Psychometric functioning, socio-demographic variability of childhood maltreatment in the general population and its effects of depression

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Key words

childhood maltreatment,
Childhood Trauma
Questionnaire, psychometry,
socio-demographic variability,
depression

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Received 25 July 2012;
revised 9 August 2013;
accepted 15 October 2013

Abstract

Maltreatment of children is a major public-health and social-welfare problem but socio-demographic variability has received little attention. This work addresses such variability in a general population cohort and associations with depression. Analyses were based on the cross-sectional SHIP-LEGEND examination among 2265 adults (29–89 years). Childhood maltreatment was multi-dimensionally assessed with the German 28-item Childhood Trauma Questionnaire (CTQ): emotional neglect; emotional abuse; physical neglect; physical abuse; sexual abuse. Non-linear associations between CTQ responses and age were assessed with fractional polynomials and cubic splines. Scale properties were analysed with confirmatory factor analyses and item response models. Associations between childhood maltreatment domains and depression [Beck Depression Inventory-II (BDI-II)] were assessed. The majority (58.9%) reported events indicative of at least mild levels of childhood maltreatment. CTQ subscales showed characteristically different non-linear associations to age across the five studied domains, indicating methodological issues like recall bias and the influence of seminal events. Psychometric scale properties were acceptable to good for all subscales except for physical neglect. Associations to depression measures varied systematically across socio-demographic strata. We conclude that socio-demographic variability is a major issue when studying self-reported childhood maltreatment in a community sample. This needs to be taken into account for the study of associations to psychiatric key outcomes. Copyright © 2014 John Wiley & Sons, Ltd.

Introduction

Maltreatment of children is a major public-health and social-welfare problem in developing and transitional countries (Akmatov, 2011) as well as in high-income countries (Gilbert *et al.*, 2009). An expanding body of research suggests that traumatic experiences during childhood are a key factor in predicting negative health outcomes and adult psychopathology (Collishaw *et al.*, 2007; Kessler *et al.*, 2010; van der Vegt *et al.*, 2009), including depression (Green *et al.*, 2010; MacMillan *et al.*, 2001; Wainwright and Surtees, 2002; Wiersma *et al.*, 2009), somatization disorders (Brown *et al.*, 2005; Spitzer *et al.*, 2008), pain disorders (Brown *et al.*, 2005; Walsh *et al.*, 2007), anxiety (Heim and Nemeroff, 2001), personality disorders (Johnson *et al.*, 1999; Tyrka *et al.*, 2009), substance use disorders (Lo and Cheng, 2007; Martinotti *et al.*, 2009), dissociative symptoms (Dutra *et al.*, 2009) as well as somatic impacts like imbalance of inflammatory factors (Danese *et al.*, 2009), and obesity (Bentley and Widom, 2009; D'Argenio *et al.*, 2009). Furthermore, childhood maltreatment is increasingly examined as an early life stressor to study gene-environment interactions (Appel *et al.*, 2011; Binder *et al.*, 2008; Caspi *et al.*, 2003; Grabe *et al.*, 2011; Kim-Cohen *et al.*, 2006; Polanczyk *et al.*, 2009). In summary, retrospective assessments of childhood maltreatment are indispensable in clinical work and research (Green *et al.*, 2010; Kendall-Tackett and Becker-Blease, 2004).

However, relying on self-reports of childhood maltreatment poses a considerable methodological challenge (Widom and Morris, 1997; Widom and Shepard, 1996) in socio-demographically heterogeneous general population cohorts. Responses are likely to be influenced by individual as well as societal factors, comprising autobiographical memory, changing social norms, or even seminal events like war.

Autobiographical memory is at least partly reconstructive and affected by cognitive mechanisms (Brewin and Andrews, 1998). This threatens the validity of retrospective information (Widom and Morris, 1997). Studies suggest that childhood trauma is a common but frequently underreported problem (Medrano *et al.*, 1999). For example, a large proportion of women (38%) with documented histories of sexual victimization in childhood did not recall the abuse 17 years later (Williams, 1994). A similar result was obtained for confirmed histories of physical or sexual abuse in childhood among adults who were followed up approximately 20 years later (Widom and Morris, 1997). Men are much less willing to report experiences of abuse and maltreatment in childhood compared to women (Dindia and Allen, 1992; Widom and Morris, 1997;

Widom and Shepard, 1996). Research on the Socio-emotional Selectivity Theory (SST) indicates an inclination for emotionally positive information over emotionally negative information in autobiographical memory in elder adults (Carstensen *et al.*, 1999). The tendency to increasingly process positive and decreasingly process negative information with advancing age has also been described as the positivity effect (Langeslag and van Strien, 2009).

Societal norms are subject to considerable changes across time. For example, physical punishment was accepted and widely practiced as a means of education in many Western societies well into the late twentieth century. Only in the year 2000, a changed family law banished corporal punishments, psychological injuries or other degrading measures as legal means of parental education in Germany (Heinrich, 2011). Along these legal reforms parental acceptance of physical punishments underwent a sharp decline in the last decades (Trunk, 2010).

Associations of autobiographic memory and societal norms on recalled incidences of childhood maltreatment are most likely to appear as slow gradual changes over prolonged time periods. In contrast, faster changes in incidence rate of recalled childhood maltreatment should be related to seminal events. For example, supply shortages and infrastructural deficiencies in European countries during late World War II and the subsequent years are well documented (Benz, 2005). Related events like lack of nutrition or medical assistance are categorized as indicators of physical neglect nowadays but were largely related to societal circumstances and common in those years (Häusser and Maugg, 2011). Therefore caution is indicated, when interpreting self-reports in adult cohorts because present European surveys commonly comprise individuals that witnessed this era in their childhood.

The purpose of this study was to study the socio-demographic variability of self-reported childhood maltreatment as measured with the German 28-item Childhood Trauma Questionnaire (CTQ) and to assess the psychometric functioning of this instrument across socio-demographic strata. A particular emphasis was placed on non-linear associations of self-reported childhood maltreatment with age. To the best of our knowledge, this has not received dedicated attention in a general population cohort before. Non-linear models were applied to capture long-term as well as short-term changes on responses to the German version of the CTQ (Bernstein *et al.*, 1997). Subsequently, we assessed the variability of associations between self-reported childhood maltreatment and depression across socio-demographic strata. We selected depression because of its major epidemiologic importance (Wittchen *et al.*, 2011) and its role as the primary psychiatric outcome in the SHIP-LEGEND project

(Schmidt *et al.*, 2013b). Furthermore, childhood traumata have well established links to depression (Appel *et al.*, 2011; Nanni *et al.*, 2012).

Subjects and methods

Study of Health in Pomerania (SHIP) “Life-Events and Gene-Environment Interaction in Depression” (LEGEND)

Sample and sample recruitment

Data from the Study of Health in Pomerania (SHIP) were used (John *et al.*, 2001; Schmidt *et al.*, 2011; Volzke *et al.*, 2011). The target population comprised adult German residents (20–79 years) in north-eastern Germany living in three cities and 29 communities with a total population of 153,263. All participants were drawn from local population registries and had to be of German nationality with their primary place of residence in the study region. There were no specific exclusion criteria. The net sample comprised 6265 eligible subjects, out of which 4308 participated in SHIP-0 (1997–2001). Follow-up examinations (SHIP-1) were conducted five years after baseline and comprised 3300 participants. All participants gave written informed consent.

Between 2007 and 2010, the “Life-events and Gene-environment Interaction in Depression” (LEGEND) study comprised a profound psychometric assessment of the SHIP participants (Volzke *et al.*, 2011). Until then, 639 participations from the baseline sample SHIP-0 were either deceased ($n = 383$) or refused further participation on SHIP ($n = 256$). In total, 3669 subjects of the baseline

sample were invited to LEGEND, 92 of these deceased during study conduction and 1011 refused participation in LEGEND. Another 132 subjects did not respond to repeated efforts of contact (at least three written invitations, 10 telephone calls and five home visits). A further 34 subjects agreed to participate, but did not show up on several arranged dates or were not able to arrange an appointment. Among the 2400 subjects who participated in LEGEND, 89 were excluded from the analysis because of unreliable information or inconsistencies in the interview according to a judgment of the interviewer or supervisor that included the performance on a verbal memory test (VLMT) at the beginning of the interview (Helmstaedter *et al.*, 2001). The criterion for exclusion based on the VLMT was less than four recalled words at the first trial. Subjects older than 85 years were excluded from our analyses due to their very low count ($n = 46$).

In total 2265 participants were included in our analyses. LEGEND participants were slightly more often female compared to non-participants (52.46% versus 48.90%, $p = 0.02$), and had a younger baseline age (mean years 46.32 [standard deviation (SD) = 14.41] versus 54.18 [SD = 17.64], $p < 0.01$). A sample description is provided in Table 1.

Instruments

The VLMT and a diagnostic interview for mental disorders based on the Diagnostic and Statistical Manual of Mental Disorders (fourth edition) were conducted at the Departments of Psychiatry and Psychotherapy in Stralsund and Greifswald or at the participants' home by fully-qualified psychologists or advanced psychology students. Participants

Table 1. Sample characteristics

	All		Males		Females	
	<i>n</i>	Per cent	<i>n</i>	Per cent	<i>n</i>	Per cent
Total number	2265	100	1072	100	1193	100
Age group (years)						
29–48	817	36.1	347	32.4	470	39.40
49–63	753	33.3	360	33.6	393	32.9
64–85	695	30.7	365	34.1	330	27.7
School education < 10 years	675	29.8	377	34.9	298	25.1
Marital status	2251	100	1071	100	1180	100
Married/living with partner	1523	67.7	778	72.6	745	63.1
Separated/divorced/widowed	442	19.6	149	13.9	293	24.8
Single	286	12.7	144	13.4	142	12.0

Marital status: 0.6% missing ($n = 14$).

completed in addition questionnaires on childhood trauma, depression, life orientation, sense of coherence, resilience, social support, personality, alexithymia, daily stresses and strains, chronic stress, physical and mental health, among others. Questionnaires were sent to the participants' homes before the interview.

Childhood maltreatment

We applied the German translation of the 28-item CTQ (Bernstein and Fink, 1998; Wingenfeld *et al.*, 2010) that assess five types of childhood trauma with 25 items: (1) emotional neglect (e.g. "I felt love"), (2) emotional abuse (e.g. "People in my family said hurtful or insulting things to me"), (3) physical neglect (e.g. "I didn't have enough to eat"), (4) physical abuse (e.g. "I was punished with a belt, a board, a cord, or some other hard object") und (5) sexual abuse (e.g. "Someone tried to make me do sexual things or watch sexual things"). The statements are introduced by the phrase "When I was growing up ...". Each item is scored on a five-point rating scale from "never true" (1) to "very often true" (5). Two out of five statements on the physical neglect subscale and all five statement of the emotional neglect scale are reverse coded. In accordance with the American CTQ-manual (Bernstein and Fink, 1998; Wingenfeld *et al.*, 2010), we classified subjects as having experienced at least mild forms of maltreatment (scale sum score ≥ 9 for emotional abuse, ≥ 8 for physical abuse, ≥ 6 for sexual abuse, ≥ 10 for emotional neglect, ≥ 8 for physical neglect).

Depression

Current depressive symptoms were assessed using the Beck Depression Inventory-II (BDI-II), a 21-item self-report questionnaire with high reliability and validity (Beck *et al.*, 1996; Kühner *et al.*, 2007). The BDI-II was used as continuous outcome measure in all analyses.

Statistical analysis

Descriptive statistics of the single CTQ items are based on proportions of subjects experiencing any event indicative of maltreatment (Table 2). Because the association between age and recalled childhood traumata is unknown we neither imposed linearity restrictions on them, nor did we assume them to be monotonously increasing or decreasing. A categorization of age was considered inadequate because any cutoff would be arbitrary, while associations may depend strongly on them (Schmidt *et al.*, 2013a). Therefore we applied second-order fractional polynomials (FP) and restricted cubic splines (RCS)

Table 2. Descriptive statistics for CTQ items and subscales

CTQ subscale, Item description	All	All
CTQ subscale, Item description	Per cent yes any ²	Mean (SD)
Scale 1: Emotional abuse	11.9	1.29 (2.43)
1. family called me "stupid"	20.9	0.31 (0.69)
2. never been born	10.0	0.17 (0.61)
3. said hurtful things	33.4	0.47 (0.79)
4. someone hated me	13.1	0.22 (0.65)
5. emotionally abused	6.3	0.12 (0.54)
Scale 2: Physical abuse	9.1	0.77 (1.86)
1. got hit – doctor	2.3	0.04 (0.31)
2. got hit – bruises	12.5	0.19 (0.58)
3. punished with hard object	25.0	0.35 (0.70)
4. physically abused	8.0	0.12 (0.48)
5. got hit – noticed	3.8	0.06 (0.35)
Scale 3: Sexual abuse	6.6	0.27 (1.50)
1 touch me sexually	4.4	0.08 (0.40)
2. threatened me – sexual	1.3	0.03 (0.29)
3. do/watch sexual things	2.6	0.05 (0.33)
4. molested me	4.3	0.07 (0.36)
5. sexually abused	2.3	0.06 (0.41)
Scale 4: Emotional neglect	40.7	4.70 (4.92)
1. helped to feel important ¹	67.2	1.43 (1.41)
2. felt loved ¹	47.4	0.85 (1.19)
3. looked out for each other ¹	44.0	0.75 (1.12)
4. family felt close ¹	50.5	0.87 (1.15)
5. family was supportive ¹	47.8	0.80 (1.11)
Scale 5: Physical neglect	41.7	2.50 (2.73)
1. had not enough to eat	27.2	0.57 (1.09)
2. cared/protected me ¹	35.3	0.81 (1.37)
3. parents too drunk	5.2	0.10 (0.47)
4. wear dirty clothes	8.3	0.12 (0.44)
5. took me to the doctor ¹	43.1	0.91 (1.30)

¹If a response other than "never true" was made the item was coded as "yes"

²For the entire scales the percentage indicates at least mild forms of maltreatment in accordance with cutoffs for the American CTQ scale as described in the text; *N*=2265.

(Royston *et al.*, 1999). Compared to FPs, RCS have an improved capability to capture short-term changes, but often perform less stable (Schmidt *et al.*, 2013b). RCS were used with five user specified knots (50, 55, 60, 65, 70) to allow for a maximum flexibility in the post-World War II years. Alternatively we calculated restricted cubic splines with a maximum of 10 knots, placed at equally distributed quantiles. Because the latter did not lead to conceptually different results we only present calculations from the

former RCS with user specified knots. To avoid overfitting, we used deviance tests to select between models: First, the most appropriate FP and RCS were selected based on a closed test procedure (Royston and Sauerbrei, 2007), using an alpha level of 0.05. Secondly, it was assessed whether the selected RCS improved fit over the FP using the same alpha level due to the large sample size.

Measurement properties of the German CTQ items were assessed with confirmatory factor analysis (CFA). Multidimensional analyses of the CTQ scales were based on second-order CFAs. These models comprised one latent factor for each subscale, which in turn were explained by an underlying second-order factor. Single subscales were studied with unidimensional CFAs. Because of the large sample size, a χ^2 -test was considered over-conservative for model selection. We used the comparative fit index (CFI) and the root mean square error of approximation (RMSEA) to decide on model fit. The CFI is an incremental fit index. It compares the fit of the model of interest with the independence model. Values range from zero to one. RMSEA is a descriptive measure to approximate overall fit of the model in the population and has a lower bound of zero. A CFI above 0.95–0.96, and a RMSEA below 0.05–0.06 indicate an acceptable model fit (Hu and Bentler, 1999; Yu, 2002). Additionally we report Cronbach's α as an indicator of internal consistency for a better comparison with previous results.

Multiple group comparisons were performed across sex and age strata (29–48 years; 49–63 years; 64–85 years). The boundaries to the last group were suitable to concentrate subjects with a World War II childhood and adolescence. We applied χ^2 difference tests for the comparison of nested models that were suitable under conditions of a robust maximum likelihood approach (Satorra, 2000).

In case of the sexual abuse subscale with very low prevalence items we additionally calculated Rasch-models after dichotomizing the response format (“never true” = no, all other response = yes; for reverse coded items, the opposite was the case: “always true” = no, all other options = yes) for analyses in the entire sample and within age-sex strata. Failing to reject the Rasch model (p -value > 0.05) indicates the usability of the sum score of the items (Skrondal and Rabe-Hesketh, 2004).

Because of the low proportion of missing responses on the CTQ items (<1% for all items, Table 3) we conducted a single imputation using age, sex and other CTQ items as predictors to render an effective sample size of 2265 in all calculations. Statistical inverse probability weights were applied to account for the differential drop-out when calculating prevalences.

Table 3. Confirmatory factor analysis (CFA) results for CTQ subscales

CTQ subscale, Item	CFA results	
Scale 1: Emotional abuse	RMSEA = 0.05; CFI = 0.97	
	λ	SE
1. family called me “stupid”	0.69	0.03
2. never been born	0.62	0.04
3. said hurtful things	0.72	0.03
4. someone hated me	0.77	0.03
5. emotionally abused	0.52	0.04
Scale 2: Physical abuse	RMSEA = 0.05; CFI = 0.94	
	λ	SE
1. got hit – doctor	0.48	0.07
2. got hit – bruises	0.87	0.02
3. punished with hard object	0.73	0.02
4. physically abused	0.73	0.04
5. got hit – noticed	0.57	0.06
Scale 3: Sexual abuse	RMSEA = 0.02; CFI = 0.97	
	λ	SE
1 touch me sexually	0.88	0.03
2. threatened me – sexual	0.69	0.08
3. do/watch sexual things	0.82	0.05
4. molested me	0.87	0.04
5. sexually abused	0.60	0.08
Scale 4: Emotional neglect	RMSEA = 0.09; CFI = 0.96	
	λ	SE
1. helped to feel important ¹	0.61	0.02
2. felt loved ¹	0.83	0.01
3. looked out for each other ¹	0.66	0.02
4. family felt close ¹	0.81	0.02
5. family was supportive ¹	0.81	0.02
Scale 5: Physical neglect	RMSEA = 0.18; CFI = 0.09	
	λ	SE
1. had not enough to eat	0.33	0.04
2. cared/protected me ¹	0.22	0.04
3. parents too drunk	0.44	0.07
4. wear dirty clothes	0.68	0.08
5. took me to the doctor ¹	0.28	0.06

¹If a response other than “never true” was made the item was coded as “yes”

Note: RMSEA, root mean square error of approximation; CFI, comparative fit index; λ , factor loadings; SE, standard error; N = 2265.

The 99% confidence intervals (CIs) and p -values were estimated for two-sided tests. Associations are labelled as “significant” if $p < 0.01$. STATA 11.1 (Stata Corporation, College Station, TX) and MPLUS 5.1 (Muthén and Muthén, CA) were used for the statistical analyses.

Results

Prevalence of events related to childhood maltreatment

Descriptive statistics of the CTQ items underline the high prevalence of many adverse childhood experiences in the adult general population (Table 2). Overall, 59.3% reported at least mild forms of childhood maltreatment. Sexual abuse was reported least frequently.

Non-linear associations between self-reported childhood maltreatment and age

Considerably different age and sex profiles resulted across the CTQ domains (Figure 1). We observed a decline of self-reported events related to emotional abuse in older participants. No similar association concerned the sexual abuse scale. Self-reported physical abuse did not increase with age. Rather, a decline occurred among those aged 50 and older. Emotional neglect showed mostly weak positive associations with age.

Only the associations of age with the physical neglect scale were subject to substantial non-linear changes in a small range of the predictor age. "Not having enough to eat" peaked strongly among those experiencing their childhood and adolescence during and after World War II. The same applied to the overall scale score for males and a small effect size in this age range concerned the item on "wearing dirty clothing" among females. Using the alpha level 0.05 did not change decisions on the choice of non-linear models.

Confirmatory factor analysis (CFA) of the Childhood Trauma Questionnaire (CTQ)

Fit indicators for a five-factor model with an underlying second-order factor indicated model misspecifications according to some fit-indices (RMSEA = 0.04; but CFI = 0.85; $\chi^2 = 1346.1$, $df = 270$). Therefore we inspected single scales (Tables 3). These results showed a good fit for the abuse scales but not for the two neglect scales. A particularly poor fit resulted for the physical neglect scale.

For the emotional abuse ($\chi^2 = 28.2$, $df = 20$, $p = 0.10$) and the emotional neglect scale ($\chi^2 = 31.9$, $df = 20$, $p = 0.04$) minor improvements were obtained by allowing different factor loadings in the six socio-demographic strata. A slightly higher improvement resulted for the physical abuse scale ($\chi^2 = 42.2$, $df = 20$, $p < 0.01$). Large differences across strata concerned the physical neglect scale ($\chi^2 = 218.7$, $df = 20$, $p < 0.01$). There were no consistent patterns across scales regarding their performance in different population strata (Table 4). The physical abuse

and neglect scale performed poorer in the elderly, while the opposite was the case for the emotional neglect scale.

The Rasch model for the sexual abuse subscale was not rejected in males (Andersen LR Test: $\chi^2 = 11.8$, $df = 12$, $p = 0.46$) and females (Andersen LR Test: $\chi^2 = 20.9$, $df = 12$, $p = 0.05$). This indicates that the sum score of the sexual abuse items may be used to represent the information in the data. Within age strata the models were not computable among males due to sparse cell counts, among females p -values related to the Anderson LR test were 0.3 or higher, indicating the reasonable use of the sum score within age strata as well.

With the exception of the physical neglect scale ($\alpha = 0.40$) the internal consistency as calculated with Cronbach's α was 0.80 or higher for all CTQ scales.

Associations between CTQ subscales and depression

Associations of CTQ subscales to BDI-scores revealed small to moderate associations within strata. Overall, associations were consistently higher in females compared to males. Associations were furthermore consistently lower in the highest age group (64–85 years) compared to the other two age groups (29–48, 49–63 years; Table 5).

Discussion

Based on a general population sample, we assessed the psychometric functioning of the CTQ across socio-demographic strata and assessed its associations to depression. Particular emphasis was placed on non-linear associations between age and self-reported adverse childhood experiences.

In line with previous findings we found that adverse childhood experiences and childhood maltreatment are common in the general population (Bebbington *et al.*, 2011; Gilbert *et al.*, 2009). Yet, characteristically different age dependencies of the childhood maltreatment domains show, that socio-demographic variability is a major issue when studying self-reported childhood maltreatment in a community sample. While the psychometric performance of most CTQ subscales is reasonable, this does not imply a comparable meaning across socio-demographic population strata, a conclusion that is further substantiated by differential associations with BDI depression scores.

The strong decline of recalled emotional abuse is likely to be related to recall bias. It has been suggested that the function of autobiographical memory may change with age from mainly interpersonal (e.g. to aid social interaction) to more intrapersonal matter (e.g. to protect ones self-worth, maintain a positive self-concept and aid

Figure 1. Prevalence of affirmative responses to CTQ-subscale items across age and sex. If a response other than “never true” was made the item was coded as “yes”. For reverse coded items, the opposite was the case: “always true” = no, all other options = yes. The y-axis displays the probability of an event. The bold line labelled as “any” abuse or neglect indicate at least mild childhood maltreatment in accordance with cutoffs for the American CTQ scale as described in the text. After the name of the item the selected statistical model is displayed: FP = fractional polynomial; S = restricted cubic spline (RCS). In parenthesis the powers of the fractional polynomials are displayed. In case of spline functions, the degrees of freedom are displayed. Alpha level was set to 0.05 to decide on the powers/degrees of freedom and on the decision of a FP versus RCS.

Table 4. Psychometric characteristics of the CTQ subscales across socio-demographic strata

	Male			Female		
	29–48	49–63	64–85	29–48	49–63	64–85
	<i>n</i> = 347	<i>n</i> = 360	<i>n</i> = 365	<i>n</i> = 470	<i>n</i> = 393	<i>n</i> = 330
	λ	λ	λ	λ	λ	λ
Scale 1: Emotional abuse	RMSEA < 0.01; CFI = 1.00	RMSEA < 0.01; CFI = 1.00	RMSEA = 0.09; CFI = 0.80	RMSEA = 0.06; CFI = 0.97	RMSEA = 0.07; CFI = 0.96	RMSEA = 0.11; CFI = 0.75
1. family called me “stupid”	0.65	0.64	0.51	0.72	0.76	0.69
2. never been born	0.48	0.57	0.50	0.72	0.70	0.44
3. said hurtful things	0.78	0.62	0.70	0.77	0.73	0.65
4. someone hated me	0.76	0.78	0.76	0.74	0.83	0.83
5. emotionally abused	0.42	0.46	0.20	0.59	0.52	0.55
Scale 2: Physical abuse	RMSEA = 0.03; CFI = 0.98	RMSEA = 0.03; CFI = 0.98	RMSEA = 0.12; CFI = 0.63	RMSEA = 0.05; CFI = 0.95	RMSEA = 0.07; CFI = 0.94	RMSEA < 0.01; CFI = 1.0
1. got hit – doctor	0.20	0.32	0.34	0.79	0.40	0.48
2. got hit – bruises	0.94	0.90	0.71	0.84	0.95	0.86
3. punished with hard object	0.64	0.78	0.62	0.72	0.83	0.76
4. physically abused	0.61	0.66	0.80	0.76	0.79	0.89
5. got hit – noticed	0.57	0.55	0.41	0.69	0.64	0.31
Scale 3: Sexual abuse ¹	RMSEA = 0.10; CFI = 0.97	RMSEA = 0.12; CFI = 0.94	RMSEA = 0.06; CFI = 0.98	RMSEA = 0.03; CFI = 0.98	RMSEA = 0.07; CFI = 0.92	RMSEA = 0.05; CFI = 0.97
1 touch me sexually	0.71	0.67	0.47	0.86	0.96	0.93
2. threatened me – sexual	0.89	0.87	0.76	0.72	0.77	0.75
3. do/watch sexual things	0.84	0.81	0.73	0.89	0.82	0.86
4. molested me	0.85	0.72	0.74	0.74	0.94	0.93
5. sexually abused	0.88	0.78	0.71	0.72	0.75	0.63
Scale 4: Emotional neglect	RMSEA = 0.10; CFI = 0.97	RMSEA = 0.12; CFI = 0.94	RMSEA = 0.06; CFI = 0.98	RMSEA = 0.14; CFI = 0.92	RMSEA = 0.12; CFI = 0.94	RMSEA = 0.07; CFI = 0.97
1. helped to feel important ²	0.71	0.67	0.47	0.66	0.66	0.52
2. felt loved ²	0.89	0.87	0.76	0.83	0.87	0.75
3. looked out for each other ²	0.84	0.81	0.73	0.84	0.81	0.75
4. family felt close ²	0.85	0.72	0.74	0.89	0.85	0.81
5. family was supportive ²	0.88	0.78	0.71	0.85	0.80	0.86

(Continues)

	RMSEA = 0.16; CFI = 0.45	RMSEA = 0.16; CFI = 0.10	RMSEA = 0.14; CFI = 0.36	RMSEA = 0.12; CFI = 0.76	RMSEA = 0.09; CFI = 0.80	RMSEA = 0.20; CFI = 0.00
Scale 5: Physical neglect						
1. had not enough to eat	0.28	0.27	0.25	0.45	0.39	0.26
2. cared/protected me ²	0.19	0.11	0.12	0.34	0.27	0.05
3. parents too drunk	0.59	0.42	0.09	0.68	0.63	0.18
4. wear dirty clothes	0.71	0.80	1.00 ³	0.68	0.70	1.00 ³
5. took me to the doctor ²	0.19	0.16	0.08	0.40	0.34	0.09

¹Due to low cell counts no convergence among males for all models.

²If a response other than "never true" was made the item was coded as "yes"

³One negative residual variance fixed to zero.

Note: Results were derived from confirmatory factor analyses (CFA) that were conducted within the age/sex strata. The root mean square error (RMSEA) and the confirmatory fit index (CFI) are provided as measures of model fit. Factor loadings (λ) are provided in the columns below the fit measures. $N = 2265$.

Table 5. Correlation of CTQ scores within depression scale (BDI-II)

Factor	BDI Sum score
	<i>r</i> (95% CI)
Males 29–48 years	
Scale 1: Emotional abuse	0.19 (0.09–0.29)
Scale 2: Physical abuse	0.13 (0.02–0.23)
Scale 3: Sexual abuse	0.06 (–0.05–0.16)
Scale 4: Emotional neglect	0.16 (0.05–0.26)
Males 49–63 years	
Scale 1: Emotional abuse	0.15 (0.05–0.25)
Scale 2: Physical abuse	0.06 (–0.04–0.16)
Scale 3: Sexual abuse	0.12 (0.01–0.22)
Scale 4: Emotional neglect	0.14 (0.03–0.24)
Males 64–85 years	
Scale 1: Emotional abuse	0.02 (–0.08–0.13)
Scale 2: Physical abuse	–0.01 (–0.11–0.09)
Scale 3: Sexual abuse	0.05 (–0.06–0.15)
Scale 4: Emotional neglect	0.08 (–0.03–0.18)
Females 29–48 years	
Scale 1: Emotional abuse	0.26 (0.18–0.29)
Scale 2: Physical abuse	0.16 (0.07–0.25)
Scale 3: Sexual abuse	0.21 (0.12–0.29)
Scale 4: Emotional neglect	0.21 (0.12–0.30)
Females 49–63 years	
Scale 1: Emotional abuse	0.26 (0.18–0.35)
Scale 2: Physical abuse	0.25 (0.15–0.34)
Scale 3: Sexual abuse	0.10 (0.00–0.20)
Scale 4: Emotional neglect	0.17 (0.07–0.18)
Females 64–85 years	
Scale 1: Emotional abuse	0.13 (0.02–0.23)
Scale 2: Physical abuse	0.00 (–0.11–0.11)
Scale 3: Sexual abuse	–0.01 (–.12–0.09)
Scale 4: Emotional neglect	0.10 (–0.01–0.21)

Displayed are Spearman Correlation Coefficients (r) with CTQ subscale scores along 95% confidence intervals (CIs).

well-being) (Carstensen, 2006; Cohen, 1998). Due to a greater focus on emotion regulation and cognitive control mechanisms that enhance positive and diminish negative information, older adults may show more emotionally gratifying memory distortions for autobiographical information than younger adults (Mather and Carstensen, 2005). Based on studies that examined the factor structures of the CTQ in samples that differ in age, it has been suggested that elder adults have a more holistic or integrated perspective on childhood experiences due to blurring memories over time and that less distal and

impressive events are more salient for younger adults (Loftus *et al.*, 1994; Paivio and Cramer, 2004). Social desirability may be an issue as well. Increased age is consistently associated with self-reports as a result of social desirability (Soubelet and Salthouse, 2011). This can be interpreted in terms of better emotional regulation and increased maturity in the elderly, or as a result of variations in values and norms and respondent's cognitive ability to retrieve information from memory (Dijkstra *et al.*, 2001). Yet, lacking a measure of social desirability, we can only speculate about related effects in our sample.

No consistent age decline concerned responses to the emotional neglect scale. A methodological explanation may be the reverse coded items, meaning that all subjects who strongly confirmed the list of positive events did not contribute to the neglect score. Regarding sexual abuse, a decline was only observed in females but not in males. However, the small number of events complicates the detection of reliable associations in our sample. As expected, females reported sexual abuse substantially more often than males.

We did not find a consistent increase of recalled events indicative of physical abuse with age. Even the contrary was the case in adults aged 50 and above. According to our knowledge of the high acceptance of physical punishment as an educational means during the first half of the twentieth century in Germany (Bussmann, 2004; Gershoff, 2002), this seems implausible and may indicate another example of the described positivity effect (Langeslag and van Strien, 2009; Thomas and Hasher, 2006). Our results implicate that even the recollection of rather concrete behaviours may be influenced by cognitive control mechanisms that diminish negative information.

Most respondents between their early sixties and mid-seventies experienced their childhood during the World War II and post-war period or were displaced persons from the former eastern territories of Germany with corresponding infrastructural shortages. The item related to insufficient nutrition showed a strong curvilinear association with age. An event like "not having enough to eat" which is due to shared public circumstances like war may be psychologically less damaging compared to individual, man-made traumatic events (APA, 1994). Therefore enhancing positive and diminishing negative information might not be as necessary in this case. A similar association in females concerning the item on "wearing dirty clothes" is inconclusive due to its small effect size. Insufficient medical attendance was subject to a monotonous increase up to the highest age groups. Explanations for this almost linear increase remain speculative and may be indicative for a general improvement in the availability of medical care during the twentieth century in Europe (Becker *et al.*, 2010).

In agreement with prospective data on individuals with officially documented and substantiated cases of childhood victimization (Widom and Morris, 1997; Widom and Shepard, 1996; Williams, 1994), we found some substantial differences in reported prevalences between men and women concerning all abuse categories. These differences point into opposite directions depending on the domain of childhood maltreatment. Sexual abuse was reported more often by women compared to men. This may be partially related to response bias as well (Widom and Morris, 1997; Widom and Shepard, 1996). Regarding physical abuse, men reported higher prevalences on most items. This likely reflects sex specific differences in parental styles (Böhm and Riemann-Kühne, 1993; Rendtorff, 2006) and is in line with other findings: for example, a Swiss study showed that boys are more frequently punished physically than girls (Schöbi and Perrez, 2007).

Despite its considerable socio-demographic variability, the psychometric properties of the CTQ were good to acceptable for all subscales except physical neglect. The latter is in line with findings from previous studies (Gerdner and Allgulander, 2009; Klinitzke *et al.*, 2012; Scher *et al.*, 2001; Villano *et al.*, 2004; Wingenfeld *et al.*, 2010). It suggests the usability of the CTQ in a general population cohort from a psychometric point of view, with the exception of the physical neglect subscale. However, this may not suffice to ensure valid associations as implied by the age related associations. Furthermore, different associations resulted between CTQ subscales and BDI scores demographic strata. Associations are consistently smaller and mostly of a negligible effect size among the elderly. This may be related to the different response behaviour across age strata. However, alternative explanations for the differing associations between the scales cannot be ruled out. The linkage between childhood trauma and later depression is a multifactorial pathway that involves changes of neuroendocrine stress response, glucocorticoid resistance, increased central corticotropin-releasing factor (CRF) activity, immune activation, and reduced hippocampal volume (Heim and Nemeroff, 2001; Heim *et al.*, 2010), in addition to cognitive and behavioural dysfunction. Developmental psychological studies indicate ways in which childhood traumatic experiences might challenge maturing mechanisms of emotional or mood regulation (Pynoos *et al.*, 1999). In spite of numerous studies that support the associative link between childhood maltreatment and depression in later life, the causal process and involved systems are still undetermined.

Our study has several limitations. The cross-sectional design is a major obstacle in distinguishing the relative influence of different sources of bias on our observed

results. Drop out might have biased results. Yet, we applied statistical weights to account for known factors related to attrition. Had we omitted these weights, the main conclusions would not have been affected. Selective mortality might have influence the descent prevalence of childhood maltreatment across age groups. However, this influence is unable to explain the magnitude of the prevalence changes on many items. Despite the large overall sample size there might not have been sufficient power to reliably detect short-term changes in the prevalence for all self-reported events. We used American cutoffs for mild childhood maltreatment in our study to retain comparability to other studies (Häuser *et al.*, 2011; Wingenfeld *et al.*, 2010; Wulff, 2006). However, these cut-offs require further validation in German samples. Overall, from a methodological point of view, it is important to note, that we found few non-linearities of relevance, despite the use of two approaches that are highly suited to detect them. A few associations might indicate overfitting as for example the increase of any physical neglect in younger women.

Conclusion

Ideally, a retrospective assessment tool for childhood maltreatment should be as invariant as possible to specific characteristics of the researched population and recall latency. Our results show that this cannot be broadly assumed for the CTQ despite its overall psychometric functioning. It is insufficient to bear only intrapersonal factors in mind when interpreting responses to childhood maltreatment items. Future research should use qualitative approaches to obtain more insights on potentially different interpretations of the used questions across

age-groups. Practitioners should check, whether positive responses to CTQ are related to major events during the lifetime of the individual and be aware of a declining propensity among elderly to respond positive to items with emotionally aversive content. It is of importance that the associations of socio-demographic variables with CTQ scores sample may be different in other samples depending on the given background of the population. Moreover, the socio-demographic variability of CTQ responses may have a relevant effect on the study of associations to depression. This should be studied with regard to other psychiatric outcomes as well.

Acknowledgements

This work was supported by the German Research Foundation (GR 1912/5-1) and the Federal Ministry of Education and Research (01ZZ9603, 01ZZ0103, and 01ZZ0403), the Ministry of Cultural Affairs and the Social Ministry of the Federal State of Mecklenburg-West Pomerania. SHIP is part of the Community Medicine Research Net of the Ernst-Moritz-Arndt-University of Greifswald, Germany. The work is also supported by the Greifswald Approach to Individualized Medicine (GANI_MED) network funded by the Federal Ministry of Education and Research (grant 03IS2061A).

The authors would like to thank Daniela Becker, Varinia Popek, Elena Stoll, Frauke Grieme, Mathias Becker, Daniela Schrader, Julia Schwanda, Daniel Grams and Andrea Rieck for their contribution to the study (organization, data collection and data management).

Andrea Schulz and Carsten Oliver Schmidt contributed equally.

Declaration of interest statement

The authors have no competing interests.

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