Cognitive Function Is Preserved in Older Adults With a Reported History of Childhood Sexual Abuse

Joanne Feeney,[1] Yumiko Kamiya,[1] Ian H. Robertson,[2,3] and Rose Anne Kenny[1,3]
[1]Department of Medical Gerontology, Trinity College, Dublin, Ireland
[2]School of Psychology, Trinity College, Dublin, Ireland
[3]Institute of Neuroscience, Trinity College, Dublin, Ireland

Childhood sexual abuse (CSA) is associated with mood and cognitive deficits in children and young adults. Evidence suggests that the effects of early-life adversity persist throughout adulthood; however, the impact of CSA on cognition in older adults is largely unknown. This study investigated cognitive function in older adults with a reported history of CSA. Data are from a population-based study (The Irish Longitudinal Study on Ageing) of 6,912 adults aged 50 years and older. Participants answered questions about CSA as part of a stressful life events questionnaire. Global cognition, executive function, memory (both objective and self-rated), attention, and processing speed were measured via a comprehensive battery of tests. Anxiety and depression, other childhood adversity, health behaviours, chronic disease, and medication use were also assessed. Of the total sample, 6.5% reported CSA. These individuals were more likely to have experienced other forms of childhood adversity and to exhibit poor mental health compared to those who reported no history of CSA. Multivariate regression analyses revealed, however, that CSA was associated with better global cognition, memory, executive function, and processing speed, despite poorer psychological health in this group. Future studies should aim to investigate possible reasons for this finding.

Childhood abuse can have profound and lasting effects on psychological health. Children who are subject to abuse and neglect are more likely to develop psychopathology (Benjet, Borges, Mendez, Fleiz, & Medina-Mora, 2011); there are reports of neurological correlates of maltreatment (De Bellis et al., 2002) and cognitive deficits in these children compared to their peers (Porter, Lawson, & Bigler, 2005). Adults who have experienced childhood abuse are also predisposed to conditions such as depression, anxiety, and posttraumatic stress disorder (PTSD; Green et al., 2010). Studies of adults with abuse or maltreatment histories have shown abnormalities in the regulation of the hypothalamic–pituitary–adrenal (HPA) axis—the main neuroendocrine stress response system (Heim, Shugart, Craighead, & Nemeroff, 2010; Penza, Heim, & Nemeroff, 2003). The HPA axis is regulated by multiple neurocircuits involving other regions of the brain such as the hippocampus, amygdala, and prefrontal cortex (Jankord & Herman, 2008). PTSD sufferers demonstrate impairments in cognition (e.g., Boals & Banks, 2012; Koso & Hansen, 2006; Yehuda et al., 1995), but only a handful of studies have examined cognitive function in adult victims of childhood abuse specifically, with or without pathology. There is evidence that young adults with a history of abuse have impaired cognitive function (Bremner et al., 1995; Navalta, Polcari, Webster, Boghossian, & Teicher, 2006). However, sample sizes in these studies were small with limited cognitive assessment, and in some cases only individuals with PTSD were included, thus limiting the general applicability of the findings. A recent study by Gould et al. (2012) carried out more thorough cognitive profiling of adult victims of childhood abuse and neglect and found deficits in executive function in this group.

Evidence suggests that the early-life disadvantage, in particular psychological problems, is associated with worse cognitive function in late life (Brown, 2010); however, little is known about the impact of specific stressful life events on cognitive functioning in older adults. Two recent studies have examined the effect of stressful events occurring within the past 3 years in older adults and observed both positive and negative effects on cognition depending on the stressor in question (Comijs, van den Kommer, Minnaar, Penninx, & Deeg, 2011; Rosnick, Small, McEvoy, Borenstein, & Mortimer, 2007). However, it is

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notable that these events were recent and possibly ongoing, and data on abuse were not gathered.

To our knowledge, the only study to address the issue of the impact of childhood sexual abuse on cognitive function in older adults is the ESPRIT study (Ritchie et al., 2011). The presence or absence of both negative and positive childhood events was examined in relation to cognitive function at two yearly intervals in adults over 65 years of age. Certain events, such as the loss of a parent, were associated with cognitive deficits. However, childhood abuse was positively related to verbal fluency and memory, although low numbers in these groups meant that the impact of CSA specifically could not be analysed. These findings were attributed to a possible resilience effect, manifesting as reduced vulnerability to cognitive impairment. A more thorough investigation of the effect of childhood sexual abuse on late-life cognitive functioning in a larger sample is warranted.

The aim of the current study was to investigate the impact of CSA on subjective and objective cognitive function in a population-based study of adults aged 50 years and over, adjusting for potential confounders such as gender, education, childhood environment, and mental health.

Method

Participants and Procedure

The Irish Longitudinal Study on Ageing is a nationally representative, prospective cohort study of over 8,000 adults, which assesses the social, economic, and health circumstances of community-dwelling older adults in Ireland. The sampling frame is the Irish Geodirectory, a comprehensive listing of all residential addresses in Ireland. A clustered sample of addresses was chosen and all residents aged 50 years or over and their spouses or partners (of any age) were eligible to participate in the study. The first wave of data collection was completed in 2011.

The Irish Longitudinal Study on Ageing includes (a) a computer-aided personal interview administered in respondents' homes including questions on sociodemographics, wealth, health, lifestyle and behavior, social support and participation, and health care utilisation; (b) a self-completion questionnaire, and (c) a health assessment carried out in one of two dedicated health centres or in the respondent's home if travel to a centre is impractical. Individuals with overt dementia were excluded from the study at baseline. The overall response rate was 62.0% (N = 8,175). These were individuals who completed the interview component of the study. Of those, 84.5% also returned the self-completion questionnaire (n = 6,912) and 72.1% participated in a health assessment (n = 5,898). A detailed description of the design of The Irish Longitudinal Study on Ageing and recruitment procedures has already been published (Kearney et al., 2011). After providing a complete description of the study to the participants, written informed consent was obtained. Full approval for the study was obtained from the institutional ethics committee and all procedures adhered to the tenets of the Helsinki Declaration, 1983.

Measures

Respondents were asked two questions on childhood sexual abuse as part of a stressful life events inventory in the self-completion questionnaire. For each event, respondents were asked to indicate whether the event occurred (yes or no), and the year in which the most recent incident occurred. The two questions about childhood sexual abuse were as follows: (a) "Before you were 18 years old, were you ever sexually abused by either of your parents?" and (b) "Before you were 18 years old, were you ever sexually abused by anyone other than your parents?" If a respondent answered yes to either of these questions, they were assigned "1" for CSA; if they answered no they were assigned a "0": 2.3% and 2.7% of respondents failed to answer questions 1 and 2, respectively, and were not included in the analysis.

The Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) and the Montreal Cognitive Assessment (MoCA; Nasreddine et al., 2005) were administered. Verbal memory was assessed using 10-word-list learning and recall, with both immediate and delayed recall components. Prospective memory was assessed via two tasks. For the first task, participants were instructed to remind the interviewer to record the time once a particular section of the interview had finished. For the second task, participants were asked to write their initials on the top, left-hand corner of a piece of paper when it was later handed to them.

Visual memory was assessed using the picture memory task from the Revised Cambridge Examination for Mental Disorders of the Elderly (Roth et al., 1998). A verbal fluency test was used as a measure of executive function; respondents were required to name as many animals as possible in 1 minute. The Colour Trails Tasks 1 and 2 (D'Elia, Uchiyama, & White, 1996) were administered to assess visual scanning and executive function. The visual reasoning task from the Cambridge Examination for Mental Disorders of the Elderly was also included as a measure of executive function.

A computer-based choice reaction-time task was administered as an index of mental processing speed. Respondents were required to depress a central button until a stimulus appeared onscreen. Stimuli consisted of either the word "YES" or the word "NO" (in uppercase) and respondents were required to press the corresponding button. A return to the central button was then necessary for the next word to appear onscreen. The variables of interest were mean reaction time and reaction time variability (the *SD* of individual response times). Increased reaction time variability in older adults is associated with cognitive impairment (Strauss, Bielak, Bunce, Hunter, & Hultsch, 2007), and reaction time variability has been shown to predict performance in several cognitive domains in older adults, over and above mean reaction time (Hultsch, MacDonald, & Dixon, 2002).

The Sustained Attention to Response Task (Robertson, Manly, Andrade, Baddeley, & Yiend, 1997) is a measure of the ability to self-sustain mindful, conscious processing of repetitive stimuli, and to inhibit prepotent responses. The numbers 1–9 appear on a computer screen in consecutive order and the participant is required to press the spacebar in response to every number except the number 3. Performance on the task was indexed by the number of errors of commission (pressing in response to the "3") and errors of omission (failing to press in response to any of the numbers 1, 2, 4, 5, 6, 7, 8, or 9). Self-reported memory was assessed by asking respondents to rate their memory as excellent, very good, good, fair, or poor.

Data on the presence of other forms of childhood adversity were collected via the self-completion questionnaire and computer-aided personal interview. This included parental substance abuse, childhood physical abuse by parents and others, and father's education (proxy for childhood socioeconomic status). Childhood physical abuse was ascertained from two questions: "Before you were 18 years old, were you ever physically abused by either of your parents?" and "Before you were 18 years old, were you ever physically abused by anyone other than your parents?" The question on parental substance abuse was "Before you were 18 years old, did either of your parents drink or use drugs so often that it caused problems in the family?"

Anxiety was assessed by the Hospital Anxiety and Depression Scale (HADS-A; Zigmond & Snaith, 1983). Depression symptoms were assessed by the 20-item Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). A cutoff score of 11 on the HADS and 16 on the CES-D was used to signify clinically significant anxiety and depression, respectively.

Respondents were identified as having never smoked, as current smokers, or as previous smokers. The CAGE Questionnaire (Mayfield, McLeod, & Hall, 1974) was included in the self-completion questionnaire to screen for alcoholism. A total score of 2 or greater out of 4 is considered clinically significant for the identification of problem drinking, with sensitivity of 93% and a specificity of 76% (Bernadt, Mumford, Taylor, Smith, & Murray, 1982).

Respondents were asked to rate their health as excellent, very good, good, fair, or poor. To assess chronic conditions, respondents were presented with a list of conditions and were asked whether a doctor had ever diagnosed them with any disease on the list. These included cardiovascular conditions (high blood pressure, angina, a heart attack, congestive heart failure, an abnormal heart rhythm), diabetes, a stroke, transient ischaemic attack, chronic lung disease, asthma, arthritis, osteoporosis, cancer, stomach ulcers, varicose ulcers, liver damage, and chronic pain. Fifteen individuals also reported a doctor's diagnosis of Alzheimer disease or dementia, and these were excluded from the current analysis. All medications were noted and classified according to the Anatomical Therapeutic Chemical Classification (ATC) System (http://www.whocc.no/atc_ddd_index/).

Respondents were asked about the frequency of their participation in various activities comprising the Social Participation Scale (House, Robbins, & Metzner, 1982). These activities included going to films, plays, or concerts; attending lectures and classes; reading magazines and books for pleasure; playing cards, bingo, or other games; and participating in sporting activities or exercise. The frequency was recorded and respondents were classed as engaging in an activity daily, weekly, or less often.

Other measured factors included age, gender, highest level of educational attainment (primary, secondary, or tertiary), current marital status (married or single), and father's education level (proxy for childhood socioeconomic status).

Data Analysis

Response rates varied between subgroups of the population and so inverse probability weights were calculated for the main sample by comparing the distribution of age, gender, and education in the sample to that of the Quarterly National Household Survey (Central Statistics Office, 2010). Specific health assessment and self-completion questionnaire weights were also created to account for differential response rates to these components. All analyses were weighted. Chi-square tests were used to test the association of CSA with socioeconomic, physical, and mental health variables. Linear regression models were used to estimate the effect of CSA on cognition where outcomes were normally distributed or rendered normal after logarithmic transformation. Binary outcomes were modeled with logistic regression. As the number of errors made on the MoCA, MMSE, and Sustained Attention to Response tasks approximated a negative binomial distribution, negative binomial regression was used to test the association between CSA and these outcomes.

Multivariable regression models were fitted with the cognitive test of interest as the dependent variable and CSA exposure as the independent variable. Model 1 was adjusted for age, gender, and education only. Potential confounders of CSA and cognition were entered into Model 2. These factors were marital status, father's education (proxy for socioeconomic status), smoking, alcoholism, parental substance abuse, childhood physical abuse, chronic disease (including cardiovascular disease), anxiety, depression, cardiovascular medication, and psychotropic medication. The variable denoting frequency of attendance at classes and lectures from the Social Participation Scale was added to the third and final model.

Results

The prevalence of CSA was 6.5%, with a higher proportion of women than men reporting CSA. The vast majority of CSA victims were abused by individuals other than their parents (Table 1).

Table 2 presents descriptive statistics for the sample stratified by CSA. In nearly all cases, there were significant differences between the groups. Those reporting CSA were younger and better educated than those with no history, but were less likely to be married. Individuals reporting CSA were more likely to

Table 1
The Prevalence of Reported CSA in The Irish Longitudinal Study on Ageing

	Men		Women		Total	
CSA	*n*	%	*n*	%	*n*	%
Any	186	5.9	265	7.0	451	6.5
By parents	19	0.6	24	0.6	43	0.6
By others	183	5.8	250	6.6	433	6.3
By both parents and others	16	0.5	9	0.2	25	0.4

Note. CSA = child sexual abuse.
[a]Based on 6,912 respondents with self-completion questionnaire data, 2.3% of whom were missing on CSA by parents, and 2.7% were missing on CSA by others.

Table 2
Descriptive Statistics

Variable	CSA ($n = 451$) %	Non-CSA ($n = 6,256$) %
Age group		
50–64 years	74.0	57.8***
65–74 years	20.3	23.6
≥ 75 years	5.7	18.5
Education		
Primary	28.1	38.3
Secondary	42.0	43.6
Tertiary	29.9	18.1***
Married	63.3	68.8*
Father's education (primary or less)	69.8	79.7***
Smoked		
Never	30.8	44.2***
CAGE (screening for possible alcoholism)		
Positive	20.8	11.3***
Parental alcohol or drug abuse	22.7	7.6***
Physical abuse by parents during childhood	19.1	2.1***
Physical abuse by others during childhood	43.3	2.7***
Mental health		
Anxiety	23.7	12.3***
Depression	20.4	10.6***
Number of chronic conditions (*M*, *SE*)	1.9 (0.07)	1.7 (0.02)
Cardiovascular disease	15.8	14.9
Self-rated health		
Excellent/very good	45.8	54.0**
Self-rated memory		
Excellent/very good	38.5	43.8*
Cardiovascular medication	42.4	51.3***
Psychotropic medication	22.6	17.0**
Frequent attendance at classes or lectures (≥ once weekly)	11.9	7.1***

Note. CSA = childhood sexual abuse.
*$p < .05$. **$p < .01$. ***$p < .001$.

be current or past smokers, and to meet the criteria for alcohol abuse. CSA was also associated with clinically significant anxiety and depression as well as with psychotropic medication use, whereas those reporting CSA were less likely to rate their health or memory as very good or excellent and were less likely to use cardiovascular medicines. The most striking differences between the groups were on other forms of childhood adversity. Almost one in four of the CSA survivors reported having a parent who suffered from substance abuse, compared to less than 1 in 10 of the non-CSA group. CSA victims were almost 10 times more likely than individuals in the non-CSA group to report experiencing physical abuse by their parents, and were over 14 times more likely to report physical abuse by individuals other than their parents (Table 2).

Table 3, Model 1 displays the association between CSA and performance on tests of cognitive function, adjusting for age, gender, and education. CSA was associated with fewer errors on the MoCA and MMSE. CSA was associated with better immediate recall. Model 2 displays the second multivariable model regressing performance on the cognitive tests on CSA after also adjusting for marital status, father's education, smoking, alcoholism, parental substance abuse, chronic and cardiovascular disease, childhood physical abuse by parents or others, anxiety, depression, and cardiovascular and psychotropic medication. Adjusting for these variables, the association between CSA and performance on the MoCA, MMSE, and immediate word recall tasks was strengthened. In addition, CSA was also associated with faster times to complete Color Trails Task 1 and 2, and less variable reaction times on the Choice Reaction Time task.

Those reporting CSA were more likely to attend classes or lectures even after controlling for age, gender, and education, $OR = 1.57$, 95% CI [1.13, 2.17], $p = .007$, although there was no association between CSA and any of the other leisure and social activities. Given that engaging in social and cognitively stimulating activities may increase cognitive reserve and therefore act as a buffer against cognitive decline (Fratiglioni, Paillard-Borg, & Winblad, 2004), we added frequency of attendance at classes and lectures into our final regression model to investigate whether the observed associations between CSA and cognition were dependent on this variable. Adjusting for attendance at classes or lectures in addition to the other confounding variables from Model 2 reduced the size of the coefficient associated with immediate word recall so that the relationship with CSA was no longer significant at the .050 level ($p = .057$).

Table 3
Multivariate Regression of Childhood Sexual Abuse on Cognitive Function

	Model 1		Model 2	
Dependent variable	*B*	[95% CI]	*B*	[95% CI]
MoCA errors	−0.14***	[−0.22, −0.06]	−0.15**	[−0.24, −0.05]
MMSE errors	−0.20**	[−0.35, −0.06]	−0.23*	[−0.43, −0.03]
Immediate word recall	0.19*	[0.01, 0.37]	0.20*	[0.01, 0.40]
Delayed word recall	0.21	[0.01, 0.44]	0.23	[−0.03, 0.49]
Log transformed CTT1 time (ms)	−0.03	[−0.07, 0.01]	−0.06*	[−0.10, −0.01]
Log transformed CTT2 time (ms)	−0.03	[−0.06, 0.01]	−0.05*	[−0.08, −0.01]
Verbal fluency	0.16	[−1.05, 1.37]	0.06	[−0.19, 2.02]
Visual reasoning	0.10	[−0.05, 0.25]	0.13	[−0.05, 0.31]
SART omission errors	−0.08	[−0.21, 0.05]	−0.04	[−0.19, 0.11]
SART commission errors	−0.03	[−0.14, 0.07]	−0.03	[−0.16, 0.09]
Log transformed CRT (ms)	−0.01	[−0.03, 0.01]	−0.02	[−0.04, 0.00]
Log transformed CRT variability (ms)	−0.03	[−0.07, 0.02]	−0.06*	[−0.12,−0.01]
Prospective memory 1	0.10	[−0.22, 0.42]	0.07	[−0.30, 0.43]
Prospective memory 2	0.02	[−0.29, 0.33]	0.14	[−0.27, 0.55]

Note. CI = confidence interval; MoCA = Montreal Cognitive Assessment; MMSE = Mini-Mental State Exam; CTT = Color Trails Task; SART = Sustained Attention to Response Task; CRT = choice reaction time. Model 1 was adjusted for age, sex and education. Model 2 was adjusted for age, gender, education, marital status, father's education, smoking, alcoholism, parental substance abuse, childhood physical abuse by parents or others, chronic disease, anxiety, depression, cardiovascular medication, and psychotropic medication.

*$p < .05$. **$p < .01$. ***$p < .001$.

However, the association between CSA and other tests of cognition remained.

Due to the possible presence of undiagnosed cognitive impairment among the older study participants, we investigated whether the positive relationship between CSA and performance on certain cognitive tests remained when individuals in the 50–64 years age group ($n = 1{,}428$) and the 65 years and over age group ($n = 738$) were analyzed separately. CSA was associated with better immediate word recall in both the 50–64 years and 65 years and over age groups, and with better delayed word recall and visual reasoning in the younger age group only (Table 4).

Discussion

To the best of our knowledge, this nationally representative study is the first to explore, in detail, cognitive functioning in adult survivors of CSA aged 50 years and above. Prior research from our group has found that individuals with a reported history of CSA have poorer self-reported health and mental health but are comparable to the non-CSA group on objective health measures, suggesting a mismatch between perceived and actual health status in this group (Kamiya, Timonen, & Kenny, 2012). Contrary to expectations, we found that older adult survivors of CSA performed better on tests of global cognitive function and on an immediate word recall task than older adults who report no history of CSA, adjusting for age, gender, and education. When early-life environment, mental health, disease, and medication use were taken into account, the association with cognitive performance was strengthened. Controlling for differences in activity and social participation did not markedly attenuate the relationships observed, suggesting that these differences in cognition are not mediated purely by greater social/intellectual engagement in the CSA group. Finally, conducting further analyses for the younger and older age group separately revealed that the association between CSA and certain measures of cognition was, if anything, slightly stronger in the younger age group than among older individuals. Despite the fact that the number of eligible individuals aged 65 or older was considerably less than the number who were 50–64 years of age, the results from these analyses suggest that the overall finding of a positive association between CSA and cognitive function is not likely to be due to the presence of cognitive impairment in the older age group.

The positive association observed between sexual abuse in childhood and cognitive function in late-life contradicts the evidence of a damaging effect of early adversity on mental health in later years. However, there is limited prior data on cognition in older CSA victims from which to draw comparisons. Gould et al. reported poorer performance among CSA victims on certain cognitive tasks; however, the mean age of this cohort was 30 years, considerably younger than those individuals sampled in the current study. The experience of CSA for many of the individuals in the Gould study may still have been relatively fresh, resulting in a greater continuing impact on their lives: 73% had past or current major depression at the time of the study. Thus,

Table 4
Regression of Childhood Sexual Abuse on Cognitive Function by Age Group

	Age 50–64 years ($n = 1,428$)		Age 65+ years ($n = 738$)	
Dependent variable	*B*	[95% CI]	*B*	[95% CI]
MoCA errors	−0.18	[−0.38, 0.03]	−0.33	[−0.66, 0.01]
MMSE errors	−0.15	[−0.00, 0.04]	−0.33	[−1.21, 0.56]
Immediate word recall	0.43*	[0.02, 0.83]	0.65*	[0.03, 1.27]
Delayed word recall	1.03***	[0.45, 1.61]	0.02	[−0.82, 0.86]
Log transformed CTT1 time (ms)	0.00	[−0.10, 0.10]	−0.06	[−0.21, 0.09]
Log transformed CTT2 time (ms)	−0.21	[−0.11, 0.07]	−0.08	[−0.24, 0.09]
Verbal fluency	1.34	[−0.32, 3.01]	0.58	[−1.73, 2.89]
Visual reasoning	0.38*	[0.00, 0.75]	0.70	[−0.81, 2.20]
SART Omission errors	−0.15	[−0.45, 0.15]	−0.09	[−0.76, 0.57]
SART Commission errors	−0.18	[−0.42, 0.06]	−0.12	[−0.70, 0.46]
Log transformed CRT (ms)	−0.00	[−0.05, 0.05]	−0.14	[−0.35, 0.07]
Log transformed CRT variability (ms)	−0.11	[−0.39, 0.17]	−0.28	[−0.93, 0.37]
Prospective memory 1	0.25	[−0.50, 0.99]	0.76	[−1.22, 2.75]
Prospective memory 2	0.57	[−0.25, 1.38]	0.14	[−2.03, 2.31]

Note. CI = confidence interval; MoCA = Montreal Cognitive Assessment; MMSE = Mini-Mental State Exam; CTT = Color Trails Task; SART = Sustained Attention to Response Task; CRT = choice reaction time. Analyses were adjusted for age, gender, education, marital status, father's education, smoking, alcoholism, parental substance abuse, childhood physical abuse by parents or others, chronic disease (including cardiovascular conditions), anxiety, depression, cardiovascular medication and psychotropic medication, and attendance at classes and lectures.

*$p < .05$. **$p < .01$. ***$p < .001$.

it is likely that the individuals recruited represented those who were severely affected by their childhood experiences. The Esprit study recruited community-dwelling older adults via random selection from the electoral register and assessed their verbal fluency, visual memory, executive function, immediate and delayed word recall. Their results are consistent with the current findings. Childhood abuse was associated with better verbal fluency at baseline and less decline of visual memory, however low numbers reporting physical or sexual abuse ($n = 26$) limit the interpretation of their results.

The prevalence of reported CSA in the current study was 6.5%, comparable to that of the telephone survey of sexual violence in Ireland when only the more extreme forms of abuse are considered (McGee, Garavan, Byrne, O'Higgins, & Conroy, 2011). The higher prevalence of CSA in middle to early old age is also consistent with the results of SAVI and other studies of the long-term effects of childhood abuse (Draper et al., 2008; Saachs-Ericsson, Medley, Kendall-Tackett, & Taylor, 2011). This may reflect a reporting bias, a real shift in sexual abuse trends, or increased mortality among older victims of CSA.

We also report higher educational attainment among those who report CSA. This contrasts with evidence linking CSA to lower levels of education and failure to complete formal schooling (Noll et al., 2010). Studies of neuropsychological function among adult survivors of CSA rarely report educational attainment or have reported no difference in educational status between the groups under study. One exception—an Australian survey of over 20,000 adults recruited through General Practitioners—found that those who reported a history of abuse were more likely to have attended tertiary education (Draper et al., 2008). It is possible that the individuals who acknowledged CSA were those who were better educated and had coped better following their abuse. This would be consistent with theories of resilience after trauma, whereby numerous factors may influence whether an individual is able to adapt and even thrive following trauma exposure. These factors include cognitive appraisal and coping styles, genetic and epigenetic differences, social support, physical health, and personality (Mealer, Jones, & Moss, 2012; Southwick & Charney, 2012; Wu et al., 2013). A limitation of the current study is that no information was sought on PTSD symptoms and no questions were asked about a prior PTSD diagnosis. Thus, we cannot determine whether the CSA group contained a proportion of individuals with a history of PTSD, consistent with the literature. This would afford greater insight into possible resilient individuals within this cohort. However, our results show a higher prevalence of clinically significant anxiety and depression in the CSA group and these individuals also leave the labour force earlier because of illness or disability (Barrett & Kamiya, 2012). These results do not suggest a typically resilient phenotype for the group who report CSA, as a whole.

Several other possible mechanisms link CSA to improved cognition in later life. Mounting evidence suggests that, regardless of the development of psychopathology, childhood abuse is associated with HPA axis dysregulation in adulthood. The most common biological phenotype is characterized by

hypersecretion of corticotrophin-releasing hormone (CRH) by the hypothalamus accompanied by reduced cortisol output from the adrenal glands (Penza et al., 2003). This hypocortisolism is evident in adult victims of abuse in response to both pharmacological challenge and psychosocial stressors (Heim, Newport, Bonsall, Miller, & Nemeroff, 2001; Heim et al., 2000). Early-life trauma is associated with an initial increase in adrenal cortisol production, but a subsequent attenuation of this response over time so that the individual eventually becomes hypocortisolaemic (Trickett, Noll, Susman, Shenk, & Putnam, 2010) a mechanism that has been suggested to be adaptive in the long term (Fries, Hesse, Hellhammer, & Hellhammer, 2005). The damaging effect of a prolonged elevation of cortisol levels on structures such as the hippocampus and prefrontal cortex is now well established. Higher cortisol levels in middle- and old age have also been associated with cognitive decline in longitudinal studies (Lee et al., 2007; Lupien et al., 1998). Thus, a trauma-associated decrease in adrenal cortisol production could potentially be neuroprotective, with the functional implications not becoming evident until middle to old age when the impact of accumulated damage and a lack of ability to compensate would normally exacerbate cognitive decline.

An alternative hypothesis relates to hyperarousal. CRH hypersecretion after trauma is associated with increased arousal due to activation of the central noradrenergic system (Valentino & Van Bockstaele, 2008), consistent with reports of hypervigilance in PTSD sufferers. Childhood trauma may trigger higher levels of arousal and vigilance that could improve cognitive performance in the short term. A persistent upregulation of noradrenergic activity may also increase plasticity and promote cognitive reserve in the long term via both disease-compensatory and disease-modifying processes (Robertson, 2013).

There is also some literature on the relationship between emotional regulation and adverse outcomes following stress. Heightened activity of the amygdala has been proposed to enhance memory consolidation (Nathan, Griffith, McReynolds, Hahn, & Roozendaal, 2004; McGaugh, Cahill, & Roozendaal, 1996) influencing the formation of traumatic memories. Furthermore, PTSD sufferers and individuals with elevated cortisol levels have been shown to preferentially attend to threat stimuli (e.g., angry faces, images of combat threat; e.g., Ellenbogen, Carson, & Pishva, 2010; McNally, Kaspi, Riemann, & Zeitlin, 1990) and to exhibit greater amygdala activity when doing so (e.g., Armony, Corbo, Clément, & Brunet, 2005). Unfortunately, no tests of emotional cognitive function were included in The Irish Longitudinal Study on Ageing. It would therefore be interesting, in light of the above findings, to explore the relationship between CSA, attention, and memory in older adults, where emotive stimuli are concerned.

The reliance on self-report data is a major limitation of the current study, as it is of the majority of studies of the impact of CSA on later-life outcomes. The two questions on CSA were also open to interpretation, raising the possibility that those reporting CSA may have experienced a variety of forms and severity of abuse. However, similar prevalence rates to those of the SAVI study for severe abuse suggests that it is the more extreme forms of CSA that were endorsed. The lack of information regarding the age of onset and duration of abuse is also a limitation, as the effects of stress on the brain during childhood and adolescence may depend on whether the stressor occurs during critical windows for the development of particular brain structures (Andersen et al., 2008).

Reporting of CSA among older adults is associated with better cognitive function despite a higher prevalence of psychological problems in this group. Further studies in similarly sized samples in conjunction with longitudinal assessment and neuroendocrine profiling of individuals are necessary to try to replicate this finding and elucidate the mechanisms underlying this effect.

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