Full length article

Cumulative childhood maltreatment and its dose-response relation with adult symptomatology: Findings in a sample of adult survivors of sexual abuse

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A R T I C L E   I N F O

A B S T R A C T

In the present study, we examined the role of cumulative childhood maltreatment experiences for several health related outcomes in adulthood, including symptoms of psychological distress as well as perceived social support and hardiness. The sample comprised adult survivors of sexual abuse (N = 278, 95.3% women, mean age at first abusive incident = 6.4 years). One-way ANOVAs revealed a statistically significant dose-response relation between cumulative childhood maltreatment scores and self-reported symptoms of posttraumatic stress (PTSS), anxiety, depression, eating disorders, dissociation, insomnia, nightmare related distress, physical pain, emotional pain, relational problems, self-harm behaviors as well as on a measure of symptom complexity. Cumulative childhood maltreatment was also associated with lower levels of work functioning. An inverse dose-response relation was found for perceived social support and hardiness. Using a Bonferroni corrected alpha level, cumulative childhood maltreatment remained significantly associated with all outcome measures with the exception of eating disorder symptoms after controlling for abuse-related independent variables in hierarchical regression analyses. Results add to previous literature by showing that dose-response relation between cumulative childhood adversities and adult symptom outcomes could also be identified in a sample characterized by high exposure to adversities, and lends support to the notion put forth by previous authors that cumulative childhood adversities seem to be related to the severity of adult health outcomes in a rule-governed way.

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1. Introduction

Sexual abuse occurs at epidemic rates worldwide. Prevalence studies report rates ranging between 8 and 31% for women and 3–17% for men during childhood (Barth, Bermetz, Heim, Trelle, & Tonia, 2013; Finkelhor, 1994), with comparable prevalence rates reported for adult sexual assault (Elliott, Mok, & Briere, 2004) and intimate partner sexual violence (Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002). Moreover, childhood sexual abuse often co-occurs with other types of childhood maltreatment, such as physical and emotional abuse or neglect (Clark, Caldwell, Power, & Stansfeld, 2010; Kessler et al., 2010; Turner, Finkelhor, & Ormrod, 2010).

Over the years, a massive and continuously growing body of literature established that being victimized by sexual abuse increases the risk of a wide range of short- and long-term mental and somatic negative health outcomes. Among the reported outcomes are increased risk of suicide and suicide attempts, post-traumatic stress, anxiety, depression, sleep disorders, eating disorders, substance abuse, sexual problems, social impairment, interpersonal problems (Beichtman, Zucker, Hood, DaCosta, & Akman, 1991; Beichtman et al., 1992; Chen et al., 2010; Jumper, 1995; Kendler et al., 2000; Maniglio, 2009; Paolucci, Genius, & Violato, 2001; Putnam, 2003), functional gastrointestinal disorders, obesity, chronic pain conditions (Gilbert et al., 2009; Leserman, 2005; Maniglio, 2009; Paras et al., 2009), as well as alterations of neurobiology and stress physiology (Bremner et al., 1997; Dannlowski et al., 2012; Hulme, 2011; Vythilingam et al., 2002). Moreover, survivors of sexual abuse show high degrees of comorbidity of symptoms and disorders (i.e., meeting diagnostic criteria for several mental disorders; Trickett, Noll, & Putnam, 2011).

While sexual abuse is a well-established risk factor for multiple mental and somatic symptoms as well as social problems, studies also document substantial symptom heterogeneity among those victimized (see for example Kendall-Tackett, Williams, & Finkelhor, 1993; Paolucci et al., 2001; Trickett et al., 2011), indicating the presence of factors moderating symptom outcomes. One factor consistently associated with less severe symptomatology among sexual abuse survivors is the degree of perceived social support- a protective factor known to have beneficial health effects both directly (Cohen & Wills, 1985; Uchino, 2006; Umberson & Montez, 2010) and indirectly (e.g. through stress buffering; Brewin, Andrews, & Valentine, 2000; Cohen, 2004; Ozer, Best, Lipsey, & Weiss, 2008). Specifically, higher levels of perceived social support were associated with better health outcomes in both child (Kaufman et al., 2004; Tremblay, Hébert, & Piché, 1999) and adult (Burgess & Holmstrom, 1978; Hyman, Gold, & Cott, 2003; Lueger-Schuster et al., 2015; Runtz & Schallow, 1997; Steine et al., 2012) survivors of childhood sexual abuse, and among survivors of adult sexual abuse (Burgess & Holmstrom, 1978; Ullman, 1999). The association between perceived support and health outcomes among sexual abuse survivors is likely to be complex. For example, several representative population studies showed that childhood sexual abuse itself is a significant predictor of smaller network size and lower levels of emotional support from friends, family or spouses later in life (Golding, Wilsnack, & Cooper, 2002). Another construct of potential relevance for differences in symptom outcomes, is the personality style of *hardiness*. Hardiness has been described as a constellation of personality characteristics contributing to stress resilience. It is a multidimensional construct comprising characteristics from three sub-facets: 1) the degree to which one believes one can control events happening in one's life (*Control*), 2) the degree to which one approaches difficult situations as opportunities to learn and grow (*Challenge*), as well as 3) the degree to which a person is engaged in a variety of life domains (*Commitment*) (for more elaborate information, see Eschleman, Bowling, & Alarcon, 2010; Maddi et al., 2002). Hardiness has been shown to play a role in mental health and stress resilience. Specifically, higher levels of hardiness have been associated with lower levels of mental health problems, both in general and following stressful events (Beasley, Thompson, & Davidson, 2003; Eschleman et al., 2010; Pengilly & Dowd, 2000). This has also been found among sexual abuse survivors (Feinauer, 2003; Feinauer et al., 1996). However, other studies indicate that stress resilience itself may be negatively affected by exposure to sexual abuse (e.g., increasing the risk of developing depression after sressful events later in life; Kendler, Kuhn, & Prescott, 2004). Whether this also holds true for hardiness remains unclear due to a lack of previous studies investigating this, highlighting the need for studies addressing this question.

Several abuse-related factors have also been associated with differences in short- and long-term symptom outcomes, including a close relation to the perpetrator (particularly a biological parent), abuse involving the use of force, and abuse involving oral, anal or genital penetration (Beichtman et al., 1991; Beichtman et al., 1992; Feehan, Nada-Raja, Martin, & Langley, 2001; Fergusson, McLeod, & Horwood, 2013; Kendall-Tackett et al., 1993; Kendler et al., 2000; Leserman, 2005; Tremblay et al., 1999; Trickett, Reiffman, Horowitz, & Putnam, 1997; Tyler, 2002).

In other samples (e.g., national representative samples, national population samples, clinical samples), several large scale studies have reported evidence of a "dose-response" relation between cumulative exposure to different types of childhood adversities and severity of symptomatology later in life. Specifically, a graded relationship was found between the number of different types of childhood adversities experienced and the risk of suicide attempts, anxiety disorders, depression, sleep disturbances, obesity, hallucinations, drug use, antisocial behavior, as well as with many leading causes of death in adults, including ischemic heart disease and cancer (Anda et al., 2006; Chapman et al., 2004; Clark et al., 2010; Felitti et al., 1998; Koskenvuo, Hublin, Partinen, Paunio, & Koskenvuo, 2010; Schilling, Aseltine, & Gore, 2008; Turner et al., 2010; Walker et al., 1999). Exposure to cumulative childhood adversities also was associated with an increasing symptom *complexity* in both child and adult clinical samples (Cloitre et al., 2009).

Given the interrelatedness of sexual abuse with other types of childhood adversities (Clark et al., 2010; Kessler et al., 2010; Turner et al., 2010), it seems plausible that heterogeneity in the degree of exposure to other childhood adversities could contribute to the symptom heterogeneity observed among sexual abuse survivors. However, to the best of our knowledge no

previous studies have addressed this question in a sexually abused sample specifically. On the other hand, a few studies have examined the association between cumulative childhood adversities for symptom *complexity* in samples where relatively high proportions had experienced sexual abuse. Cloitre and colleagues demonstrated that symptom complexity (defined as the number of complex posttraumatic stress disorder symptoms exceeding predefined clinical cut-off scores) increased with increased exposure to different types of childhood traumatic experiences in their clinical samples of 582 adults and 152 children with childhood maltreatment histories. Approximately two thirds of both samples had experienced childhood sexual abuse, and approximately half of the adult sample had experienced sexual abuse in adulthood (Cloitre et al., 2009). Similarly, Briere and colleagues reported a linear relationship between the number of trauma types experienced during childhood and symptom complexity later in life in their sample of 2453 female university students, of whom 8.3% and 14.7% had experienced rape or other types of sexual abuse during childhood, respectively (Briere, Kaltman, & Green, 2008).

Building on previous studies reporting a dose-response relation between cumulative childhood adversities and more severe symptom outcomes later in life, the aim of the present study was to examine whether a similar dose-response pattern could be identified in a sample comprising adult survivors of sexual abuse. Specifically, we investigated the role of cumulative childhood maltreatment (sexual abuse, physical/emotional abuse and neglect) for current symptoms of posttraumatic stress (PTSS), anxiety, depression, sleep disturbances (insomnia and nightmare-related distress), eating disorders, pain (physical and emotional), dissociation, relational problems, self-harm behaviors, as well as with a measure of symptom complexity and a measure of work functioning. Based on the existing literature documenting a dose-response relation between cumulative childhood maltreatment and negative health outcomes, we hypothesized that cumulative childhood maltreatment scores would be positively associated with the symptom outcome measures and negatively associated with work functioning levels. In addition, we explored whether cumulative childhood maltreatment showed associations with perceived social support and hardiness, given the lack of previous studies examining this question. Based on previous studies reporting lower perceived social support levels among adult survivors of childhood sexual abuse, we hypothesized that such relation would also be found for a broader array of childhood maltreatment, and thus that higher cumulative childhood maltreatment scores would be associated with reporting less perceived social support. No specific hypotheses were made for the hardiness outcome measure due to the lack of previous studies investigating hardiness levels as a function of childhood maltreatment exposure. Finally, we explored whether the relation between cumulative childhood maltreatment and the outcome measures persisted after controlling for abuse characteristics that have been shown to contribute to differences in symptom severity in previous studies.

2. Methods

2.1. Procedure

The study used data from the project "*Longitudinal Investigation of Sexual Abuse* (LISA)"; a three-wave longitudinal study on long-term effects of sexual abuse with data collection waves conducted in 2009, 2011 and 2014 (for detailed information on the recruitment of the initial LISA-study sample, see Steine et al., 2012). The LISA-study was a collaborative effort between the University of Bergen and four of the largest support centers for sexual abuse survivors in Norway. Support centers are situated in every county in Norway, and serve the functions of providing low threshold help in terms of information, free individual consultations, support groups, talks and social events to people who have been victimized by sexual abuse. The invitations to participate in the study were sent via postal mail, along with information about the confidential and voluntary nature of participation, a detailed description of the study, a questionnaire, and a pre-paid return envelope. The questionnaires were mailed by employees at the centers in order to maintain confidentiality of the participants. The study was conducted in line with the Declaration of Helsinki, and was approved by the Regional Ethics Committee for Medical and Health Research, of Western Norway (approval number 264.08), the Norwegian Directory of Health, and by the Norwegian Social Science Data Services.

2.2. Measure of childhood maltreatment

The presence and frequency of abuse or neglect during childhood were measured using the short form of the Childhood Trauma Questionnaire (CTQ-SF) (D. Bernstein & Fink, 1998). The CTQ-SF measures five types of childhood maltreatment: 1) physical abuse (e.g., being hit hard enough to leave bruises), 2) physical neglect (e.g. did not have enough to eat), 3) emotional abuse (e.g. was called names or felt hated by one's own family), 4) emotional neglect (e.g. did not feel loved), and 5) sexual abuse (e.g. was touched sexually or made to do sexual things). Response categories (coded from 1 to 5) are "never true", "rarely true", "sometimes true", "often true", and "very often true". Total subscale scores range from 5 to 25, with higher scores reflecting more childhood maltreatment. Additionally, a qualitative threshold reflecting the *severity* of the maltreatment has been established, comprising the categories "None", "Low", "Moderate" and "Severe" childhood maltreatment. In the present study, a cumulative trauma score based on these qualitative categories was used. Respondents were classified as either "*No childhood maltreatment*" (coded as "0"), "*1-5 childhood maltreatment types at low level*" (coded as "1"), "*1 type of childhood maltreatment at moderate to severe level*" (coded as "2"), or "*2 childhood maltreatment types at moderate to severe level*" (coded as "3"), "*3 childhood maltreatment types at moderate to severe level*" (coded as "4"), "*4 childhood maltreatment types at moderate to severe level*" (coded as "5"), or "*5 childhood maltreatment types at moderate to severe level*" (coded as "6"). Since all study participants had experienced sexual abuse, none scored "0" on this cumulative childhood

maltreatment variable. Additionally, only 8 participants scored "1" on this variable. These were excluded from the present study in order to achieve a more even group size for the statistical analyses. Thus, the childhood maltreatment categories included in the statistical analyses represented 1–5 childhood maltreatment types at moderate to severe level, respectively. The CTQ-SF has shown good psychometric properties (Bernstein et al., 2003), amongst other in a Norwegian clinical sample (Dovran et al., 2013). Chronbach's α for the composite score was 0.84 in the current sample.

2.3. Outcome measures

2.3.1. Post-traumatic stress symptoms (PTSS). PTSS were assessed using the *Impact of Event Scale-Revised* (IES-R). The IES-R is a 22-item questionnaire measuring core symptoms of post-traumatic stress: Intrusion of trauma-related memories/emotions, avoidance of trauma-related stimuli, and hyperarousal (Weiss & Marmar, 1997). Participants indicate the extent to which they have experienced trauma-related distress during the past seven days. Examples of items are "*Any reminder brought back feelings about it*", "*I was aware that I still had a lot of feelings about it, but I didn't deal with them*", and "*Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart*". Response categories (coded from 0 to 4) are "not at all", "a little bit", "moderately", "quite a bit", and "extremely", providing total scores ranging from 0 to 88, where higher scores indicate more pronounced PTSS. Moreover, a score of $\geq$ 33 indicates clinically significant posttraumatic stress symptomatology (Weiss & Marmar, 1997). The scale has shown good psychometric properties, including for the validity of the use of its sum-score (P. Creamer, Bell, & Failla, 2003; Weiss, 2004). Chronbach's α for the IES-R sum score in the current sample was 0.95.

2.3.2. Anxiety and depression symptoms. The *Hospital Anxiety and Depression Scale* (HADS; Zigmond & Snaith, 1983) was used to measure anxiety and depression symptoms the past week. The HADS consists of two sub-scales, measuring anxiety (HADS-A) and depression (HADS-D), respectively. Each subscale consists of 7 items (coded from 0 to 3), providing possible subscale scores ranging from 0 to 21. A score $\geq$11 is regarded as indicative of probable clinically significant anxiety and depression, respectively. Chronbach's α in the current sample was 0.84 for HADS-Anxiety, 0.86 for HADS-Depression, and 0.90 for the total scale.

2.3.3. Insomnia symptoms. To measure the frequency of insomnia symptoms, we used the *Bergen Insomnia Scale (BIS).* The respondents indicate how many days per week they have experienced nocturnal symptoms and daytime consequences of insomnia during the past month. The total scores range from 0 to 42. Additionally, a categorical score based on diagnostic criteria of insomnia from the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) can be created (Pallesen et al., 2008). Chronbach's α for the scale was 0.85 in the current sample.

2.3.4. Nightmare distress. Distress due to nightmares was assessed using the *Nightmare Distress Questionnaire (NDQ).* The NDQ includes 13 items where respondents indicate on a 1–5 point scale the degree of distress experienced due to nightmares, and the effects of nightmares on daytime functioning and quality of life. Total scores range from 13 to 65 (Belicki, 1992). Chronbach's α was 0.92 in the current sample.

2.3.5. Eating disorder symptoms. To assess eating disorder symptoms, we used the *Eating Disorder Examination Self Report Questionnaire (EDE-Q)*, a self-report questionnaire based on the eating disorder examination (EDE) (Cooper & Fairburn, 1987). The EDE-Q is determined to be a psychometrically sound self-report measure for screening of eating disorders (Luce & Crowther, 1999; Mond, Hay, Rodgers, Owen, & Beumont 2004). Its 36 items assess main behavioural features of eating disorders the past four weeks. Most items are rated along a 7-point scale. The scores are summarized and divided by the number of items, providing a mean item score. Chronbach's α in the current sample was 0.94.

2.3.6. Physical and emotional pain. The *Short form McGill Pain Questionnaire* (SF-MPQ) (Melzack, 1987) was used to obtain a measure of physical and emotional pain. The SF-MPQ is a multidimensional pain inventory that provides information about the basic attributes of pain quality as well as intensity of the pain. Of its 15 descriptors, 11 assess physical (*Sensory*) and four assess emotional (*Affective*) pain. Each descriptor is scored on a four-point intensity scale ranging from "0" (none) to "3" (severe). Possible subscale scores range from 0 to 33 on the *Sensory* subscale, and from 0 to 12 on the *Affective* subscale, with higher scores indicating more pain. The SF-MPQ also includes a question about the frequency of pain, ranging from "never" (coded as "0") to "all the time" (coded as "7"). Chronbach's α in the current sample was 0.76 for the emotional pain subscale, 0.85 for the physical pain subscale, and 0.90 for the composite scale.

2.3.7. Dissociative symptoms. To obtain a measure of dissociative symptoms, we used the *Dissociative Experiences Scale Taxon (DES-T).* The DES-T comprises 8 items derived from the 28-item Dissociative Experiences Scale (Bernstein & Putnam, 1986) thought to be the most sensitive to pathological dissociation. Each item is scored according to how often the respondent has experienced a specific symptom of dissociation, ranging from never (0%) to always (100%) with intervals of 10% (Waller, Putnam, & Carlson, 1996). Chronbach's α was 0.86.

2.3.8. Relational problems. *Relational problems* were assessed by five items constructed for the purpose of the LISA-project. The items assessed the person's subjectively experienced relational difficulties in general at the current time ("*I have difficulties trusting others*", "*I find it difficult to engage in close relationships with others*", "*I find it difficult to grow fond of others*", "*I attach to others easily*" (reversed) and "*I believe that others like me/are fond of me*" (reversed). Response categories (coded from 1 to 5) were "strongly disagree", "disagree", "neither disagreeing nor agreeing", "agree", and "strongly agree". Possible scores ranged from 5 to 25, with higher scores reflecting more relational difficulties. Chronbach's α for the scale was 0.75.

2.3.9. Self-harm behaviors. The *Self-Harm Inventory (SHI)* (Sansone, Wiederman, & Sansone, 1998) was used in order to obtain data on the respondents' history of self-harm behaviors. The SHI comprises 22-items assessing different types of self-harm behaviors. Response categories are "no" (coded as "0") and "yes" (coded as "1"). A total score is generated by totaling the number of the 22 items, providing scores ranging from 0 to 22. Each endorsement of a self-harm behavior is considered pathological. Kuder-Richardson 20 for the total scale was 0.79 in the current sample.

2.3.10. Symptom complexity. To obtain a measure of symptom complexity, we created a variable counting the number of measures where the subject scored higher than established cut-offs (where available). Thus, symptom complexity was based on the IES-R (≥ 33), the HADS-A (≥ 11), the HADS-D (≥ 11) the EDE-Q (≥ 4), the BIS (scoring 3 or more on at least one of item 1–4 and 3 or more on item 5–6), and the SF-MPQ (pain reported daily or all times). This resulted in a summary score ranging from 0 to 6, with higher scores indicating a more complex symptomatology.

2.3.11. Perceived social support. The *Multidimensional Scale of Perceived Social Support (MSPSS)* (Zimet, Dahlem, Zimet, & Farley, 1988) was used to measure perceived social support. The MSPSS is a 12-item questionnaire addressing perceived social support from family, friends, and significant others at the current time. The MSPSS provides a continuous score ranging from 12 −84, with higher scores indicating higher levels of perceived social support. The MSPSS has good test-retest and internal reliabilities and moderate construct validity (Zimet et al., 1988; Zimet, Powell, Farley, Werkman, & Berkoff, 1990). Chronbach's α in the current sample was 0.91.

2.3.12. Hardiness. To obtain a measure of hardiness, we used a Norwegian version of the *Dispositional Resilience Scale-15 DRS-15* (Hystad, Eid, Johnsen, Laberg, & Thomas Bartone, 2010). The DRS-15 has 15 items which measures the three sub-dimensions comprising hardiness; commitment, control and challenge, which together makes up a general hardiness dimension (Hystad et al., 2010). Items are scored along a 4-point scale ranging from 0 ("not true") to 3 ("completely true"), providing scores ranging from 0 to 45 for the total scale. The scale has good psychometric properties, including the use of the general hardiness dimension specifically (Bartone, 1999, 2007; Hystad et al., 2010), which was used in the present study. Cronbach's α in the current sample was 0.82.

2.3.13. Work functioning. A dichotomous variable was used to assess level of work functioning. Respondents were classified according to whether they reported being recipients of disability or work assessment pension (coded as "1") or not (coded as "0").

2.4. Covariates: age, age at first abuse, characteristics of the abuse and perpetrator

The respondent's current age and age at the first abusive incident was assessed through an open-ended question. The selection of the covariates pertaining to characteristics of the perpetrator and the victim was based on their association of these variables with symptom severity in previous studies. Dichotomous variables (1 = yes; no = 0) were created based on whether or not the abuse had involved the use of *threats* by the perpetrator (e.g. of being rejected, sent away, or that oneself or a loved one would be harmed if they told anyone about the abuse), *violence* (e.g. the victim was attacked, held in place, or subjected to violence by the perpetrator), *penetration* (vaginal, anal or oral penetration of penis/fingers/objects) and whether or not at least one of the perpetrators was a *biological parent.*

2.5. Statistical analyses

2.5.1. ANOVAs. One-way ANOVAs with Tukey HSD post-hoc test were used to compare all cumulative childhood maltreatment subgroups on mean scores of PTSS, anxiety symptoms, depression symptoms, eating disorder symptoms, insomnia symptoms, nightmare distress, physical pain, emotional pain, dissociative symptoms, relational problems, self-harm behaviors, perceived social support, and hardiness.

2.5.2. Hierarchical linear regression. Hierarchical linear regression analyses were used to examine associations of cumulative childhood maltreatment with all the outcome measures. Hierarchical regression was chosen in order to assess the ability of cumulative childhood maltreatment to predict symptoms levels, perceived social support and hardiness, after controlling for the influence of demographics and abuse characteristics. Step 1 of the analyses included the predictor *current age*. In Step 2, the variables *age at first abusive incident*, *threats*, *violence*, *penetrative abuse* and *biological parent perpetrator* were added. Finally, the *cumulative childhood maltreatment* variable was added in step 3. Preliminary analyses were conducted to ensure

Table 1
Descriptive Statistics of Main Variables in the Study.

Continuous variables	M	SD	Range	95% CI
Age at first abusive incident	6.35	3.79	0–20	5.89–6.81
CTQ- Composite score	69.86	16.85	33–116	67.87–71.85
CTQ- Emotional abuse	16.29	5.43	5–25	15.66–16.94
CTQ- Emotional neglect	15.38	3.1	6–21	15.02–15.75
CTQ- Physical abuse	9.09	5.00	5–25	8.50–9.68
CTQ- Physical neglect	10.24	3.87	5–24	9.78–10.69
CTQ- Sexual abuse	18.84	5.16	5–25	18.23–19.45
PTSD-symptom score (IES-R)	43.04	19.61	0–87	40.59–45.48
Anxiety symptoms (HADS-Anxiety)	11.01	4.66	1–21	10.47–11.57
Depression symptoms (HADS-Depression)	6.66	4.68	0–20	6.09–7.22
Eating disorder symptoms (EDE-Q)	3.07	1.28	1–5.8	2.91–3.22
Insomnia symptoms (BIS)	22.52	10.73	0–42	21.25–23.78
Nightmare distress (NDQ)	33.95	10.59	13–60	32.66–35.25
Physical pain (SF-MPQ-Sensory)	22.16	7.66	6–42	21.14–23.18
Emotional Pain (SF-MPQ-Affective)	8.45	3.33	0–16	8.02–8.88
Dissociative symptoms (DES-T)	11.63	12.69	0–57	10.09–13.17
Relational problems	16.09	4.19	5–25	15.59–16.59
Self-harm behavior (SHI)	6.68	4.08	0–20	6.17–7.20
Perceived social support (MSPSS)	52.73	14.34	12–84	51.01–54.46
Hardiness (DRS-15).	27.46	6.97	11–43	26.57–28.35
Symptom complexity score	3.03	1.32	0–6	2.85–3.21
Categorical variables	Yes			
IES-R score ≥ 33	65.8%			
HADS-Anxiety score ≥ 11	54.3%			
HADS-Depression score ≥ 11	22.3%			
BIS DSM-IV Criteria of Insomnia	79.5%			
EDE-Q-mean sum score ≥ 4	24.1%			
Pain daily or all the time	35.6%			
Threatened by perpetrator	37.4%			
Abuse involved physical force/violence	46.4%			
Penetrative abuse	79.1%			
Biological parent perpetrator	37.8%			

Note: CTQ = Childhood Trauma Questionnaire. IES-R = Impact of Event Scale-Revised. HADS = Hospital Anxiety and Depression Scale. EDE-Q = Eating Disorder Examination Self Report Questionnaire. BIS = Bergen Insomnia Scale. NDQ = Nightmare Distress Questionnaire. SF-MPQ = Short form McGill Pain Questionnaire. DES-T = Dissociative Experiences Scale Taxon. SHI = Self-Harm Inventory. MSPSS = Multidimensional Scale of Perceived Social Support. DRS-15 = Dispositional Resilience Scale-15. M = Mean. SD = Standard Deviation. 95% CI = 95% Confidence Interval. Categorical variables: Numbers represent the percentage of respondents with affirmative score on the respective variable.

no violations of assumptions concerning linearity, normality, and multicollinearity. To correct for multiple testing given the high number of tests (fourteen outcome measures), a Bonferroni corrected alpha level of <0.004 was regarded as statistical significant.

2.5.3. Chi-square test and hierarchical logistic regression. For the dichotomous *level of work functioning* variable, Pearson's Chi Square test for independence was used to examine the association between this variable and cumulative childhood maltreatment. Hierarchical binary logistic regression was used to assess the association of cumulative childhood maltreatment with level of work functioning, controlling for the same covariates as described above.

3. Results

Descriptive statistics for all variables used in the study are provided in Table 1.

3.1. Sample

3.1.1. Present study sample. Childhood maltreatment data were obtained in wave 2 of the LISA study, during which a total of 291 study participants filled out the CTQ. Only those with complete CTQ-data were included in the present study. This resulted in a final sample of 278 sexual abuse survivors (95.3% women), aged 18–71 years (M = 41.2 years, SD = 11.9 years). The most frequently reported highest education level achieved in the sample was undergraduate degree at a university/college (29.5%), followed by high school (23.3%), graduate degree at a university/college (17.8%), professional vocational education (15.3%), primary school (12.7%), and not completed primary school (1.5%). The most frequently reported work status was a recipient of disability/occupational rehabilitation pension (43.8%), followed by full time employed (28.1%), part-time employed (13.1%), student (8.8%), unemployed (4.0%), retired (1.5%), and home maker (0.7%). Mean age at first abusive incident was 6.4 years (SD = 3.8 years, range = 0–20 years). Independent samples *t*-test showed that participants for whom CTQ-SF data

were available were somewhat older than those for whom these data were not available (40.9 versus 37.1 years), but no statistically significant differences were found between these groups on any of the other variables used in the study.

3.2. ANOVAs

Results of one-way ANOVA analyses and Tukey HSD post-hoc tests are displayed in Table 2. There was a statistically significant difference between cumulative childhood maltreatment subgroups on symptoms of posttraumatic stress ($F(4244) = 10.75$, $p < .001$), anxiety ($F(4271) = 7.25$, $p < .001$), depression ($F(4262) = 4.91$, $p < .01$), eating disorders ($F(4248) = 3.20$, $p < .05$), insomnia ($F(4273) = 7.25$, $p < .001$), nightmare distress ($F(4254) = 12.62$, $p = p < .001$), physical pain ($F(4213) = 12.71$, $p < .001$), emotional pain ($F(4230) = 10.83$, $p < .001$), dissociation ($F(4260) = 7.22$, $p < .001$), as well as relational problems ($F(4270) = 4.12$, $p < 0.01$) self-harm behaviors ($F(4235) = 7.30$, $p < .001$), symptom complexity ($F(4203) = 5.61$, $p < .001$), perceived social support ($F(4262) = 11.96$, $p < .001$), and hardiness ($F(4233) = 2.90$, $p < .05$). For a visual representation of the mean scores of the outcome measures as a function of cumulative childhood maltreatment, see Supplementary Fig. 1a –m.

3.3. Hierarchical linear regression

Main parameters from the hierarchical regression analyses are displayed in Table 3. After controlling for current age, age at first abusive incident and abuse characteristics, there was a statistically significant positive association between cumulative childhood maltreatment and symptoms of posttraumatic stress ($\beta = 0.33$, $p < .001$), anxiety ($\beta = 0.33$, $p < .001$), depression ($\beta = 0.30$, $p < .001$), eating disorders ($\beta = 0.20$, $p < .01$), insomnia ($\beta = 0.25$, $p < .01$), nightmare distress ($\beta = 0.37$, $p < .001$) physical pain ($\beta = 0.37$, $p < .001$), emotional pain ($\beta = 0.31$, $p < .001$), dissociation ($\beta = 0.30$, $p < .001$), as well as relational problems ($\beta = 0.27$, $p < .001$), self-harm behaviors ($\beta = 0.30$, $p < .001$) and symptom complexity ($\beta = 0.29$, $p < .001$). A statistically significant negative association was found between cumulative childhood maltreatment and current levels of perceived social support ($\beta = -0.36$, $p < .001$) and hardiness ($\beta = -0.22$, $p < .01$). With the exception of eating disorder symptoms, all effects remained significant at the Bonferroni corrected alpha level of 0.004.

3.4. Chi-Square test and hierarchical logistic regression

Pearson's Chi-Square test of independence revealed a statistically significant association between cumulative childhood maltreatment and level of work functioning ($\chi(4) = 30.49$, $p < .001$). Those with higher cumulative childhood maltreatment scores were more likely to be recipients of disability or work assessment pension, indicating lower work functioning among these individuals (Fig. 2 in Supplementary material). Cumulative childhood maltreatment remained significantly associated with level of work functioning after controlling for current age, age at first abusive incident and abuse characteristics in the hierarchical logistic regression analysis ($OR = 1.37$, $p < 0.01$).

4. Discussion

The aim of the present study was to examine the role of cumulative childhood maltreatment in symptom outcomes as well as in measures of social support and hardiness in a sample comprising adult survivors of sexual abuse. In line with our hypotheses, a significant dose-response relation was found between cumulative childhood maltreatment experiences and current symptoms of posttraumatic stress, anxiety, depression, eating disorders, dissociation, insomnia, nightmare related distress, physical and emotional pain, relational problems, self-harm behaviors as well as on a measure of symptom complexity and level of work functioning. Also in line with our hypotheses, an inverse dose-response relation was found between cumulative childhood maltreatment and measures of perceived social support. Moreover, such inverse dose-response relation was also found between cumulative childhood maltreatment and hardiness. Finally, with the exception of eating disorder symptoms, all effects remained highly significant after controlling for abuse-related factors shown to be associated with symptom severity in previous studies.

The main finding of the present study is the replication of a dose-response relation between cumulative childhood maltreatment and higher symptom scores across all symptom outcome measures in adulthood, as well as with lower work functioning. This finding is consistent with previous studies reporting a dose-response relation between childhood adversities and more severe adult symptomatology (Anda et al., 2006; Chapman et al., 2004; Clark et al., 2010; Felitti et al., 1998; Koskenvuo et al., 2010; Schilling et al., 2008; Turner et al., 2010; Walker et al., 1999), and adds to the existing literature by showing that such relations can also be found in a sample selected based on exposure to sexual abuse and with high levels of exposure to childhood maltreatment. Moreover, our finding of a dose-response relation between cumulative childhood maltreatment and greater symptom *complexity* lends support to the point raised by previous researchers on this topic; that cumulative childhood adversities seems to be associated with an increased number of symptoms in a rule-governed way (Cloitre et al., 2009).

The high prevalence (Barth et al., 2013; Krug et al., 2002) and interrelatedness of different childhood maltreatment types (Clark et al., 2010; Kessler et al., 2010; Turner et al., 2010), the latter which was also observed in the present sample, highlight that any preventive efforts aimed at detecting and reducing childhood maltreatment should be targeted at a broad

Table 2

Means, Standard Deviations and ANOVA Statistics for all Outcome Measures.

Symptoms	Number of CMT	Descriptives		ANOVA statistics			Tukey HSD
		M	SD	F (df)	η^2	Effect size	
PTSS (IES-R)				10.75 (4, 244)***	0.17	Large	1 vs. 4
	1	34.07	18.77				1 vs. 5
	2	38.81	17.79				2 vs. 5
	3	38.14	20.13				3 vs. 5
	4	45.45	17.19				4 vs. 5
	5	55.51	17.41				
Anxiety (HADS-A)				7.25 (4, 271)***	0.10	Medium	1 vs. 4
	1	8.60	4.72				1 vs. 5
	2	10.59	4.63				2 vs. 5
	3	10.53	4.61				3 vs. 5
	4	11.53	4.06				
	5	13.19	4.35				
Depression (HADS-D)				4.91 (4, 262)**	0.07	Medium	1 vs. 4
	1	4.51	3.94				1 vs. 5
	2	6.23	4.45				
	3	6.28	4.48				
	4	7.53	4.66				
	5	8.24	5.04				
Eating disorders (EDE-Q)				3.20 (4, 248)*	0.05	Small	1 vs. 5
	1	2.63	1.20				
	2	3.10	1.22				
	3	2.98	1.16				
	4	3.02	1.24				
	5	3.54	1.43				
Insomnia (BIS)				7.25 (4, 273)***	0.11	Medium	1 vs. 5
	1	19.45	9.92				2 vs. 5
	2	20.65	10.11				3 vs. 5
	3	20.05	10.45				4 vs. 5
	4	22.95	10.85				
	5	28.47	9.89				
Nightmare distress (NDQ)				12.62 (4, 254)***	0.20	Large	1 vs. 4
	1	28.39	8.88				1 vs. 5
	2	30.47	8.86				2 vs. 4
	3	32.38	11.31				2 vs. 5
	4	36.25	9.75				3 vs. 5
	5	40.61	9.55				
Physical pain (SF-MPQ)				12.71 (4, 213)***	0.24	Large	1 vs. 5
	1	18.55	5.06				2 vs. 5
	2	19.88	6.53				3 vs. 5
	3	20.23	7.34				4 vs. 5
	4	22.76	8.06				
	5	28.09	6.71				
Emotional pain (SF-MPQ)				10.83 (4, 230)***	0.19	Large	1 vs. 5
	1	7.09	2.65				2 vs. 5
	2	7.96	3.35				3 vs. 5
	3	7.76	3.38				4 vs. 5
	4	8.17	3.12				
	5	10.98	2.72				
Dissociation (DES-T)				7.22 (4, 260)***	0.11	Medium	1 vs. 4
	1	5.22	5.42				1 vs. 5
	2	8.45	9.45				2 vs. 4
	3	11.19	11.32				2 vs. 5
	4	15.20	14.41				
	5	16.09	15.30				
Relational problems				4.18 (4, 270)**	0.06	Medium	1 vs. 5
	1	14.84	4.36				2 vs. 5
	2	14.86	3.64				
	3	16.02	4.04				
	4	16.89	4.08				
	5	17.32	4.34				

Table 2 (*Continued*)

Symptoms	Number of CMT	Descriptives		ANOVA statistics			Tukey HSD
		M	SD	F (df)	η^2	Effect size	
Self-harm behavior (SHI)				7.30 (4, 235)***	0.12	Medium	1 vs. 4
	1	4.88	3.00				1 vs. 5
	2	5.65	3.82				2 vs. 5
	3	6.32	3.47				3 vs. 5
	4	7.49	4.11				
	5	8.81	4.67				
Symptom complexity				5.61 (4, 203)***	0.11	Medium	1 vs. 4
	1	2.32	1.09				1 vs. 5
	2	3.00	1.32				3 vs. 5
	3	2.79	1.39				
	4	3.21	1.20				
	5	3.61	1.29				
Perceived social support (MSPSS)				11.96 (4, 262)***	0.18	Large	1 vs. 3
	1	60.89	10.18				1 vs. 4
	2	59.63	13.92				1 vs. 5
	3	49.53	13.32				2 vs. 3
	4	49.36	14.10				2 vs. 4
	5	47.00	13.99				2 vs. 5
Hardiness (DRS-15)				2.90 (4, 233)*	0.05	Small	ns
	1	29.68	6.67				
	2	28.50	6.90				
	3	28.21	7.03				
	4	25.84	7.00				
	5	25.92	6.70				

Note: Number of CMT = Number of childhood maltreatment events at moderate to severe level. M = mean. SD = standard deviation. η^2 = ETA squared. Tukey HSD displays the group means that differed at the $p < 0.05$ level.

IESR-R scores ≥ 33 indicates clinically significant posttraumatic stress symptoms. HADS-A and HADS-D scores of ≥ 8 and ≥ 11 indicates *possible* and *probable* clinically significant anxiety/depression symptoms, respectively. An EDE-Q score of ≥ 4 indicates clinically significant eating disorder symptoms.

  * $p < 0.05$.
  ** $p < 0.01$.
  *** $p < 0.001$.

Table 3
Summary of Hierarchical Linear Regression Analyses.

	Unstandardized coefficients			Beta	Regression model parameters					
Symptoms	B	SE	95% CI	β	Bonf. corr.	ANOVA (F, df), p	R^2	Adj.R^2	$\Delta R^2 1 \to 2$	$\Delta R^2 2 \to 3$
PTSS	4.62	0.98	2.69–6.55	0.33	*	F(7, 226) = 6.12***	0.16	0.13	0.08	0.08
Anxiety	1.10	0.23	0.64–1.56	0.33	*	F(7, 236) = 4.43***	0.12	0.09	0.03	0.08
Depression	1.01	0.24	0.54–1.48	0.30	*	F(7, 236) = 3.64**	0.10	0.07	0.02	0.07
Eating Disorders	0.18	0.70	0.05–0.32	0.20	ns	F(7, 229) = 2.09*	0.06	0.03	0.03	0.03
Insomnia	1.91	0.55	0.84–2.98	0.25	*	F(7, 236) = 3.35**	0.09	0.06	0.04	0.05
Nightmare distress	2.84	0.51	1.83–3.84	0.37	*	F(7, 233) = 7.98***	0.19	0.17	0.09	0.11
Physical pain	2.05	0.41	1.25–2.86	0.37	*	F(7, 196) = 5.94***	0.18	0.15	0.06	0.11
Emotional pain	0.74	0.18	0.39–1.08	0.31	*	F(7, 212) = 4.19***	0.12	0.09	0.05	0.07
Dissociation	2.74	0.63	1.50–3.98	0.30	*	F(7, 236) = 5.18***	0.13	0.10	0.06	0.07
Relational problems	0.83	0.22	0.41–1.25	0.27	*	F(7, 236) = 2.70*	0.07	0.05	0.01	0.06
Self-harm behaviors	0.87	0.21	0.46–1.28	0.29	*	F(7, 217) = 6.05***	0.16	0.14	0.09	0.07
Symptom complexity	0.28	0.08	0.13–0.42	0.29	*	F(7, 188) = 2.86**	0.10	0.06	0.02	0.07
Other measures										
Social support	−3.73	0.69	−5.10 to −2.35	−0.36	*	F(7, 236) = 6.66***	0.17	0.14	0.04	0.10
Hardiness	−1.13	0.38	−1.87 to −0.36	−0.22	*	F(7, 217) = 1.99, p = 057	0.06	0.03	0.02	0.04

Note: Standard errors (SE) and 95% confidence intervals (95% CI) are for unstandardized coefficients. Bonf.corr: Asterisk indicates effects remaining significant at the 0.004 Bonferroni corrected alpha level. ANOVA, R^2, and R^2 Adjusted are for regression model 3 including all predictor variables. $\Delta R^2 1 \to 2$ indicates R^2 change between step 1 and 2 of the regression analysis. $\Delta R^2 2 \to 3$ shows R^2 change after adding Childhood maltreatment in step 3.

  * $p < 0.05$.
  ** $p < 0.01$.
  *** $p < 0.001$.

range rather than single types of childhood maltreatment. Moreover, the importance of implementing such interventions is underscored by findings by both the present and multiple previous studies of increased symptom severity and complexity with increased exposure to such adversities early in life. From a clinical perspective, the present findings combined with the overall literature implicate that clinicians working with patients with cumulative childhood maltreatment exposure should

be aware of the potential severe and complex symptomatology in this group, which may not only call for a broader range of interventions, but also for long-term treatments. Also, a more complex symptomatology among patients should kindle clinicians (e.g. general practitioners, psychotherapists) to assess childhood maltreatment histories if such information is not already obtained.

The other main finding of the present study is the association of cumulative childhood maltreatment with lower levels of perceived social support and hardiness, both of which are factors shown to play an important role in overall health and stress resilience (Cohen, 2004; Eschleman et al., 2010; Ozer et al., 2008; Uchino, 2006; Umberson & Montez, 2010). The association between cumulative childhood maltreatment with lower perceived social support is in line with findings from several representative population studies showing that childhood sexual abuse is associated with lower social support levels in adulthood (Golding et al., 2002), and may indicate that exposure to childhood maltreatment compromises development of the capacity to build or utilize supportive relationships. By the same token, we found a reverse dose-response association between cumulative childhood maltreatment and hardiness, although the effect size was small (Table 2). To our knowledge, this is the first study to report such association in a sexually abused sample, underlining the need for replication of this finding to see if this can also be found in other samples. The role of hardiness in both stress-resilience and greater subjective well-being, as documented across multiple sample types in previous studies (DeNeve & Cooper, 1998; Eschleman et al., 2010), makes the role of childhood maltreatment for later hardiness a topic worthy of further investigation.

Taken together, the association of cumulative childhood maltreatment with lower levels of perceived social support and hardiness may indicate that childhood maltreatment is a distal risk factor that compromises the development of more proximal protective factors that play important roles for health and stress resilience later in life. Furthermore, our finding raises the question of whether this may also occur in a rule-governed, dose-dependent way. However, replications of our findings in other samples are needed before any conclusions can be drawn on this matter.

The present findings should be interpreted within the confines of its limitations. Given that the sample comprised sexual abuse survivors who were users of support centers, as well as the relatively low response rate of the study (32.7% in wave 1 of the LISA-study; Steine et al., 2012), our sample may not be representative for the sexually abused population in general. Moreover, although most effect sizes were medium to large for the associations of cumulative childhood maltreatment with symptom levels and complexity (Table 2), we do not know the clinical significance of these differences due to the self-reported nature of our symptom outcome measures. Given the retrospective assessment of childhood maltreatment, we also cannot rule out biases in the reporting of childhood maltreatment. Moreover, we cannot rule out the possibility that other common method biases may have impacted our results (e.g., potential biases introduced by the fact that all measures were obtained from the same source; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In light of these limitations; our findings should be replicated in representative population samples, and in longitudinal prospective studies using clinically valid assessments of symptomatology.

Strengths of the present study include its replication of the dose-response relation of cumulative childhood maltreatment with adult symptom outcomes that has been shown by previous studies, as well as the preliminary evidence of an inverse dose-response relation with constructs involved in overall health and stress resilience, providing directions for future research on this topic.

5. Conclusions

In the present study, cumulative childhood maltreatment scores were associated with higher symptom scores, lower work functioning, and greater symptom complexity in a dose-dependent way, in accord with our hypotheses and with existing literature. Cumulative childhood maltreatment scores were also associated with lower levels of perceived social support and hardiness in a dose-dependent way. Overall our findings indicate that cumulative childhood maltreatment may create a dual risk in the form of contributing to both more severe symptom outcomes as well as lower levels of protective factors playing important roles in overall health and stress-resilience later in life, and lend support to the notion that cumulative childhood maltreatment may relate to more severe outcomes in a rule-governed way.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.chiabu.2017.01.008.