in this area. Following this, once the course was released there was a high level of responses both from identified service providers, and individuals or organisations who saw the course advertised online. Indeed, one service provider contacted the researchers and asked to be involved as an organisation after seeing the online campaign. This indicates that there is a willingness amongst providers to engage in this type of training. Furthermore, while some providers did not wish to participate, this was largely because they felt that the time required from participants was too great to spend on an untested and unproven course. Following the positive outcomes of this evaluation, it is possible that these providers would be willing to engage in a follow-up.

There was also a high level of completion for those who registered to join the course. Typically, Massive Online Open Courses (MOOCs), the most common form of online training, achieve a 15% completion rate for participants, with 40% considered an industry high (Jordan, 2013). This course reported a 50% completion rate which is in line with the highest levels of completion. This indicates that the course materials and the online format were likely acceptable to individual participants, as well as at an organisational level. However, a notable number of those registered did not complete the course, and there is limited data regarding those who exited or failed to complete. Evidence from MOOCs has identified that completion rates may be a flawed measure of success, as many participants may complete a substantial element of the course, and yet never complete the course (Hadi & Gagen, 2016). It is proposed that this occurs as learners are likely to sign up to the course with a specific aim in mind, and many will therefore take from the course what they need without completing the full programme. Due to the technological limitations of the current course, there is no available data regarding the points that individual users exited the materials. Therefore, it is possible that individual learners completed sections of the course or even the

majority of the course, and yet never completed the final assessment. This may also have been more likely to occur than in standard MOOC programmes, due to the use of a secondary system to collect data, which required the participant to exit the course webpage and begin data entry in another system. There is also no qualitative feedback from these participants which might highlight whether they gained what they needed and did not continue, or whether they found the course materials and/or online environment somehow unacceptable. Future permutations of the course would likely involve a higher level of online functionality and tracking so that these issues could be explored.

The qualitative and quantitative feedback for the course also demonstrates evidence of acceptability. The quantitative feedback was overwhelmingly positive with most individuals reporting that they had a positive experience and were likely to recommend the course to colleagues. Similarly, the qualitative feedback was largely positive, with participants reporting that all elements of the course were helpful. Where changes were suggested, a high number were to do with the technological limitations of the course, for example, requesting the ability to listen to information rather than read it, or the addition of being able to save their own work within the webpage for when they return later. These elements were also considered desirable by the researchers during the design process and would aim to be supported in future.

Importantly, there was also a request for a higher level of information, and expansion of the current modules to include, for example, links with attachment and relationship development. This was considered by the researchers as part of the course development but due to the nature of piloting the course, a short course with a singular focus was chosen. Therefore, although relevant, these topics were beyond the scope of the current training. It is, however, positive that individuals are requesting additional information and expansion of the current materials, as this could be seen to imply a level of acceptability for the method of delivery. Participants also requested more feedback and interactivity which would be considered in future developments.

2.4.2 Feasibility

The significant knowledge-gain results also support the feasibility of online training for residential care staff. There was a significant increase in the average score following the course compared with the scores before the course, and an associated increase in self-

reported knowledge for the topics covered. However, as might be expected for a short training course, the overall increase was quite small, just over two points on the scoring scale. This may be indicative of a good base level of knowledge amongst residential workers, although, the sample was largely self-selecting and therefore may be biased towards the individuals who are most motivated to seek further information and training, and therefore may have a higher level of baseline knowledge. This could be addressed in future by working with service level management to identify those most suitable for the training or including the training as part of initial training for inexperienced workers. Furthermore, given the bespoke nature of the course questionnaire, there may be issues regarding knowledge measurement. It is possible that the items used were not robust enough to identify gaps in knowledge or could be solved by other means. For example, a question which asked about what behaviours might be seen if initiation is problematic could be solved through a semantic understanding of the word “initiate” without the associated understanding of EF. The addition of other items of additional difficulty may be considered in future to address this issue.

Importantly, there was less deviation in the post-course scores, with a smaller range of scores and a lower standard deviation value. This implies that those who began at the lowest levels of learning demonstrated the most knowledge gain, which brought their knowledge levels in line with those who did well before the course. This might suggest that the course as it stands could be best used as part of induction or basic training for those with limited knowledge. This was also reflected in the qualitative feedback, where requests were made for higher level information and further modules for more advanced practitioners. However, length of service and level of seniority did not play a significant role in the participants pre-course scores. It is therefore possible that this would serve as a good introductory training, based on an individualised professional development plan, where prior knowledge and training would be considered by individual experience, rather than based on position or length of experience, as even those who had been in their roles for a long time, or who held senior positions showed benefit.

2.4.3 Clinical Implications

Although knowledge gain was the primary aim of the course, a secondary aim was knowledge transformation to influence practice change. This was assessed by measuring knowledge

retention over time and through participants qualitative feedback about how they would use the knowledge gained on the course in their role. Knowledge retention over time has been difficult to assess within the specified time frame and has therefore not been explored in the current paper. Qualitatively, however, participants reported an intention to use the strategies and skills gained in the course to support their professional roles. Participants also reported their intention to share the knowledge gained with colleagues and other multidisciplinary groups which supports the government aim of a trauma-informed workforce. Positively, the majority reported an increased level of understanding and insight for young people, in particular, in relation to challenging behaviour. This has positive implications for clinical practice as staff attributions to challenging behaviour can have a large impact on children's relationships with staff and services. This is explored further in Chapter Three.

2.4.4 Limitations

There were however several limitations to the findings. The technological difficulties of using two systems for course delivery and data collection led to complications regarding the evaluation of the course and the direction of future changes. For example, as the course was hosted in a publicly available webpage, rather than a system requiring login, there was no ability to identify who was visiting the site and therefore no inferences can be made about the pattern of engagement made by individual learners. This means that we cannot say whether those who spent longer on the site benefitted with the most learning, which elements of the course people tended to focus on or at which points participants most commonly exited the course. Similarly, it was not possible to prevent unregistered individuals from accessing the course materials. As participants tended to come from a small selection of organisations, it was possible for the webpage to be shared and accessed amongst colleagues, without completing the pre-course registration. This led to the existence of post-course data, which was not linked to a pre-course registration and provided no demographic information or comparative value. To minimise this, instructions and reminders to register were placed on the welcome page to the course, however, this is known to have occurred in at least two cases. This difficulty was compounded by the reliance on a participant provided code to identify pre- and post-course data. This was omitted or altered by several participants leading to unmatched data that could not be analysed as part of the final sample.

Furthermore, due to high attrition rates following course completion, it has not been possible to assess knowledge retention over time, and subsequently the impact on possible practice change. Alternative methods of assessing this concept, for example, self-reported measures of practice change or evaluation of changes within the residential units staff belong to are also unavailable. Therefore, the implications for providers whose staff complete the course cannot be explored fully and this is likely to be a focus for future research.

Finally, it is difficult to generalise the findings regarding the pre-existing knowledge of residential childcare staff, as those who registered to take part are likely to be the most motivated members of staff who engage well with training, meaning that their responses may over reflect the pre-existing competence of staff. In addition, the use of bespoke measures to identify knowledge may lead to the questionnaire failing to address the concept assessed and instead of tapping into other knowledge. Repetition and corroboration of the results of this study would be beneficial in future.

2.4.5 Conclusions

Overall, the results and evaluation of the course provide positive support that online learning is feasible and acceptable with residential staff working with children in care. There was a demonstrable increase in learning for those who completed the course, and the high level of completion, in relation to typical online courses, which shows a high degree of acceptability. Many participants also left feedback regarding their appetite for this information and consideration for how they might use the information in their practice, which is possibly indicative of practice change. However, the lack of information at follow up or measures which might record practice change means this cannot be substantiated at present. Future changes may include additional information or modules in attachment and relationships, as well as further reading materials for those who wish to know more. More advanced technological support is also likely to be required, such as a learning management system or equivalent, to support the level of functionality required for a more detailed analysis.

2.5 Chapter Two References

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3 CHAPTER THREE: Exploring the Impact of Brief Online Training in Neurodevelopmental Trauma on the Knowledge and Attributions of Residential Childcare Workers.

Authors: Louise Hendry ^{a, b}, Dr Emily Taylor ^a, and Dr Lucie Mackinlay ^b (2019)

Affiliations

- c) The School of Health in Social Science, University of Edinburgh, Edinburgh, Scotland, UK, EH8 9AG
- d) Looked After Children's Psychology Department, NHS Forth Valley, Falkirk, Scotland, UK, FK1 4HA

Corresponding Author

Louise Hendry – Looked After Children's Psychology Department, NHS Forth Valley, Camelon Education Centre, Abercrombie Street, Camelon, Falkirk, Scotland, UK, FK1 4HA.

Louise.Hendry1@nhs.net

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Abstract

Background:

Children in residential care represent a complex and vulnerable group of young people, many of whom present with emotional difficulties and challenging behaviour. Despite this very little research has focussed on the attributions of residential workers with children in care, and training for residential support workers is minimal. The recent expansion of our understanding of trauma has also evidenced that much of this challenging behaviour may be underpinned by cognitive difficulties related to developmental trauma. Notably, deficits in executive function, a set of skills known to be sensitive to the effects of trauma, have been associated with increased levels of externalising difficulties. However, there is limited evidence that cognitive difficulties are considered as the cause of challenging behaviour.

Aims:

This paper therefore aims to examine the pre-existing attributions of frontline care staff working with children in residential settings and consider the impact of online training in executive function and trauma informed practice on these attributions.

Method:

Residential care staff across the UK were recruited to complete an online training course focussing on the impact of trauma on the development of executive function. Participants completed a bespoke knowledge questionnaire and the Attributional Style Questionnaire, before and after they completed the training. The attributional profile of staff prior to completing the course is explored on four subscales of internality, stability, globality and controllability. The scales are explored using correlational analysis and any changes following course completion are considered.

Results:

Results indicated that, prior to training, support workers identified causes of challenging behaviour which were most likely to have high perceptions that they were global across the child's life and low perceptions of control. There were also significant positive relationships between internal and controllable attributions, and global and stable attributions. Following the course, there was a notable increase in attributions that behaviour was stable and global

across time and situations, and a significant decrease in attributions that the cause of challenging behaviour is internal to the child or under their control. Significant positive relationships between internal and controllable, and stable and global attributions were maintained across time. However, a previously positive relationship between globality and control was reversed after course completion to become a significantly negative relationship.

Conclusions:

The results demonstrate support for the use of online training in trauma and EF to increase knowledge and alter attributions in residential childcare workers. However, knowledge gain was not directly linked to attributional gain, therefore the mechanism of attributional change is unclear.

Keywords: Attributions, Online Training, Residential Care Staff, Children in Care,

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3.1 Introduction

Children within the care system represent a population who have experienced a high level of developmental trauma, such as abuse and neglect. In comparison with children living in private households, children in alternative care have higher rates of recognised mental health conditions, with 42% experiencing some form of childhood disorder, versus 8% of those in private households (Meltzer, Gatward, Corbin, Goodman, & Ford, 2002). In residential care, this prevalence rate is even higher with some studies quoting that up to 96% of adolescents accommodated in residential units, present with diagnosable psychiatric disorders (McCann, James, Wilson, & Dunn, 1996). Additionally, 72% of children aged 5-15-years-old show emotional or behavioural problems (Sempik, Ward, & Darker, 2008) much of which presents as challenging behaviour. A review by Berridge, Biehal, & Henry, (2012) identified that approximately 75% of children in residential care had exhibited violent or aggressive behaviours in the preceding six-months. Indeed, aggression shown by young people in residential care homes has been acknowledged as contributing to staff turnover, sickness and stress (Colton & Roberts, 2007; Curry, McCarragher, & Dellmann-Jenkins, 2005). Externalising problems, such as challenging behaviour, have also been linked to a variety of underlying cognitive difficulties associated with the neurodevelopmental impact of trauma. Notably there is evidence of a relationship between reduced executive function (EF) and externalising difficulties (Hodgdon et al., 2018). This paper will therefore consider the attributional profile of residential childcare workers towards challenging behaviour, as well as consider whether increasing knowledge of EF difficulties through online training, leads to any change in this profile.

3.1.1 Staff Attributions to Challenging Behaviour

In residential care, attributions of individual staff members or teams are likely to have a significant impact on the working culture of the whole unit. However, it is difficult to make assumptions regarding the attitudes of care workers towards challenging behaviour, due to limited empirical research. Much of the research which considers staff attributions to challenging behaviour has been conducted with Intellectual Disability care staff. However, more recently, work with foster carers and residential staff has identified some common themes regarding attributions in this area. This is important, as the overall attitude of a staff group is related to their collective responses to challenging behaviour, even at times

overriding the individual characteristics of carers (Williams, 2016), who largely enter into roles in residential care for positive ideological reasons (Moses, 2000).

Attribution theory explores how individuals identify the causal explanations they generate to explain particular events or the behaviour of others. Weiner (1985, 1995) and Rudolph, Roesch, Greitemeyer, & Weiner (2004) have attempted to unify attribution theory, with the central tenet that individuals make attributions about the cause of events, based on four causal dimensions; locus of causality, stability, globality and controllability (Weiner, 1985). That is, whether the cause of an event or behaviour is internal or external to the person, whether it is stable across time, whether it occurs in multiple areas of the person's life and how much control they have. These attributions are important as they have been evidenced as having a role in the emotional and behavioural responses of parents to children's inappropriate behaviour (McGuinness & Dagnan, 2001).

3.1.2 Attributions in Care Workers

McGuinness (2007) explored the attributions of foster carers using a modified Attributional Style Questionnaire (ASQ), which explored these dimensions, alongside the emotional reaction of foster carers and their beliefs about the individual's level of responsibility for their challenging behaviour. He found that where carers judgments of responsibility were higher, they reacted with more anger and less sympathy. Increased anger was also related to less confidence regarding the management of the behaviour, and an increased belief in the likelihood of placement breakdown. This suggests that placement stability can be undermined by carers judgements about the responsibility of a child for their actions. Katsukunya (2010), further explored the attributions of foster carers and found that carers of children with higher levels of behavioural difficulties made more attributions which were controllable, personal and stable within the child. Furthermore, in residential settings, Moses (2000), found that children who were perceived as difficult and unrewarding by care staff, were less likely to receive emotional investment than those seen as co-operative and keen to change. This would suggest, that where carers feel limited confidence to manage a behaviour, or where high levels of challenging behaviour exist, they are more likely to make negative attributions about the child's ability to control their behaviour and may feel more inclined to end a placement. However, research in this area is extremely limited and the

definition of challenging behaviour is highly subjective, making it difficult to pull definitive patterns from the data at this stage.

Perceptions of workers within the UK care system can also be contradictory (Steels & Simpson, 2017), with children seen as both vulnerable and in need of protection but also threatening and needing to be controlled (Bell, 2011). In some cases, there is evidence that this has left care workers confused about their role and unable to understand children's behaviour in the context of the care environment (McLean, 2015). This could potentially leave carers placing a greater sense of responsibility for challenging behaviour upon the child. Furthermore, the lack of legal authority that residential care staff have over a child, can mean that they struggle to impose consequences (Steels & Simpson, 2017). It could therefore be argued that residential staff are likely to experience less confidence in their ability to manage children's behaviour and an increased belief that the cause of the behaviour lies within the child, rather than their environment. Based on McGuinness's (2007) findings, this may lead to less sympathy for the child, increased anger in response to challenging behaviour, and increased placement instability. In residential care, it could be considered that this placement instability is represented through high levels of staff turnover. Aggression shown by young people in residential care homes has been recognised as contributing to staff turnover, sickness and stress (Colton & Roberts, 2007; Curry et al., 2005). The consequences of staff turnover for young people is the loss of trusted staff, a sense of instability and the challenge of building relationships with new staff members (Barford & Whelton, 2010; Seti, 2008). This is crucial as the failure of working relationships between children and care staff has been suggested as contributing to increased mental health difficulties and increased stigmatisation for children (Andersson & Johansson, 2008; Crettenden, Wright, & Beilby, 2014; McLean, 2015). Furthermore, in a review of residential care, relationships with staff were highlighted as the largest single factor that determined placement satisfaction for children and young people (Hart, La Valle, & Holmes, 2015). Staff attributions are therefore important to consider for improved placement stability, improved working relationships between children and staff members, and the positive development of young people.

3.1.3 Role of Developmental Trauma in Challenging Behaviour

Research suggests that the behavioural difficulties of many children in care are underpinned by cognitive vulnerabilities as a result of negative early experiences (McLean, 2016). Indeed, many children are referred to services primarily for behavioural difficulties, rather than underlying trauma (van der Kolk et al., 2009). Children in care who have experienced trauma and neglect in their early life are likely to have corresponding changes in their brain development, including alterations in memory, learning, attention and Executive Function (EF; see Fisher, 2015 and Op den Kelder, Van den Akker, Geurts, Lindauer, & Overbeek, 2018 for an overview). These difficulties are likely to lead to complex and pervasive difficulties, including challenging behaviour. van der Kolk et al. (2009), put forward a proposal for the diagnosis of developmental trauma which summarised the common symptomatology. This included consideration of oppositional behaviour, physical and verbal aggression, and mistrust of caring adults, as part of this diagnosis.

Hodgdon et al. (2018) also demonstrated a direct link between reduced EF capacity and externalising problems. EF is a set of meta-cognitive skills which aid individuals to plan out and adapt their behaviour to reach identified goals, in order to effectively resolve challenges in everyday life (Burgess & Simons, 2005). Importantly, the development of these skills is particularly sensitive to the neurodevelopmental impact of trauma (De Bellis, 2005). EF has also been proposed as a mediator of the relationship between polyvictimisation and externalising behaviour for children in residential care (Hodgdon et al., 2018), suggesting that underlying cognitive difficulties may play a mediating role in the severity of challenging behaviour. Furthermore, a key aspect of EF is inhibitory control, which has been linked in numerous studies to externalising problems and challenging behaviour (Bohlin, Eninger, Brocki, & Thorell, 2012). Indeed, inhibition is more closely related to externalising problem behaviour than other EF components, such as working memory and cognitive flexibility (Young et al., 2009). However, given the correlational nature of the evidence we cannot yet identify whether EF difficulties are caused by, or lead to, externalising problems.

Importantly, the full impact of trauma on EF for children in the care system is yet to be explored. Much of the research conducted with residential care populations is conducted within specific localised care systems, and as researchers work in internationally located hotspots (see Chapter One), it is difficult to draw comparisons across localities as the

provision of services known as “residential care” may vary greatly by location. Many studies also link trauma with a diagnosis of Post-Traumatic Stress Disorder (PTSD), which is problematic for the care population in several ways. Firstly, PTSD may occur in relation to a singular acute trauma, rather than the more pervasive chronic and complex trauma experienced by many children in care. Secondly, in a large number of cases where children and adolescents have been exposed to complex trauma, PTSD is not the primary psychiatric diagnosis (Putnam, 2003). Instead there is often no diagnosis, multiple unrelated diagnoses, or a focus on developing behavioural control, without recognition of interpersonal trauma (van der Kolk et al., 2009). Similarly, PTSD is rarely considered for children in care, with conduct disorder the most commonly received diagnosis (McCann et al., 1996; Meltzer et al., 2003; Meltzer et al., 2004). It would therefore appear that EF difficulties may be treated as challenging or defiant behaviour, rather than being recognised as being the result of interpersonal trauma. This is a perception which is likely to impact on the residential workers relationships with the children in their care, and their ethos or methods of working.

3.1.4 Training and Attributions

In line with this, there is previous evidence that the challenging behaviours of traumatised children may at times elicit controlling and punitive responses from those who care for them (Bath, 2008), a practice which is likely to perpetuate the child’s difficulties. It has therefore been argued that children need adults around them who can recognise the developmental impact of their experiences and that this may lead to a range of challenging behaviours (Bath, 2008). One way of increasing this recognition, is to provide training which increases staff knowledge, with the secondary aim of altering staff perceptions of challenging behaviour to elicit more empathetic responses.

Previous research with Intellectual Disability care staff has demonstrated that training courses aimed at knowledge increase, can also have an impact on attributional change (Dowey, Toogood, Hastings, & Nash, 2007; Kalsy, Heath, Adams, & Oliver, 2007; McGill, Bradshaw, & Hughes, 2007). A systematic review of training in Positive Behavioural Support (PBS), a challenging behaviour intervention for individuals with Intellectual Disabilities, highlighted that over fourteen studies, staff training had a positive impact on knowledge, emotional responses, and attributions in staff (MacDonald & McGill, 2013). Importantly the training also led to clinical practice change and associated reductions in challenging

behaviour from service-users. Furthermore, there is evidence that training for care staff has had an impact on decreasing attributions of controllability (Kalsy et al., 2007), a key attribution which is associated with negative carer responses (McGuinness, 2007). Short term isolated training has also been shown to be effective at altering the causes staff identify for challenging behaviour (Grey, McClean, & Barnes-Holmes, 2002) and their confidence in managing these difficulties (Lowe et al., 2007). However, it has been noted that attributional changes following training are not always sustained at follow up (Lowe et al., 2007). It is also difficult to evaluate the impact of training on the overall quality of care provided, rather than individual benefits to particular staff (Sargeant, 2000). Despite this, there is historical evidence within social care, that staff training can have a positive impact on the extent to which working practice can affect the well-being of users (Burgio & Burgio, 1990; Mercer, Heacock, & Beck, 1994; Smyer, Brannon, & Cohn, 1992) and the awareness of care workers to service-users' needs (O'Kell, 1995).

3.1.5 Current Study

However, very few studies have sought to examine the impact of training for residential childcare workers on their attributions towards the challenging behaviour of children in their care. The limited nature of the research regarding attributions for residential staff with children in care means much of this evidence is seeking to describe, rather than influence, the attributions made. The current study therefore aims to examine the pre-existing attributions of frontline care staff working with children in residential settings and consider the impact of training in EF and trauma informed practice on these attributions. By increasing their knowledge of the often-overlooked consequences of childhood trauma. It is hypothesised that this will increase carers consideration for the impact of these difficulties, in a population where trauma and neglect are highly prevalent.

3.2 Method

3.2.1 Design

To explore the study aims, an online training course for residential care staff was developed and evaluated using a pre-and post- test within groups design. Residential care staff working with children in care were recruited to complete a training course outlining the neuropsychological impact of trauma and neglect on children and young people in care, with a focus on EF. Participants completed an assessment designed by the researchers to

measure their learning, and measures of attribution regarding challenging behaviour, prior to undertaking training, immediately upon completing the training, and at three-month-follow up.

Participants & Recruitment

Participants were recruited from residential care staff across the UK in private and council run facilities. The course was advertised online through Facebook and Twitter and direct links with local provisions were identified. Where direct approaches to councils and companies were made, 67% of care providers contacted, agreed to distribute the participant information sheet through their internal mailing systems, see Appendix F. for an overview of the recruitment strategy. Participants were recruited on a voluntary basis in all cases.

Any individual currently working with a registered care provider, providing residential care for children was eligible to take part in the study. Details of the persons role, length of service in this area and level of training were collected during participant registration. Individuals from alternative professions or designations were not discouraged from taking part, however, they were informed that their data may be excluded from the final analysis in line with the projects aims.

3.2.2 Materials

The training course was hosted in an online medium and remotely accessed by the participants at a time of their choosing. It was delivered across four one-hour modules titled as follows:

- Module 1: Brain and behaviour
- Module 2: Understanding EF
- Module 3: Difficulties with EF
- Module 4: Strategies to help

Within each module were scenario, and knowledge-based, multiple-choice questions to assess the participants learning. For a full description of the course materials and their development please see Chapter Two. Prior to live recruitment, the course content was piloted with a selection of three lay individuals and independently reviewed by both a specialist alternative care clinician within NHS Forth Valley and an independent academic.

The course was released live online on the 16th October 2018 and remained active and recruiting participants until the 31st March 2019.

3.2.3 Measures

Participants were invited to complete the initial measures and register for the course using an online survey powered by Qualtrics software. On registration the participant was presented with the participant information and asked to provide informed consent to take part in the study (see Appendix G). Participants were aware of their right to withdraw at any time without prejudice. Once consent was provided, the participant provided demographic information, and assigned themselves a unique identifying code. This was used to link participant responses at each time point so that responses could remain anonymous at the point of completion and reduce the need for socially desirable responses and participant bias. As part of registration the participants also completed a knowledge-based questionnaire and a modified version of the Attributional Style Questionnaire (ASQ; Peterson et al., 1982, as used in McGuinness, 2007). After registration participants were required to wait seven-days, at which point they received an automated email which provided access to the course materials. This delay was included to prevent unnecessary fatigue at repeating the measures and limit the impact of immediate recall. Participants also completed the ASQ and knowledge-based questionnaire upon completion of the course and at three-month follow up. After completing the course, participants were also asked for evaluative feedback. A summary of each measure is outlined below, also see Appendix H. for examples.

Knowledge-Based Questionnaire

To assess the comprehension and retention of the knowledge presented in the training course a bespoke knowledge and skills-based questionnaire was developed. This included multiple choice questions relevant to the information contained within the modules of training, scenarios in which potential hypotheses for a behaviour are considered, and short free response questions. The responses to these questions were measured using a points-based system. This was presented both pre-and post-training to measure increased knowledge following completion, as well as at a three-month follow up, in order to consider whether any knowledge increase is maintained over time.

Attributional Style Questionnaire

The ASQ included three scenarios, designed to represent the commonly exhibited behaviours of children in care (Minnis & Del Priori, 2001). The scenarios are as follows:

Scenario 1

The 12-year-old child you are looking after often shouts and swears at you, because you have said “no” to a request or demand.

Scenario 2

The 12-year-old child you are looking after destroys their own property and sometimes your property when they are angry and upset.

Scenario 3

The 12-year-old child you are looking after constantly steals money from your house and denies doing so when confronted.

The rater is asked to use a Likert scale to rate the internality, stability, globality and controllability of the behaviour described. Given the lack of prior research in this area, the unsuitability of measures of attribution designed for intellectual disability populations, and the scenario-based teaching style, which was enacted in the training course, the ASQ was considered most appropriate for the current study. The ASQ has been used in over 500 studies and Sharrock et al. (1990) demonstrated good reliability for each of the four scales with Cronbach alpha scores as follows; internal-external 0.80; stable-unstable 0.82; global-specific 0.70; controllable-uncontrollable 0.86.

3.2.4 Planned Analysis

A cross-sectional correlational approach using Pearson’s Product Moment Co-efficient, has been used to explore the varying profile of responses given for the subscales of internality, stability, globality and controllability. Similar previous research found a medium effect size of .46 (McGuinness & Dagnan, 2001). An a priori power calculation, computed via G*Power (Faul, Erdfelder, Buchner, & Lang, 2009), showed that for an alpha of .05, power of .8 (Cohen, 1992) and effect size of 0.4, then 44 participants are required for this analysis.

A repeated measures t-test was also used to examine the difference between the participants responses pre- and post-training. The a priori calculation for a repeated measures t-test, using an alpha level of 0.05 (Cohen, 1992), effect size of 0.6, and statistical

power of 0.8 (Cohen, 1992; Tabachnick & Fidell, 2001) stipulated a minimum of 24 participants were required for the pre and post-test comparisons.

3.2.5 Ethical Considerations

The study was approved through the University of Edinburgh ethical process, and was also screened by Glasgow, Lanarkshire and Falkirk Council's using their internal ethics process.

3.3 Results

3.3.1 Participants

Participants were recruited from residential childcare units across the UK between October 2018 and March 2019. In total, there were 318 responses to the registration questionnaire, 98.4% of which provided consent for participation. Incomplete or partial responses accounted for 107 (33.6%) of the total responses, and five participants did not provide consent to continue, A further 21 participants reported a professional role other than those included in the project and were therefore excluded, meaning 185 complete registrations were provided. 104 responses were received for the post-course questionnaire. Of these, seven did not provide completed post course responses which included the ASQ, six responses belonged to participants previously excluded due to their professional role and two participants provided duplicate responses, meaning 89 participants provided complete sets of post-course data. This provides a completion rate of 48.1% amongst those registered and 28.4% of the total consenting responses, including partial responses. Of the 88 completed post-course questionnaires, 12 participants did not provide their unique identifying number and could not be matched to their pre-course questionnaire data. The final sample therefore included 76 sets of complete pre- and post- data. Please see Figure 3-1. for a pictorial representation of the participants included in the final sample.

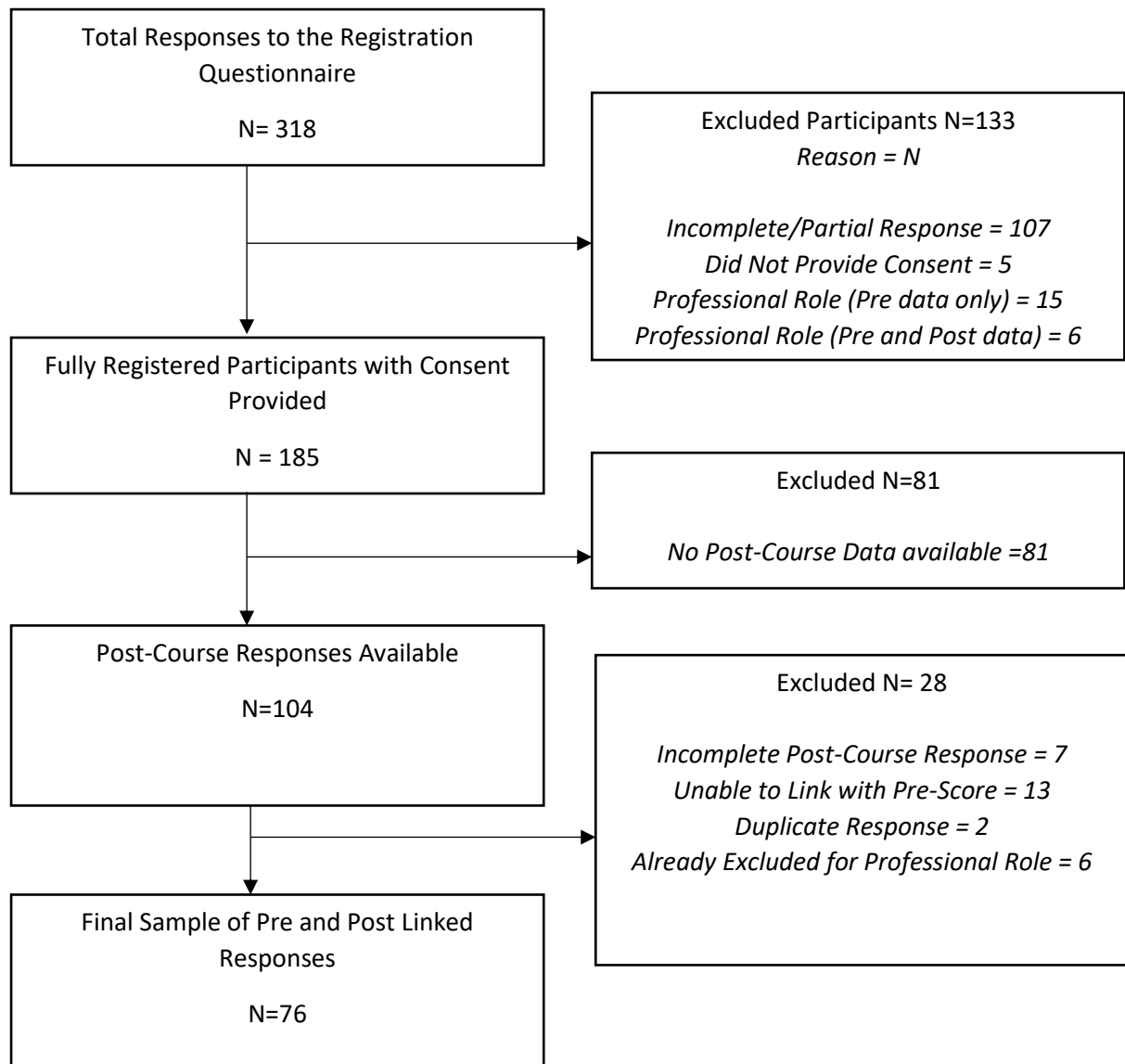


Figure 3-1. Flowchart representing participants and their inclusion or exclusion from the current study.

Follow up invitations were issued after three-months, 23 participants completed the course prior to 31st December 2018, which allowed for the completion of the follow up measures before the 31st March 2019. Of these individuals, 16 provided consent for follow up and were issued the questionnaires. Out of those contacted, five completed the follow up questionnaires providing an attrition rate of 68.8% from completion to follow up. The follow up data has therefore not been analysed further at this stage.

3.3.2 Profile of Attributions

Pre-course attributions were rated for stability, globality, controllability and level of internality to the child, by scoring on a seven-point Likert scale for three scenarios. Given that so little is known about the attributions of care workers, the data obtained for all registered participants was considered initially, to identify any trends regarding general attributions. These scores were averaged across scenarios and explored using a variety of statistical methods as explored below.

3.3.3 Demographics

In total there were 185 registered participants who had completed the full set of pre-course measures and who were not excluded based on job role. Registered participants ranged in age from 20-65 years old, this was normally distributed across the ages and covers the entire working life span. The mean age of registered participants was 42.89 years old. Registered participants included 122 females (65.9%) and 63 males (34.1%). For a full overview of the sample demographics please see Chapter Two.

3.3.4 Correlational Analysis

To analyse the relationship between each of the measured scales, the mean score given by each participant across all three scenarios was calculated. Using Pearson's Product Moment Co-efficient two relationships between the scales were noted. Participant scores for level of internality were significantly positively correlated with scores for controllability $r = .339$, $n = 185$, $p < .001$. Indicating that the more internal the cause of challenging behaviour is deemed to be, the more controllable it is deemed to be, or vice versa. Similarly, there was a significant positive correlation between stable and global attributions $r = .282$, $n = 185$, $p < .001$. Indicating a relationship where higher perceptions of stability, increase the belief that this reason will occur in other areas of the child's life, or vice versa. All correlations are displayed in Table 3-1. Correlational analysis of the pre-course mean scores for each subscale of the Attributional Style Questionnaire. Significant correlations at the $p < .01$ level are identified in bold.

All Registered Participants	PRE (N=185)	ASQ Internal Mean	ASQ Stable Mean	ASQ Global Mean	ASQ Controllable Mean
ASQ Internal Mean	R	1	.107	-.004	.339
	Sig		.148	.953	.000
ASQ Stable Mean	R		1	.282	.134
	Sig			.000	.070
ASQ Global Mean	R			1	.093
	Sig				.209
ASQ Controllable Mean	R				1
	Sig				

Table 3-1. Correlational analysis of the pre-course mean scores for each subscale of the Attributional Style Questionnaire. Significant correlations at the $p < .01$ level are identified in bold.

Using a one-way ANOVA, exploration of any differences in attributions based on demographic data were also conducted. There were no significant differences identified based on job role, ethnicity or length of service for attributions of internality. Using an independent sample t-test, there was also no significant difference for each scale based on gender. Correlational analysis using Pearson's r also identified no significant relationship between age and attributional scale for all scales. There was however, a significant difference noted in the scores given by those of varying educational levels for internality $F(5,179) = 4.241$ $p = .01$. However, on analysis this difference was based on two points of outlying data and once removed the significant difference was neutralised, demonstrating that this was an individual difference rather than a reliable group difference.

However, it should be noted that the attributions on all scales, across all registered participants varied widely, with the full range of scores 1-7 reported across each scale. The means for internality $m = 3.49$, stability $m = 3.8$, globality $m = 4.40$, and controllability $m = 3.08$, are therefore likely to trend towards the centre as a reflection of this variation. There were also some differences based on the scenarios across the scales. Repeated measures ANOVAs conducted between the scores across scenarios for each scale, identified no significant differences between the responses to the scenarios for internal and global attributions, but significant differences across scenarios based on stability $F(2) = 3.916$, $p = .021$ partial $\eta^2 = .033$, and controllability $F(2) = 3.433$, $p = .033$ partial $\eta^2 = .019$. It is therefore possible that there are differences which occur due to factors associated with the scenarios themselves, or the reasons provided for the behaviour, which influence the profile of responses. Figure

3-2. demonstrates the variation in registered participants responses across each scenario for each scale.

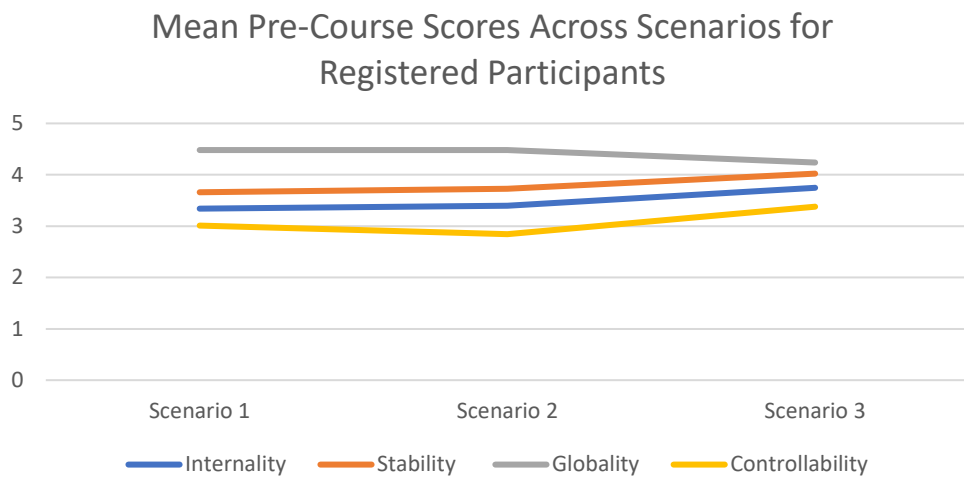


Figure 3-2. Average scores for each scenario across the four subscales of the ASQ.

Given the variation based on scenario, each scale and scenario have therefore been correlated individually. Correlations are shown in table 3-2, the level of significance required has been adjusted using the Bonferroni correction, meaning only $p < .004$ are reported as significant. Participant scores across scenarios, correlated significantly for each identified scale and all significant relationships confirmed those already identified. This indicates that using the average of responses, is likely to be an accurate reflection of the differences and therefore an acceptable method of interpreting the data. See Table 3-2. for an overview.

Correlational Analysis

N = 184		Scenario One				Scenario Two				Scenario Three			
R (sig)		Internal	Stable	Global	Control	Internal	Stable	Global	Control	Internal	Stable	Global	Control
1	I	1	0.041 (0.578)	0.015 (0.835)	.232* (0.001)	.461* (0.000)	0.025 (0.739)	0.087 (0.237)	0.141 (0.055)	.361* (0.000)	-0.020 (0.785)	-0.141 (0.056)	0.103 (0.163)
	S		1	0.116 (0.117)	0.091 0.219	0.053 (0.474)	.401* (0.000)	0.063 (0.395)	0.124 (0.094)	0.027 (0.711)	.287* (0.000)	0.106 (0.150)	-0.036 (0.624)
	G			1	0.027 (0.712)	0.047 (0.525)	0.035 (0.635)	.515* (0.000)	.178* (0.016)	0.042 (0.574)	.191* (0.009)	.317* (0.000)	-0.029 (0.697)
	C				1	.271* (0.000)	0.113 (0.127)	0.088 (0.232)	.531* (0.000)	.289* (0.000)	0.110 (0.138)	0.011 (0.887)	.538* (0.000)
2	I					1	0.126 (0.087)	0.067 (0.367)	.261* (0.000)	.523* (0.000)	0.091 (0.217)	-0.092 (0.211)	.177 (0.016)
	S						1	.209* (0.004)	0.107 (0.147)	0.025 (0.732)	.392* (0.000)	.210* (0.004)	-0.073 (0.325)
	G							1	0.055 (0.456)	0.079 (0.287)	.325* (0.000)	.369* (0.000)	0.062 0.400
	C								1	.177* (0.016)	.169 (0.022)	.179 (0.015)	.493* (0.000)
3	I									1	.191 (0.010)	-0.112 (0.128)	.340* (0.000)
	S										1	.262* (0.000)	.176 (0.017)
	G											1	-0.005 (0.947)
	C												1

Table 3-2. Correlational analysis of responses per scenario across each subscale of the Attributional Style Questionnaire. All significant correlations are identified with an *. Vertical Axis, Scenarios are identified as 1,2,3 and subscales identified as I-Internal, S-stable, G-Global, C-Controllable.

3.3.5 Post-Course Comparison

Post course comparison was conducted using, a repeated measures t-test to explore any changes in knowledge or attributions following the course.

3.3.6 Profile of Course-Completers

In total there were 76 participants included in the pre-post analysis. Course-completers ranged in age from 22-65 years old, and the mean age was 42.55 years old. Course-completers included 53 females (69.7%) and 23 males (30.3%). The demographics were reflective of the registered group with most participants, 73 (96.1%) reporting white ethnic backgrounds, most (88.2%) working full-time, and most working in Scotland, 71 participants (93.4%), or England, 5 participants (6.6%). The majority of course-completers, 52 (68.4%) worked as residential support workers, 15 (19.7%) were senior support workers, 6 (7.9%) were registered managers and 3 (3.9%) responded other but identified roles with alternate titles within residential care. The majority had been in their role for more than 10 years, for a full description of length of service see Table 3-3. Course-completers most frequently reported A-levels as their highest qualification (35, 46.1%), 22 (28.9%) had undergraduate degrees, 11 (14.5%) had professional qualifications, 6 (7.9%) had master's level qualifications, and 2 (2.6%) had no formal qualifications or had GCSE or equivalent.

Length of Service Indicated	Frequency of Response	Percentage of Responses
Less than 6 months	8	10.5
Less than 1 year	3	3.9
1-2 years	14	18.4
2-3 years	10	13.2
4-5 years	6	7.9
More than 5 years	13	17.1
More than 10 years	22	28.9
Total	76	100

Table 3-3. Reported frequencies for length of service across course-completers.

Prior to undertaking the course, there was no significant difference identified for course completers based on role or length of service. There was also no difference for each scale based on gender or ethnicity. Correlational analysis using Pearson's *r* also identified no significant relationship between age and attributional scale for all scales

There were some significant differences noted in the scores given by those of varying educational levels for internality $F(5,70) = 2.352$ $p=.05$. However, on further analysis this difference was based on outlying data on demographic and experimental variables which when removed neutralised the difference.

Participants attributional profiles also mirrored those of the larger group, with significant positive correlational relationships between internality and control, and stability and globality. However, there was also an additional significant positive relationship where participants who provided increased ratings of control also recorded increased perceptions of globality.

Course-Completers	PRE (N=76)	ASQ Internal Mean	ASQ Stable Mean	ASQ Global Mean	ASQ Controllable Mean
ASQ Internal Mean	R	1	-.058	.093	.266*
	Sig		.617	.426	.020
ASQ Stable Mean	R		1	.310**	-.041
	Sig			.006	.728
ASQ Global Mean	R			1	.350**
	Sig				.002
ASQ Controllable Mean	R				1
	Sig				

Table 3-4. Correlational analysis of Attributional Style Questionnaire scores for course-completers prior to completing the course. Significant correlations are identified in bold. *significant at the $p<.05$ level ** significant at the $p<.01$ level

3.3.7 Knowledge Gain

Knowledge was measured based on a points-based system where the maximum possible score was 14. Using a paired-samples t test, there was a significant difference noted between pre-course score ($m=10.80$, $SD= 2.26$) and post-course score ($m=12.97$, $SD=1.22$) on measures of knowledge gain $t(75)= -9.747$ $p<.01$.

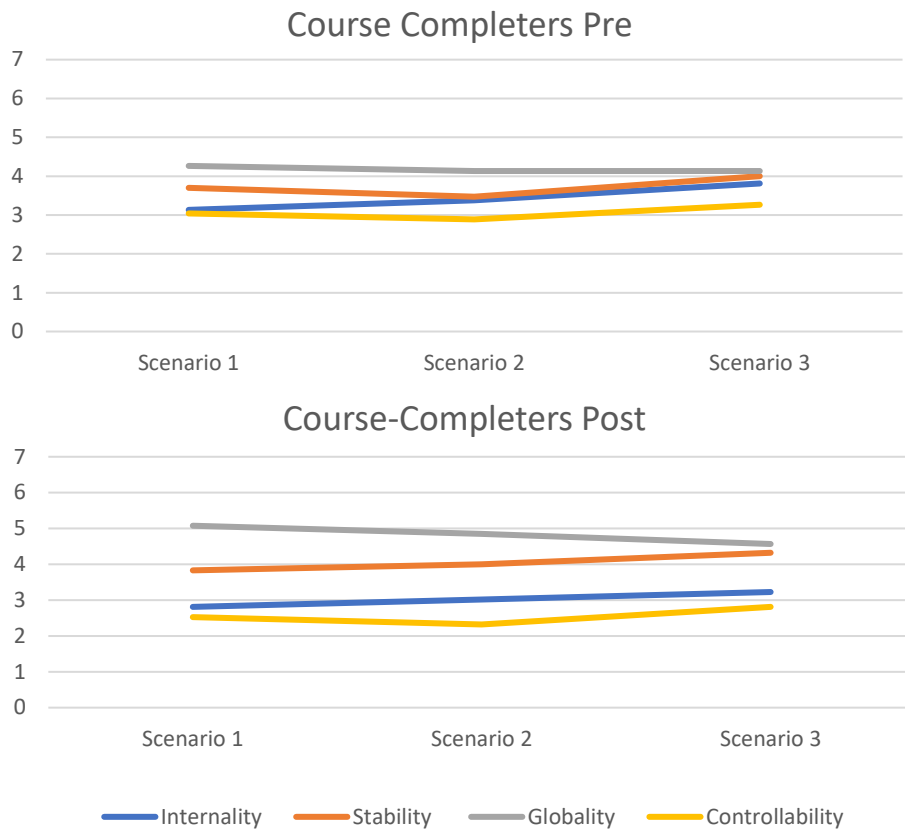


Figure 3-3. The average scores for each subscale of the ASQ, for each scenario across course-completers pre- and post-course scores.

3.3.8 Attributional Shift

Using a repeated measures t-test there were significant differences between all subscales on the ASQ, for pre- and post-course scores. See Table 3-5. and Figure 3-4. for an overview of the pre- and post-mean scores for each scale.

ASQ Scale	Pre Mean	Pre SD	Post Mean	Post SD	t (df= 75)	Sig (p)
Internal	3.40	.95	3.04	1.2	2.34	.022
Stable	3.66	.943	4.19	1.34	-3.194	.002
Global	4.25	1.20	4.90	1.34	-3.617	.001
Control	3.17	1.13	2.59	.98	4.151	.000

Table 3-5. Pre- and post-course comparisons for the attributional averages of course completers, df= degrees of freedom, SD= standard deviation

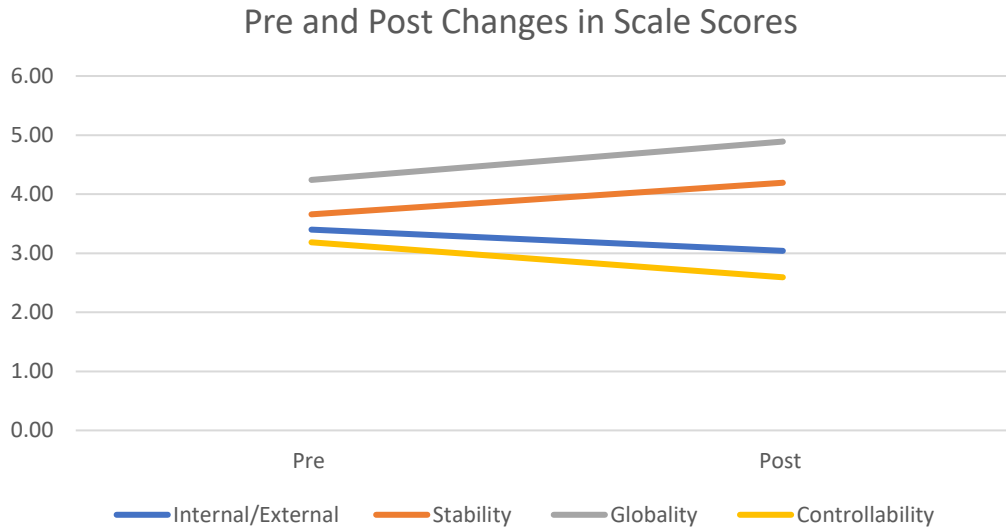


Figure 3-4. *The average scores reported for each subscale of the ASQ pre- and post-course.*

However, there were no significant correlations between the difference scores of each participant, for level of knowledge change and level of attributional change, for any scale of the ASQ. Furthermore, there were no significant correlations between the knowledge score provided pre- and post- or the attributions made. Indicating the lack of a consistent relationship between the level of pre-existing knowledge, or knowledge gained, and the attributions made.

Following the course, the pre-existing relationships between attributions of internality and control $r=.382, p=.001$, and stability and globality $r=.259, p=.024$ remained. Indicating that these are consistent relationships over time. While the relationship between global and controllable attributions had reversed and was now a negative relationship $r= -.422, p<.001$, indicating a change following the course, where as perceptions of behaviour as global are increased, perceptions of control are decreased, or vice versa.

POST Course (N=76)		ASQ Internal Mean	ASQ Stable Mean	ASQ Global Mean	ASQ Controllable Mean
ASQ Internal Mean	R	1	-.039	-.193	.382**
	Sig		.738	.095	.001
ASQ Stable Mean	R		1	.259*	-.142
	Sig			.024	.220
ASQ Global Mean	R			1	-.422**
	Sig				.000
ASQ Controllable Mean	R				1
	Sig				

Table 3-6. Correlational analysis of the post-course mean scores for each subscale of the Attributional Style Questionnaire. Significant correlations are identified in bold.

3.4 Discussion

The results demonstrate that providing training of the impact of trauma on EF, increases knowledge and alters staff attributions towards challenging behaviour. There was a significant increase in the participants stable and global attributions, and a significant decrease in the participants attributions of internal and controllable causes of challenging behaviour. However, the attributional scores were not significantly influenced by any of the confounding variables examined, including level of knowledge tested at pre- and post-, and level of knowledge gain. This makes it difficult to draw conclusions on the reasons for the attributional profile amongst this population, or for the shift over time, of which increased knowledge following training is only one hypothesis.

3.4.1 Attributional Profile

Exploration of the registered course participants identified that for each subscale of the ASQ, the mean score tended towards the middle of the scale. This is likely an accurate reflection of the responses provided, which generally followed a normal distribution. All subsections included at least one response for all possible options, indicating some variability in the data. This variability could not be explained by participants level of education, seniority, age, gender, or length of professional experience. Importantly, it was also not associated with pre-existing knowledge regarding the impact of trauma on EF, which means that knowledge alone cannot explain the attributions made. It is therefore likely that a complex combination of factors guides the interpretation of attributions. Additional causal factors for the variance in the data are explored below.

Amongst registered participants, globality was the highest scoring attribution, indicating that carers identified causes of challenging behaviour, which are perceived to occur in many areas of the child's life. It is possible that this reflects the level of difficulty experienced by children and young people in the care system, in that they experience pervasive difficulties in many areas of their life and development. In many ways, this is in line with what we know about the impact of trauma on development, attachment and emotional regulation. This perception was further increased upon completion of the course. This may be important to consider for clinical practice and future staff development, in that generalised strategies of support may be required, alongside training opportunities which focus on reducing the global nature of difficulties.

Furthermore, attributions of control were scored the lowest overall. This may reflect a pre-existing perception that children and young people are less in control of their behaviour or may be associated with the causal reasons supplied for the behaviour. Many individuals identified difficulties with emotional regulation and past trauma as the causes of challenging behaviour. It would naturally follow that these causes are associated with reduced control, as we have limited control over our early experiences in childhood, and emotional dysregulation is, by definition, a lack of emotional control. These attributions are important, as increased perceptions of control have previously led to reduced sympathy and reduced helping in residential workers (McGuinness & Dagnan, 2001).

Two significant positive relationships were also identified, between internal and controllable, and stable and global attributions, both of which are natural partners, as it can be inferred, that if the reason for problematic behaviour is located primarily within the child, then the child can also be allocated increased control over the behaviour. Similarly, if the cause of a behaviour is stable over time, it is less likely to be circumstance dependent, and more likely to have an impact in many areas of the child's life. Notably, in the pre-course responses of course-completers, a third relationship was identified between globality and control. This may indicate that a less consistent relationship between these attributions also exists. However, as the evidence is correlational no causal explanation for the relationships can be provided. Following the course, the significant positive relationships between internality and control, and globality and stability remained. The fact that these relationships remained consistent over time, despite significant differences in the pre- and post- scores for each scale, is a strong indication of a stable link over time.

3.4.2 Attributional Change

After completing the course there was a significant decrease in participants internal and controllable attributions. Controllability might be considered a logical change, since focussing on the neurodevelopmental impact of trauma, could be said to be a cause of challenging behaviour over which young people have little control. Importantly, there was an accompanying decrease in perceptions of internal causes of challenging behaviour, and the relationship between controllability and internality persisted. This suggests a co-occurring move towards an increased consideration of external causes, such as the environment around the child and the workers own practice. This is important, as there was a possibility that EF difficulties could be understood as a cause of challenging behaviour that lies within the child themselves, which would increase internal attributions. The reduction in these attributions is in line with the inclusion of strategies to support children and young people with EF difficulties, and the qualitative reports from participants, that they would use their knowledge to influence their clinical practice (see Chapter Two for an overview of the course feedback).

The relationship between global and stable attributions identified pre-course, was also stable over time. However, in contrast to internality and control, participants attributions on these scales increased following course-completion. Previous research has implied that increased perceptions that the causes of behaviour remain stable and frequent over time may reduce sympathy and intention of residential care workers to help (McGuinness & Dagnan, 2001). Therefore, the increase in global and stable attributions following the course, may be an unintended consequence of increasing knowledge in this area. However, further exploration of this link is required, particularly as other associations with global attributions changed following course-completion. Importantly, globality was significantly linked with control both pre- and post-course, although initially there was a significant positive relationship and after the course there was a significant negative relationship, indicating that the more global a cause of challenging behaviour is perceived to be, the less controllable it is, or vice versa. This reversal over time, could be an effect of course completion, as if EF difficulties are now considered to be part of the reason for challenging behaviour, this might be considered a global cause of difficulty, over which the child has limited control. Importantly, in attribution theory this combination of attributions is likely to elicit sympathetic emotions, such as concern or pity (Katsukunya, 2010), whereas, attributions of high control and high globality

are associated with more negative emotional responses. Therefore, this may represent a positive impact of course-completion, however further exploration is needed to fully assess any emotional responses associated with this change.

Furthermore, the repeated significance of attributions regarding control is important, as this has been identified as a key attribution, which plays a crucial role in the emotional responses and helping behaviours of residential carers. McGuinness & Dagnan, (2001), identified a negative relationship where increased perceptions of control, were associated with reduced levels of sympathy, and reduced intention to help in residential care staff. Based on this research it was recommended that training for residential care staff attend to attributions of control, by helping carers to identify the child's history, in order to put children's behaviours into a functional context (McGuinness & Dagnan, 2001). This approach was a notable element of the current training course, and the significant reduction in attributions of level of control following the course, can therefore be considered a positive and meaningful outcome. However, the lack of significant relationships amongst the confounding variables, makes it difficult to draw conclusions regarding the causes of attributions in this population.

3.4.3 Alternative Causes of Attributional Variance

Previous research has explored additional possible causes of attributional variation. Based on Weiner's, (1985) emotional- attributional model, McGuinness (2007) included the additional variables of the workers emotional reaction to the challenging behaviour and their confidence to manage the behaviour when it happens. These were shown to have a significant impact on the attributions made but were not explored in the current study. It is therefore possible that the emotional aspect of Weiner's model is key to understanding the variation across participants. Future research might consider these aspects more fully, particularly as emotional reaction has been linked with intention to help (McGuinness & Dagnan, 2001), which may therefore give an increased indication of possible practice change.

It is also possible that variation across the scenarios presented, has acted as a confounding factor in the consideration of an attributional profile across participants. There may be some qualitative difference in the behaviours described, the vignettes themselves, or in the reasons ascribed to each behaviour, which accounts for the attributions given. McGuinness (2007) who used this measure previously, acknowledged that there is some variation in the wording across scenarios which may account for varied attributions across situations. In

vignette one, the behaviour is categorised as being in response to an adult's action, in vignette two is described as in reaction to an emotional state, and in vignette three is in response to being "confronted". McGuinness (2007) suggested that this variation of syntax and level of contingency for the behaviour, may have had an impact on the responses provided. However, in the present study, it was decided to repeat the measure as described. This was to support consistency with previous research, in part to allow a direct comparison of the findings and also to counteract the use of bespoke measures of knowledge change and course evaluation. Importantly, an analysis of each individual scenario demonstrated significant relationships across the responses to each, indicating that despite the variation in wording there was consistency in participants responses to each subscale across scenarios.

The behaviours selected may also contribute to participants responses. The scenarios chosen to be part of the ASQ were selected to represent the behaviours on which a diagnosis of conduct disorder is made using ICD- 10 (World Health Organisation, 2010) and are in line with the behaviours demonstrated by children in residential care (Minnis & Del Priori, 2001). However, it is possible that there was some variation in how the behaviours were perceived, based on unmeasured attributions of hedonic relevance, that is the more positive or negative the effect is on the perceiver (Jones & Davis, 1965) or personalism, that is how much the perceiver feels the behaviour is aimed at them personally. In all scales in the pairwise comparisons, differences were noted between scenario one and three, and scenarios two and three, indicating that something about scenario three may be qualitatively different. Scenario three involves lying and stealing, which could be arguably considered to hold more hedonic and personal relevance, which may account for the variation in scores, as those behaviours which are seen to hold higher hedonic or personal relevance, tend to create more negative and extreme attributions (McGuinness, 2007). Furthermore, the qualitative reasons provided for the behaviour may play a part in the attributions ascribed. A qualitative approach which explores the reasons given in more depth, may be beneficial as part of further consideration of this area. This could be conducted as part of a secondary analysis of the current data set.

3.4.4 Conclusion

Overall, the results show support for attributional change as a result of online training in the impact of trauma on EF for residential staff working with children in care. However, it was not possible to demonstrate a significant link between knowledge gain and attributional

change, therefore the mechanism of attributional change following training is not fully understood, and there may be alternative explanations for the change-over time. Furthermore, not all of the changes in attributions are associated with positive responses from care providers, therefore further work is required to explore the reasons for attributional shift and consider any unintended effects on clinical practice. This may include using a qualitative approach and/or include the additional analysis of emotional reactions to challenging behaviour. This would provide a richer data set from which more causal patterns may be inferred.

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Appendix A: Child Neuropsychology Author Guidelines (Relevant Sections)

Child Neuropsychology accepts the following types of article:

Regular (Original) Articles, Brief Reports, and topical Review Articles, as well as specific Test or Book Reviews

Preparing Your Paper

All authors submitting to medicine, biomedicine, health sciences, allied and public health journals should conform to the Uniform Requirements for Manuscripts Submitted to Biomedical Journals, prepared by the International Committee of Medical Journal Editors (ICMJE).

Regular (Original) Articles, Brief Reports, and topical Review Articles, as well as specific Test or Book Reviews

Should be written with the following elements in the following order: title page; abstract; keywords; main text introduction; methods; results; discussion; acknowledgments; disclosure statement; references; appendices (as appropriate); table(s) with caption(s) (on individual pages); figures; figure captions (as a list)

Please include a word count for your paper. There are no word limits for articles in this journal.

Spelling can be US or UK English so long as usage is consistent.

Checklist: What to Include

Author details. Please ensure everyone meeting the International Committee of Medical Journal Editors (ICMJE) requirements for authorship is included as an author of your paper. All authors of a manuscript should include their full name and affiliation on the cover page of the manuscript. Where available, please also include ORCIDiDs and social media handles (Facebook, Twitter or LinkedIn). One author will need to be identified as the corresponding author, with their email address normally displayed in the article PDF (depending on the journal) and the online article. Authors' affiliations are the affiliations where the research was conducted. If any of the named co-authors moves affiliation during the peer-review process, the new affiliation can be given as a footnote. Please note that no changes to affiliation can be made after your paper is accepted.

Disclosure statement.

Please include a disclosure statement, using the subheading "Disclosure of interest." If you have no interests to declare, please state this (suggested wording: The authors report no conflict of interest). For all NIH/Wellcome-funded papers, the grant number(s) must be included in the declaration of interest statement. Read more on declaring conflicts of interest.

Figures.

Figures should be high quality (1200 dpi for line art, 600 dpi for grayscale and 300 dpi for colour, at the correct size). Figures should be supplied in one of our preferred file formats:

EPS, PS, JPEG, TIFF, or Microsoft Word (DOC or DOCX) files are acceptable for figures that have been drawn in Word. For information relating to other file types, please consult our Submission of electronic artwork document.

Tables.

Tables should present new information rather than duplicating what is in the text. Readers should be able to interpret the table without reference to the text. Please supply editable files.

References

References can be in any style or format, so long as a consistent scholarly citation format is applied. Author name(s), journal or book title, article or chapter title, year of publication, volume and issue (where appropriate) and page numbers are essential. All bibliographic entries must contain a corresponding in-text citation. The addition of DOI (Digital Object Identifier) numbers is recommended but not essential.

The journal reference style will be applied to the paper post-acceptance by Taylor & Francis.

Complying with Ethics of Experimentation

Please ensure that all research reported in submitted papers has been conducted in an ethical and responsible manner and is in full compliance with all relevant codes of experimentation and legislation. All papers which report in vivo experiments or clinical trials on humans or animals must include a written statement in the Methods section. This should explain that all work was conducted with the formal approval of the local human subject or animal care committees (institutional and national), and that clinical trials have been registered as legislation requires. Authors who do not have formal ethics review committees should include a statement that their study follows the principles of the Declaration of Helsinki.

Consent

All authors are required to follow the ICMJE requirements on privacy and informed consent from patients and study participants. Please confirm that any patient, service user, or participant (or that person's parent or legal guardian) in any research, experiment, or clinical trial described in your paper has given written consent to the inclusion of material pertaining to themselves, that they acknowledge that they cannot be identified via the paper; and that you have fully anonymized them. Where someone is deceased, please ensure you have written consent from the family or estate. Authors may use this Patient Consent Form, which should be completed, saved, and sent to the journal if requested.

Appendix B: Prospero Registration

Trauma and Executive Function in Care Experienced Children: A Systematic Review of the evidence

Louise Hendry, Emily Taylor

Citation

Louise Hendry, Emily Taylor. Trauma and Executive Function in Care Experienced Children: A Systematic Review of the evidence. PROSPERO 2018 CRD42018086256 Available from: http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018086256

Review question

What is the impact of trauma, abuse and neglect on the executive functioning of children in care?

Searches

We will search the following electronic bibliographic databases: MEDLINE, EMBASE, PsycINFO, Psycarticles, and The Cochrane Library (Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Methodology Register). Further databases may be included if deemed relevant at a later stage.

The search strategy will include terms relating to the population, neuropsychology and the types of experiences children in care have experienced e.g. Trauma and/or neglect.

There will be no language restrictions and no time restrictions on the papers found however it is anticipated that due to the nature of the search only more recent papers will be recalled. If a clear cut off appears this will be used as part of the inclusion/exclusion criteria.

Types of study to be included

We will include empirically based studies concerning the examination of executive function in the specified population. Excluded will be non-empirical studies or studies exploring other cognitive functions not related to executive function in this population.

Condition or domain being studied

Childhood Trauma. Executive functioning difficulties.

Participants/population

Children and young people who are in the care of their local authority, either through foster care, kinship care, adoption or residential accommodation.

Intervention(s), exposure(s)

The review will not explore a particular intervention but the interaction between executive function difficulties and previous exposure to trauma, abuse and neglect.

Comparator(s)/control

Not applicable

Context

This review is aiming to be particularly inclusive in anticipation of limited suitable findings, as a result the context is not specified. However, it is anticipated that studies retrieved and included will have been conducted within schools, clinics and healthcare settings.

Main outcome(s)

Establishing the impact of trauma, abuse and neglect upon executive functioning skills within a specified population of looked after and accommodated children.

Additional outcome(s)

none

Data extraction (selection and coding)

The titles and/or abstracts of studies retrieved using the search strategy and those from any additional sources will be screen independently by two review authors to identify studies which meet the criteria for inclusion. Following this the level of agreement between the two raters will be compared and any significant disagreements will be resolved through discussion with a third reviewer where possible.

A standardised, pre-piloted form will be used to extract data from the included studies for assessment of quality and evidence synthesis. Extracted information will include, the study-setting, population and participant demographics, details of the study methodology, recruitment and completion rates, outcomes and times of measurement, and information relevant to the assessment of bias.

Risk of bias (quality) assessment

One review author will independently assess the risk of bias in included studies and 30% will be rated by a secondary rater independently. Following this the level of agreement between the two raters will be compared and where there is any concern a higher percentage will be screened by both reviewers up until 100% if required. Any significant disagreements will be discussed with a third reviewer. The National Heart, Lung and Blood Institute (NHLI) tool will be used to assess quality.

Strategy for data synthesis

We will provide a narrative synthesis of the findings from the included studies, structured around the type of neuropsychological assessment, target population characteristics, and outcomes found. We anticipate there will be too few studies of sufficient quality to perform a meta-analysis on any given area or sub-group. Aggregate data will be used.

Analysis of subgroups or subsets

We do not anticipate this at this time.

Contact details for further information

Louise Hendry

s1687739@sms.ed.ac.uk

Organisational affiliation of the review

University of Edinburgh / NHS Forth Valley

Review team members and their organisational affiliations

Mrs Louise Hendry. University of Edinburgh / NHS Forth Valley

Dr Emily Taylor. University of Edinburgh

Type and method of review

Narrative synthesis, Systematic review

Anticipated or actual start date

02 April 2018

Anticipated completion date

31 December 2018

Funding sources/sponsors

University of Edinburgh Clinical Psychology Doctorate Programme

Conflicts of interest**Language**

English

Country

Scotland

Stage of review

Review Complete

Details of final report/publication(s)

Subject index terms status

Subject indexing assigned by CRD

Subject index terms

Child; Executive Function; Humans; Neuropsychological Tests

Date of registration in PROSPERO

14 March 2018

Date of publication of this version

25 April 2019

Details of any existing review of the same topic by the same authors

None

Stage of review at time of this submission

Stage	Started	Completed
Preliminary searches	Yes	Yes
Piloting of the study selection process	Yes	Yes
Formal screening of search results against eligibility criteria	Yes	Yes
Data extraction	Yes	Yes
Risk of bias (quality) assessment	Yes	Yes
Data analysis	Yes	Yes

Versions

14 March 2018

30 October 2018

25 April 2019

Appendix C: Quality Rating Tool, Adapted from National Heart, Lung and Blood Institute (NHLI) tool

NHLI No	Item	Scoring Key				Scoring Notes
N/a	Peer Reviewed (15)	Yes=1		No=0	NR/NA/CD=0	Yes= Peer reviewed and published article No=Doctoral thesis/grey literature
1	Was the research Question or objective clearly stated? And design is appropriate?	Yes=2	Partial = 1	No=0	NR/NA/CD=0	Yes= state specific objective(s) with hypothesis, design is appropriate for research question. Partial = state overall objective(s) but not hypothesis/expectations given, design is appropriate but alternative design may have been more appropriate. No=aim unclear and no pre-specified hypotheses highlighted, design is not appropriate
2	Was the study population clearly specified and defined?	Yes=2	Partial = 1	No=0	NR/NA/CD=0	Yes= Explicit and detailed description of the population/ source of participants and recruitment process, Using demographics, location and time frame of recruitment. For cohort studies provides matching criteria, number of exposed/unexposed participants and describes methods of follow up. Partial= Overview outline of participants and recruitment but without detailing for e.g. location/source or time period of selection No/NR/NA/CD = no mention of or very very limited.

5	Was the sample size justification, power description or variance and effect estimates provided?	Yes=2	Partial = 1	No=0	NR/NA/CD=0	<p>Yes= Authors report details for deciding the suitability of the study sample size for primary outcomes. Sample size was suitably large to identify clinically significant results in at least one primary outcome measure. Or effect size/ measure of variance is reported</p> <p>Partial = Sample size was described as large enough to detect clinically significant results but authors did not report details for deciding study sample size for primary outcomes and/or effect sizes/measures of variance.</p> <p>No = Lack of details on sample size justification and/or inadequate sample to calculate clinically significant results. Effect size not reported.</p>
9	Were the exposure measures (IV) clearly defined, valid, reliable and implemented consistently?	Yes=2	Partial = 1	No=0	NR/NA/CD=0	<p>Yes= Measures described in detail, tools/methods reliable, accurate, and validated.</p> <p>Partial = Measures described in detail, likely to be reliable/accurate but unvalidated or novel for this study</p> <p>0 = measures not clearly outlined, unlikely or unclear regarding reliability and/or validation.</p>
N/a	Were the measures used normed for Children and Young People?	Yes=2	Partial = 1	No=0	NR/NA/CD=0	<p>2= All measures normed for child population and expressly mentioned/described in detail in article.</p>

						<p>1= Majority of measures normed for child population and/or normed for children but not expressly described in article.</p> <p>0= not covered and not normed for children</p> <p>Not Applicable = Psychophysiological evidence e.g. neuro-imaging</p>
11	Were the Outcome measures (DV) clearly defined, valid reliable and implemented consistently?	Yes=2	Partial = 1	No=0	NR/NA/CD=0	<p>Yes= Measures described in detail, tools/methods reliable, accurate, and validated.</p> <p>Partial = Measures described in detail, likely to be reliable/accurate but unvalidated or novel for this study</p> <p>0 = measures not clearly outlines, unlikely or unclear regarding reliability and/or validation.</p>
14	Were the key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	Yes=2	Partial = 1	No=0	NR/NA/CD=0	<p>Yes= clear attempt made to control/adjust for possible confounding variables in design or analysis, explanation given regarding these decisions and outcomes.</p> <p>Partial = some attempt made to control/adjust for possible confounding variables but clear omissions or limitations in variables considered to be confounding.</p> <p>No= no adjustments described, or clear confounding variables inappropriately included/excluded in final analysis</p>

Appendix D: Author Guidelines for Children and Youth Services (Relevant sections)

GUIDE FOR AUTHORS

Your Paper Your Way We now differentiate between the requirements for new and revised submissions. You may choose to submit your manuscript as a single Word or PDF file to be used in the refereeing process. Only when your paper is at the revision stage, will you be requested to put your paper in to a 'correct format' for acceptance and provide the items required for the publication of your article.

Types of Paper The journal publishes full-length articles, current research and policy notes, and book reviews. There are no submission fees or page charges. Submissions will be reviewed by the editor, Duncan Lindsey.

Ethics

Human and animal rights If the work involves the use of animal or human subjects, the author should ensure that the work described has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. Authors should include a statement in the manuscript that informed consent was obtained for experimentation with human subjects. The privacy rights of human subjects must always be observed. **Declaration of interest** All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. Examples of potential competing interests include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding. Authors must disclose any interests in two places: 1. A summary declaration of interest statement in the title page file (if double-blind) or the manuscript file (if single-blind). If there are no interests to declare then please state this: 'Declarations of interest: none'. This summary statement will be ultimately published if the article is accepted.

Use of inclusive language

Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities. Articles should make no assumptions about the beliefs or commitments of any reader, should contain nothing which might imply that one individual is superior to another on the grounds of race, sex, culture or any other characteristic, and should use inclusive language throughout. Authors should ensure that writing is free from bias, for instance by using 'he or she', 'his/her' instead of 'he' or 'his', and by making use of job titles that are free of stereotyping (e.g. 'chairperson' instead of 'chairman' and 'flight attendant' instead of 'stewardess').

References

There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/ book title, chapter title/article title, year of publication, volume number/book chapter and the article number or pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied to the accepted

article by Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct.

Formatting requirements

There are no strict formatting requirements, but all manuscripts must contain the essential elements needed to convey your manuscript, for example Abstract, Keywords, Introduction, Materials and Methods, Results, Conclusions, Artwork and Tables with Captions. If your article includes any Videos and/or other Supplementary material, this should be included in your initial submission for peer review purposes. Divide the article into clearly defined sections.

Figures and tables embedded in text Please ensure the figures and the tables included in the single file are placed next to the relevant text in the manuscript, rather than at the bottom or the top of the file. The corresponding caption should be placed directly below the figure or table.

Article structure Subdivision - numbered sections Divide your article into clearly defined and numbered sections. Subsections should be numbered 1.1 (then 1.1.1, 1.1.2, ...), 1.2, etc. (the abstract is not included in section numbering). Use this numbering also for internal cross-referencing: do not just refer to 'the text'. Any subsection may be given a brief heading. Each heading should appear on its own separate line.

Introduction

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

Material and methods

Provide sufficient details to allow the work to be reproduced by an independent researcher. Methods that are already published should be summarized, and indicated by a reference. If quoting directly from a previously published method, use quotation marks and also cite the source. Any modifications to existing methods should also be described.

Results

Results should be clear and concise.

Discussion

This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

Conclusions The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

Appendices If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly, for tables and figures: Table A.1; Fig. A.1, etc.

Essential title page information

Title.

Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.

Author names and affiliations.

Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. You can add your name between parentheses in your own script behind the English transliteration. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lowercase superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.

Corresponding author.

Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any future queries about Methodology and Materials. Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.

Present/permanent address.

If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

Abstract A concise and factual abstract is required. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. For this reason, References should be avoided, but if essential, then cite the author(s) and year(s). Also, non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself.

Keywords

Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

Abbreviations

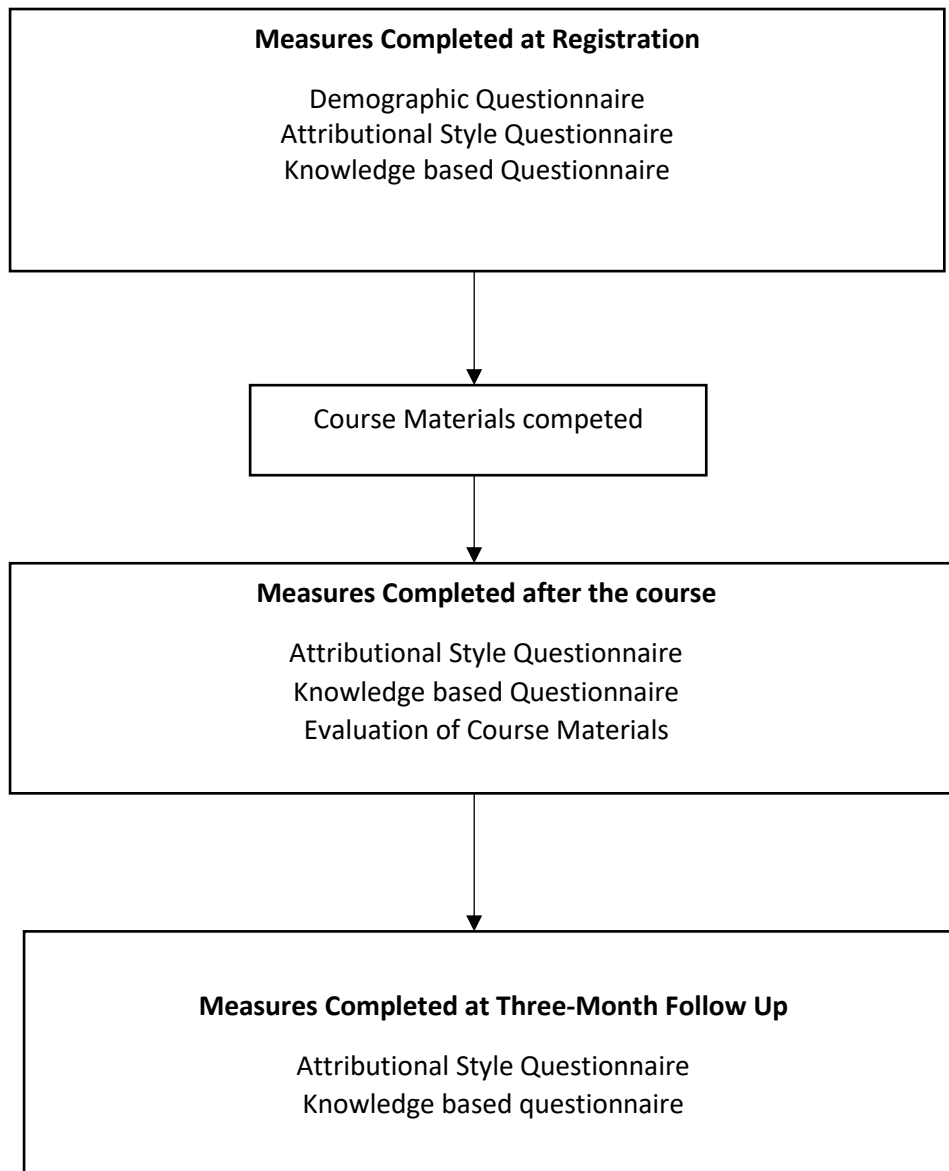
Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

Funding:

If no funding has been provided for the research, please include the following sentence: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

Appendix E: Flowchart of Measures

Flowchart representing stage at which measures were presented and sample measures.



Appendix F: Recruitment Strategy. Approaches made to Councils and external providers, including approach outcomes/decisions

Removed to preserve confidentiality.

Appendix G: Participant Information Sheet



Neuro Trauma Training

- Training for Residential Support Workers working with Looked After Children -

Welcome to our Neuro Trauma Training research project.

This project is being conducted by researchers based at the University of Edinburgh and NHS Forth Valley. We are interested in understanding how we can support best practice for frontline staff working in residential settings with Looked After Children.

Looked After Children have often suffered early adversity including trauma, abuse and neglect, all of which can have an impact on their development, even after their circumstances have changed. This study aims to develop and deliver online training about the developmental impact of trauma and neglect on children and young people in care, with a particular focus on executive function, the collective name for a set of higher-level cognitive skills which begin to mature in the mid-late teens.

As this is a new training course, we are evaluating the training itself as well as any potential impact of increasing knowledge about executive function.

Who can take part?

Residential Support Workers, Senior Support Workers and Care Staff working with Looked After Children in Residential Care settings can all take part. Staff members from local council provisions, third sector and privately-run companies are all invited to take part. Managers and other staff working in this area are also eligible if they feel the training could be relevant to their role.

What is involved?

Once registered, you will be invited to complete a knowledge-based questionnaire and a measure of their attributions regarding challenging behaviour, to assess their initial knowledge and attitudes. One week after completing these measures, each participant will receive access to the online course materials, which will be available online until 31st March 2019.

The course itself is broken down into four modules, each taking approximately one hour to complete, with information and interactive tasks to complete throughout. Upon completing the course, you will be invited to repeat the initial measures to assess any improvement or change in knowledge resulting from the course.

Finally, to see if that knowledge is retained over time, we will ask you to complete the same measures again three months after you finish the course. Participation is voluntary, and you are free to withdraw from the study at any time.

What is the benefit of completing the course?

On successful completion of the training course you will receive a certificate of completion for your Continuing Professional Development training portfolio.

Companies who choose to be involved may also receive a summary of the training evaluation. Information will be provided at a level that preserves anonymity, meaning employers will not be able to match employees to their individual responses.

Is there any cost involved?

The training is provided free of charge. It is optional for the companies involved whether they allow their staff to use their working hours to complete the course.

How do we get involved?

If you would like to register your own or your company's interest in this study, please visit: <https://tinyurl.com/neurotraumaregistration>

Or to request any further information, please email the principal researcher Louise Hendry, Trainee Clinical Psychologist at L.Hendry-6@sms.ed.ac.uk.

You can also find us on Facebook: [@NeuroTraumaTraining](https://www.facebook.com/NeuroTraumaTraining) and Twitter [@Trauma_training](https://twitter.com/Trauma_training)

We look forward to hearing from you!



This study is being conducted as a collaborative venture between the University of Edinburgh and
NHS Forth Valley.



Appendix H: Example Measures

Demographics Questionnaire

Thank you for agreeing to take part in our study, before we begin, we'd like to know a little about you. So please answer the following questions before we begin.

What is your current role?

- Residential Support Worker/Care Worker/Childcare Worker
- Senior Support Worker/ Senior Care Worker
- Registered Manager
- Other

If you responded other, please detail.....

How long have you worked in your current role?

- Less than 6 months
- Less than one year
- 1-2 years
- 2-3 years
- 4-5 years
- More than 5 years
- More than 10 years

Which company do you currently work for?

Do you work(please select)

- Full Time
- Part Time

Which area of the United Kingdom do you currently work in?

- England
- Scotland
- Wales
- Northern Ireland
- I do not work in the UK

How would you describe your gender?

- Female
- Male
- Non-Binary
- Prefer not to say

What is your current age?

What is your ethnic group?

Choose one option that best describes your ethnic group or background...

- White
- Mixed/ Multiple ethnic groups
- Asian/ Asian British
- Black / African / Caribbean / Black British
- Other Ethnic Group

If you answered 'other' in regard to your ethnic group, please specify below...

What is the highest level of education you have achieved? Please only include completed qualifications.

- No Formal Qualification
- GCSE/ National 5 Qualifications / Standard Grades or equivalent
- A Levels / NVQ / SVQ Level 3 or Equivalent
- Undergraduate Degree BSc BA or equivalent
- Masters Level qualification MA / MSc or equivalent
- Professional Qualification
- Doctorate/ PhD

Finally, we would like to use your email address to distribute the course materials. Your email will only be used to send the course materials to you and will not be linked with your responses to the knowledge and attitude questionnaires, which will be collected anonymously. In the next question you will be asked to select a unique identifying code, which we will use to link your responses to each part of the study.

Now, please select a unique identifying code, this should be your first and last initial, the last two numbers of your year of birth and the last two numbers from your mobile number, for example: RF8605. Please keep a note of this code as you will be asked to enter it on each of the responses you provide from now on.

Appendix H: Example Measures Continued

Knowledge Based Questionnaire

This section relates to your knowledge about executive function and its relation to trauma. Please answer each question based on your knowledge and memory of the course materials, if you aren't sure just make your best guess.

Firstly, please rate your opinion about your level of knowledge in relation to each area covered in the course.

	No knowledge	Very little knowledge	Some knowledge	Good level of knowledge	Very good level of knowledge
Executive Functions and what they are?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Executive Function difficulties and how they might present in children and young people?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How you can support someone with executive functioning difficulties?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The impact of trauma on development?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The following questions all relate to your direct knowledge of the topics covered, please answer to the best of your knowledge.

In what order do the levels of the brain develop?

- Cortex, Limbic System, Brain Stem
 - Limbic System, Cortex, Brain Stem
 - Brain Stem, Limbic System, Cortex
 - Brain Stem, Cortex, Limbic System
 - Cortex, Brain Stem, Limbic System
-

What is meant by the process of pruning?

- When the connections in the brain that aren't used fade away.
 - When new connections in the brain are made.
 - When the connections in the brain that are used a lot become stronger and faster.
-

Executive function is the umbrella term for a collection of higher-level cognitive skills that are used to help people interact with the world around them?

- True
 - False
-

There are five main areas of executive functioning, please select them from the following list?

- Planning
- Self-Control
- Memory
- Speech
- Mental Flexibility
- Reading
- Attention

Which area of the brain is most associated with executive functioning?

- Frontal Lobe
 - Parietal Lobe
 - Occipital Lobe
 - Temporal Lobe
-

At what age do executive function abilities usually reach full maturity?

- Mid-teens – Mid-twenties
 - Early teens - late teens
 - 10-12
 - 5-10
 - 0-5
-

If someone was having difficulty with initiating their actions, which of the following might you see? *Please select one statement.*

- The person is unable to begin a task until directly instructed how
 - The person is unable to change tactics or start a new task once they have started one task
 - The person can start a task but not complete it
 - The person changes tasks a lot and is easily distracted
-

If someone was having difficulty with their working memory, which of the following might you see? *Please select one statement.*

- The person begins to complete a task but gets distracted and starts to do something else.
 - The person begins to complete a task but cannot remember all the steps and so only completes some of the action or forgets to do some parts.
 - The person cannot work out how to complete a task and so does not complete it.
 - The person cannot begin a task unless prompted to do so.
-

If someone was having difficulty with their ability to pay attention, which of the following might you see? *Please select one statement.*

- The person gets stuck using an unsuccessful method to complete a task because they cannot think of another way.
 - The person says they will complete the task later and then forgets.
 - The person gets easily distracted and often doesn't finish things they start.
 - The person finds it difficult to change from one task to another.
-

Could difficulty with executive function be mistaken for challenging behaviour?

- Yes
 - No
 - Not Sure
-

How do you think you could tell the difference between challenging behaviour and executive function difficulties?

If you suspected someone in your care of experiencing executive function difficulties, in particular finding it hard to plan out tasks or manage their emotions, what strategies might you use to support them?

Please rank them from most likely to least likely, where 1 = most likely to use and 5 = least likely.

- _____ Breaking down information into smaller chunks when explaining a situation
- _____ Rehearsing how to plan out their actions in a particular situation
- _____ Talking to them about what happened when they are calm
- _____ Introducing a punishment when they fail to complete tasks successfully
- _____ Telling them how to do things in lots of detail all at once

Appendix H: Example Measures Continued

Attributional Style Questionnaire

The following questions relate to your attitude towards challenging behaviour by the children in your care. There are no right answers, so please go with your first instinct as much as possible. We will present three scenarios and you will be asked to rate your responses to each, this section should take about 5 minutes to complete.

Scenario 1

The 12-year-old child you are looking after often shouts and swears at you, because you have said “no” to a request or demand. Please identify what you think might be the main cause of this behaviour.

With this reason in mind, please show your agreement with the following statements by selecting one number along the scale.

Was this behaviour due to the person, or due to other people or circumstances?

It is totally due to others It is totally due to the person

1 2 3 4 5 6 7

If this behaviour happens over a long period of time will it be for the same reason?

Never for the same reason Always for the same reason

1 2 3 4 5 6 7

Does this reason apply to just this situation or all situations in the person's life?

Just this situation All situations

1 2 3 4 5 6 7

Is the reason under the person's control?

Not under their control Totally under their control

1 2 3 4 5 6 7

Scenario 2

The 12-year-old child you are looking after destroys their own property, and sometimes your property when they are angry and upset. Please identify what you think might be the main cause of this behaviour?

With this reason in mind, please show your agreement with the following statements by selecting one number along the scale.

Was this behaviour due to the person, or due to other people or circumstances?

It is totally due to others It is totally due to the person

1 2 3 4 5 6 7

If this behaviour happens over a long period of time will it be for the same reason?

Never for the same reason Always for the same reason

1 2 3 4 5 6 7

Does this reason apply to just this situation or all situations in the person's life?

Just this situation All situations

1 2 3 4 5 6 7

Is the reason under the person's control?

Not under their control Totally under their control

1 2 3 4 5 6 7

Scenario 3

The 12-year-old child you are looking after constantly steals money from the house and denies doing so when confronted. Please identify what you think might be the main cause of this behaviour?

With this reason in mind, please show your agreement with the following statements by selecting one number along the scale.

Was this behaviour due to the person, or due to other people or circumstances?

It is totally due to others It is totally due to the person

1 2 3 4 5 6 7

If this behaviour happens over a long period of time will it be for the same reason?

Never for the same reason Always for the same reason

1 2 3 4 5 6 7

Does this reason apply to just this situation or all situations in the person's life?

Just this situation All situations

1 2 3 4 5 6 7

Is the reason under the person's control?

Not under their control Totally under their control

1 2 3 4 5 6 7

Appendix I: Accepted Study Protocol

University of Edinburgh, School of Health in Social Science

RESEARCH ETHICS APPLICATION (REA)



The forms required when seeking ethical approval in the School of Health and Social Sciences have now been merged into this single electronic document. The sections you are required to complete will depend on the nature of your application. Please start to complete the form from the beginning and proceed as guided. On completion the **entire** document should be submitted electronically to your section's ethics tutor using the email addresses detailed on the final page.

FORM OVERVIEW

FORM	COMPLETION
Project registration form	: Compulsory for all applications
Document checklist	: Compulsory for all applications
Level 1 Self Audit form	: To be completed for all research studies that are not subject to review by an external UK based ethical committee.
Level 2 /3 ethical review form	: To be completed when indicated by responses on the Level 1 form.

4 PROJECT REGISTRATION FORM

This form is the first stage in applying for University ethical approval and should be completed prior to the commencement of any research project. Applications submitted without appropriate documentation will be returned.

Ethical approval is required for all projects by staff or students conducting research, or similar.

Applicants should familiarise themselves with the School's Research Ethics Policy prior to completion.

PR1 Name of Applicant: Louise Hendry (Fisher)
PR2 Name of Supervisor¹: Emily Taylor
PR3 Project Title: Considering the acceptability and feasibility of training in executive function for the Residential Care Staff of Looked After Children (LAC)
PR4 Subject Area (section of school): Clinical Psychology
PR5 If student, type of assessed work that this application relates to: Doctoral Thesis (DClinPsychol)
PR6 Planned date of project submission: May 2019
PR7 Date ethics application submitted: 05.01.2018
PR8 (Date complete information submitted if different):
PR9 IRAS Approval Number if applicable:
<i>The following to be completed by ethics administrator</i>
PR10 <i>Date Approved:</i>
PR11 <i>Amendments Requested Date:</i>
PR12 <i>Amendments Approved Date:</i>
PR13 <i>Reviewer 1</i>
PR14 <i>Reviewer 2</i> <small><i>Level 2-3 only</i></small>

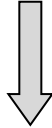
¹ Not applicable to staff members.

DOCUMENTATION CHECKLIST

DC1 Does your research project require extraction or collection of data abroad?

✓

If **No**, Skip to 2;
if **Yes**,



(i) Does the project require ethics review by 'local' ethics panel (ie abroad)? (✓ one)

No
Yes (Skip to 2)

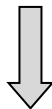
X

(ii) If yes, local Ethical review needed, please confirm (✓) electronic attachment of:

Application to that ethical review panel (in English) + copy of letter of approval

DC2 For the purposes of this research study, will you access identifiable² information on any NHS patient?

If **No**, Skip to 3;
if **Yes**,



(i) Please tick yes (✓)

Yes

(ii) Please confirm (✓) electronic attachment of:

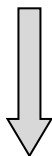
Caldicott Guardian approval for use of NHS data

(or confirmation that it is not required)

DC3 Does the project require ethical review by an external UK committee eg NHS REC or Social Work?

NB This project may require Social Work ethical review by some local authorities, although this is deemed unlikely, therefore university ethics is being sought initially to facilitate this process if required at a later stage. Please see the ethical considerations section in the brief summary provided below.

If **No**, Skip to 4;
if **Yes**,



(i) Please tick yes (✓)

Yes

(ii) Please confirm (✓) electronic attachment of:

NHS REC (IRAS) /other application form +

copy of letter of approval

² 'Identifiable information' refers to information that would allow you to know, or be able to deduce, the identity of a patient. The most common examples of this would be accessing medical records or similar, or accessing a database that includes patients' names.

indicated above. We do not accept paper documentation, please scan all documents into electronic formats. Please keep a copy of all documentation for your records.

LEVEL 1 SELF AUDIT FORM

The audit is to be conducted by all staff and students conducting any type of empirical investigation, including research, audit or service evaluation.

The form should be completed by the principal investigator and, with the exception of staff, signed by a University supervisor.

^{SA1}**Primary Research Question:**

Please tick	What type of research are you planning to do?
	Study of a novel intervention or randomised clinical trial to compare intervention in clinical practice
X	Study utilising questionnaires, interviews or measures, including auto-ethnographic.
	Study limited to working with routinely collected clinical data
	Meta-analysis or systematic review
	Research database containing non-identifiable information

^{SA2}**Please provide a brief summary of your proposed study. Our interest is in areas of your methodology where ethical issues may arise so please focus your detail on areas such as recruitment, consent, describing your participants and the nature of their involvement and data handling.**

Design

The study will involve the creation and delivery of a training course for LAC residential care staff which will be evaluated using a pre- and post- test within groups design. Residential Care Staff working with Looked After and Accommodated Children will be recruited from council units and privately-run companies, to complete a training course outlining the neuropsychological impact of trauma and neglect on children and young people in care, with a particular focus on executive function. Participants will complete an assessment, designed by the researchers to measure their learning, and measures of attribution regarding challenging behaviour, prior to undertaking training, immediately upon completing the training and at a 3-month-follow up. A repeated measures t-test will be used to examine the difference between the experimental and control groups pre- and post-training, while Friedman's Repeated Measures ANOVA will be used to examine the results in comparison to 3- month-follow up. A measure of satisfaction will also be collected upon to completion.

Participants & Recruitment

Participants will be recruited from residential care staff across Forth Valley, Edinburgh, and possibly Greater Manchester in private and council run facilities.

Recruitment will utilise several pathways. Initially the primary researchers will make direct approaches to management and relevant contacts in the identified regions. Lucie Mackinlay, Clinical Supervisor for this project has close working relationships with care staff across Forth Valley, and Falkirk, Stirling and Clackmannan councils will be contacted at the earliest opportunity for support in developing and completing the project. Recruitment will take place throughout Edinburgh, through contacts of Emily Taylor, Academic Supervisor for this project. The Trainee also has contacts in the Greater Manchester area with a national care provider through their experience in a previous role and will approach the relevant management streams for their support. Once managerial support has been given, direct staff recruitment will take place using internal email systems to promote the training to existing staff. Where necessary and/or possible the trainee will also visit the Residential Units to advertise the existence of the training, answer questions about taking part and promote engagement.

A secondary pathway will utilise social media and online platforms. As the training will be delivered remotely, participants may also be recruited from wider geographical areas through social media including Twitter and Facebook. Thirdly posters and leaflets will be sent to any relevant third-sector and charity organisations to promote the training and boost recruitment.

Any individual currently working within a registered care provider providing care for looked after children, is eligible to take part in the study. Details of the persons role, length of service in this area and level of training will be collected when the participant registers to take part in the study, however this information will not be used to exclude anyone who wishes to take part.

Materials

The training course will be hosted in an online medium and remotely accessed by the participants at a time of their choosing. It will be delivered across four modules, each requiring approximately one hour's completion time. Each module will cover a different area of interest including: the brain and behaviour, understanding development and the impact of trauma, supporting young people with tasks requiring executive function, and communication. Each module will build on previous modules by using case examples and as such will need to be completed in sequence. Within each module will be scenario and knowledge-based, multiple-choice, questions to assess the participants learning. This is based on evidence that interactive learning strategies are more effective than didactic methods (Thomson, 2001) and that problem based learning enhances knowledge acquisition and problem-solving skills (Gijbels, Dochy, Van den Bossche, & Segers, 2005). The knowledge based questionnaire will be designed to assess the identified learning objectives, which are as follows:

5. To understand the basic physiology and systems of the frontal and pre-frontal cortex.

6. To consider a variety of reasons for the described presenting behaviours and to attend to these during their work.
7. To understand why Executive Function is important in relation to Looked After Children's prenatal and early experiences
8. To understand the basic principles of Executive Function.

Once developed, the materials will be reviewed by a specialist LAC clinician within Forth Valley and an independent academic within the University. A small pilot of 3-4 staff members will also be conducted to identify and resolve any issues prior to the wider roll out of the training. Previous online- training programmes have successfully used small focus groups and independent review during the creation of their course (Hobday, Savik, Smith, & Gaugler, (2010). Piloting before initial data collection is also acknowledged to hold benefit for developing the multiple aspects included in a technology assisted-intervention (Carswell, van Ommeren, & Tol, (2016).

The staff members will be able to access the materials as they would when live recruitment is taking place. They will complete all the measures and the evaluative tool as described. The trainee will also aim to meet with this small group to discuss any feedback received directly. This will allow for consideration of the acceptability of the training to the staff team, the rate of compliance and any barriers to participation. Depending on the results of this small pilot, further work may be required to progressively refine the design before a full-scale evaluation can take place. Developing interventions using a carefully phased systematic approach is part of best practice as recommended by the Medical Research Council (Craig, Dieppe, Macintyre, Michie, Nazareth, & Petticrew, (2013).

Once released for wider recruitment, the training course will be accessible online for approximately six-months.

Measures

Participants will be invited to complete the initial measures and register for the course via email with the Trainee, after which they will be required to wait seven days before receiving their log in information to access the course materials. This will prevent unnecessary fatigue at repeating the measures and limit the impact of immediate recall of previous answers. Participants will be assessed using measures of attribution, knowledge, and skills, using a modified version of the Attributional Style Questionnaire, (ASQ; Peterson et al, 1982), and a knowledge and scenario based questionnaire developed by the primary researchers. Participants will re-complete the measures immediately after completing the training and again at 3-month follow up.

Data Storage

Data will be collected using Bristol Online Surveys and stored in an electronically secured database online for the duration of recruitment. Following this the data will be anonymised and transferred to a database held in a password protected and encrypted University of Edinburgh storage space, accessibly only to the researchers.

Identifiable data, including the participant's name, email address, role, length of service and level of training, will be collected when the participant registers to take part in the

study. There can be a high rate of staff turnover in social care industries and as such, secondary email addresses will also be collected from participants to allow for contact should they change their job role, company or employee contact details. Their email address will then be used both to access the training and link the participant to their follow up measures. Any identifiable information will be stored in a separate, password protected database and held on a secure University of Edinburgh shared drive.

Ethical Considerations

Informed consent will be gained from participants prior to completing the training and they will have the right to withdraw at any time during the study. Falkirk, Stirling, and Clackmannan Councils will each be approached for ethical consideration and input to the study, as will Edinburgh Council. Early consideration of council ethical procedures has highlighted that University approval is often required prior to any council consideration, so University approval and support will be prioritised initially.

Companies and care staff who participate in the study will also receive feedback as to the findings, these will be anonymised and presented at an overall, rather than individual level to maintain confidentiality. There has been some discussion about how best to manage the researcher's duty to pass on any worrying attributions or practices noted during the completion of the measures. It is noted that social desirability, may play a role in the responses received and any declaration by the researchers that they will pass on concerns, may further impact on the social desirability bias of the results collected. As a result, the participant information, and the course registration material, will include a disclaimer that sensitive information relating to current practice should not be shared. It is hoped this will minimise the disclosure of inappropriate or suboptimal practice and thereby mitigate any duty to pass on information to the participants employer.

Finally, it could be considered that there is an ethical obligation to assess the impact of the training before rolling out fully, due to the time and effort demands placed on the participants. Completion of the course will require a minimum of four hours input, which could potentially rise depending on each participant's needs and rate of learning. Expending this amount of effort for minimal change could be demotivating for staff. The inclusion of a small pilot will allow for a scaled analysis of any knowledge change before a wider roll out to staff in the area. This will also be important as delivering a training program which does not reach its desired aims could create a false belief about competence in the staff teams taking part. The participants will be clearly informed that the training is being evaluated for effectiveness and therefore will be providing informed consent and they will receive a certificate for four hours continuing professional development upon completion to reward their efforts.

Please circle your answer as appropriate:

	ETHICAL ISSUES		
SA3	<p>4.1.1..1 Bringing the University into disrepute</p> <p>4.1.1..2 Is there any aspect of the proposed research which might bring the University into disrepute?</p> <p>4.1.1..3 For example, could any aspect of the research be considered controversial, prejudiced, critical of a minority group or religion etc.?</p>	No	YES
		X	
SA4	<p>Protection of research subject confidentiality</p> <p><i>Will you make every effort to protect research subject confidentiality by conforming to the University of Edinburgh's guidance on data security, protection and confidentiality as specified in:</i> http://www.ed.ac.uk/schools-departments/information-services/services/research-support/data-library/research-data-mgmt/data-security</p> <p><i>For example, there are mutually understood agreements about:</i></p> <p>(a) non-attribution of individual responses;</p> <p>(b) Individuals, and organisations where necessary, being anonymised in stored data, publications and presentations;</p> <p>(c) publication and feedback to participants and collaborators;</p> <p>(d) With respect to auto-ethnographic work it is recognised that the subject's anonymity cannot be maintained but the confidentiality of significant others must be addressed.</p>	NO	Yes
			X

	(e) Where there is a dual relationship between the researcher and subject? E.g. Where the researcher is also the subject's practitioner or clinician.		
SA8	<p>4.2 Potential physical or psychological harm, discomfort or stress</p> <p>Is there any foreseeable potential for:</p> <p>(a) significant psychological harm or stress for participants (b) significant physical harm or discomfort for participants? (c) significant risk to the researcher?</p> <p>Examples of issues/ topics that have the potential to cause psychological harm, discomfort or distress and should lead you to answer 'yes' to this question include, but are not limited to:</p> <p><i>Relationship breakdown; bullying; bereavement; mental health difficulties; trauma / PTSD; Violence or sexual violence; physical, sexual or emotional abuse in either children or adults; feedback of results from the project's assessments.</i></p>	No X	YES

⁴ 'Identifiable information' refers to information that would allow you to know, or be able to deduce, the identity of a patient. The most common examples of this would be accessing medical records or similar, or accessing a database that includes patients' names.

Appendix J: Ethical Approval

