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Mashhood Ahmed Sheikh



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The potential protective effect of friendship on the association between childhood adversity and psychological distress in adulthood: A retrospective preliminary three-wave population-based study

by

Mashhood Ahmed Sheikh

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Corresponding author: Mashhood Ahmed Sheikh, Health Services Research Unit, Department of Community Medicine, University of Tromsø, 9037 Tromsø, Norway; Tel.: 0047-77620716; E-mail: mashhood.a.sheikh@uit.no.

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Abstract

Background: Previous studies that assessed the mediating role of social support in the association between childhood adversity and psychological distress based their inferences on very small, selective samples, which makes it impossible to generalise the findings to general population. The aim of this paper was to assess the mediating role of quantity and quality of social support in adulthood in the association between childhood adversity and psychological distress in adulthood. **Methods:** The study has a three-wave design; the present analysis used longitudinal data collected from 1994 to 2008 within the framework of the Tromsø Study (N=4,530), a representative prospective cohort study of men and women. Quantity and quality of social support were measured at a mean age of 54.7 years, and psychological distress in adulthood was measured at a mean age of 61.7 years. Mediation analysis was used to assess the indirect effect of childhood adversity (via quantity and quality of social support) on psychological distress in adulthood. **Results:** Childhood adversity was associated with deficits in quantity and quality of social support in adulthood ($p < 0.05$). Childhood adversity and deficits in quantity and quality of social support were associated with psychological distress in adulthood ($p < 0.05$). Quantity and quality of social support significantly ($p < 0.05$) mediated the association between childhood adversity and psychological distress in adulthood. **Limitations:** Childhood adversity was assessed retrospectively and social support was measured with two items **Conclusion:** Interventions aimed at reducing social isolation may alleviate the burden carried by survivors of childhood adversity.

Keywords: Psychological distress; social support; childhood adversity; epidemiology; psychopathology; anxiety; depression; childhood socioeconomic status; childhood abuse; social isolation; loneliness; psychological well-being; emotional distress;

Highlights

- This study revisits the link between childhood adversity and psychological distress in adulthood to clarify the interpretation of this widely-reported association.
- Childhood adversity influences psychological distress in adulthood via social support in adulthood.

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Introduction

Concepts from the emotion dysregulation model, the risky families model, the social support deterioration model, the vulnerability-stress model, the stress-sensitisation model, and the social-biological pathway model provide the theoretical foundation for positing that indicators of social support mediate the association between childhood adversity and psychological distress (i.e., depressive and anxious symptomatology) in adulthood (Barrera, 1986; Danese & McEwen, 2012; Dvir, Ford, Hill, & Frazier, 2014; Heim, Shugart, Craighead, & Nemeroff, 2010; Luecken, Roubinov, & Tanaka, 2013; Nemeroff, 2004; Pearlin, Schieman, Fazio, & Meersman, 2005; Post, 1992; Repetti, Taylor, & Seeman, 2002).

Chronic or repeated environmental stressors may affect a child's emotional, psychosocial and neurobiological development (Sheikh, 2017a), and create a sensitised stress-responsive system that influences emotion regulation, behavioural reactivity, and deficits in attentional shifting, mindfulness, and self-referential encoding (Ban & Oh, 2016; Barnes, Howell, & Miller-Graff, 2016; Stikkelbroek, Bodden, Kleinjan, Reijnders, & van Baar, 2016). Previous studies have indicated that those exposed to childhood adversity have a higher risk of developing attachment disorders (Mesquita & Maia, 2016), oppositional or conduct disorder (J. D. Ford, Connor, & Hawke, 2009; Kerig, Ward, Vanderzee, & Arnzen Moeddel, 2009), mood disorders (Gershon, Sudheimer, Tirouvanziam, Williams, & O'Hara, 2013), and antisocial personality disorders (J. D. Ford, 2005). Indeed, socioemotional impairments and deficits in interpersonal development and affect regulation have also been proposed as intermediary links between childhood adversity and psychological distress (Dvir et al., 2014; Sheikh, 2017b; Stikkelbroek et al., 2016).

Childhood adversity may also lead to vulnerabilities that produce disruptions in psychosocial functioning and maladaptive coping styles (Moretti & Craig, 2013; Repetti et

al., 2002). Previous studies have shown that certain childhood adversities lead to high emotional reactivity and decreased social competency, which in turn disturbs the formation and preservation of supportive relationships (Barnes et al., 2016; Runsten et al., 2014). An individual's functional social behaviour depends on their ability, capacity, and motivation to engage in social interactions, all of which play an important role in maintaining social relationships (Kim & Cicchetti, 2010). Exposure to certain childhood adversities is associated with emotional reactivity to stress and deficits in socioemotional adjustment and emotion regulation (Barnes et al., 2016; Stikkelbroek et al., 2016). Similarly, abused children are more likely to have difficulties interpreting the thoughts and feelings of others, have a lesser ability to understand negative emotions such as anger and sadness, and have fewer adaptive emotion regulation skills, which can affect their social relationships (Barnes et al., 2016; Wright & Folger, 2017). Other studies have shown that lower SES in childhood is associated with lower social competence and a higher likelihood of behavioural problems in childhood (Assis, Avanci, & Oliveira, 2009; Etherington, McDougall, DeWit, & Wright, 2016).

The risky families model suggests that childhood adversity influences psychological distress in adulthood through resultant social impairments and deficits in emotion regulation (Repetti et al., 2002), such as poor social skills, impulsivity (Sheikh, 2017b), reactive aggression, behavioural problems, excessive reassurance-seeking, constricted emotions, attenuated empathy, contextually inappropriate displays of affection, and externalising behaviours, all of which are associated with peer rejection (Ban & Oh, 2016; Barnes et al., 2016). Chronic stress (i.e., the cumulative load of day-to-day stresses) in childhood caused by socioeconomic and psychosocial adversity (Sheikh, 2017b) may foster social and behavioural impairments such as low self-esteem (Mossakowski, 2015; Varga, Piko, & Fitzpatrick, 2014), cynicism regarding others' intentions and behaviours, uncontrolled behaviours in social interactions, and mistrust, all of which affect may the quality and quantity of social

relationships over the life course (Coleman, Zawadzki, Heron, Vartanian, & Smyth, 2016; Etherington et al., 2016; Goodwin-Smith et al., 2017). In contrast, individuals with good emotion regulation have the ability to respond to ongoing demands with a range of socially acceptable responses such as cooperation and conciliation (Kim & Cicchetti, 2010). As a result, they show higher social competence, which may result from using more memory for mentalizing (i.e., the ability to reason about the mental states of others) during their daily social interactions (Fujisawa et al., 2015). On the contrary, individuals exposed to childhood adversity may have difficulty in modulating the intensity of their negative emotions (Moretti & Craig, 2013; Stikkelbroek et al., 2016).

The social support deterioration model (Barrera, 1986) suggests that stress erodes one's perception of the availability or effectiveness of social support, which leads to persistent difficulties in forming and maintaining social relationships (Hawley & Cacioppo, 2010; Seeds, Harkness, & Quilty, 2010). However, the need for these relationships is increased among people with these impairments (Gabriel, Read, Young, Bachrach, & Troisi, 2017). The vulnerability-stress model and the stress-sensitisation model suggest that childhood adversity may cause heightened sensitivity to subsequent stressors, which in turn may trigger psychological distress (Danese & McEwen, 2012; Heim et al., 2010). Childhood adversity may influence emotional and physiological self-regulatory abilities and alter sensory thresholds in ways that undermine effective emotion regulation and create increased vulnerability to psychological distress in later life (Moretti & Craig, 2013; Stikkelbroek et al., 2016). Accordingly, stressors such as perceived social isolation (Oetzel, Duran, Jiang, & Lucero, 2007) may have a greater influence on psychological distress among those who have experienced childhood adversity. Previous research has shown that individuals exposed to childhood adversity perceive themselves as having less social support and have a smaller social network in adulthood (Goodwin-Smith et al., 2017; Shevlin, McElroy, & Murphy,

2015), which may create a pattern of distress in their lives (Oetzel et al., 2007; Weber & Cummings, 2003).

Several studies have shown that perceived social support has a protective effect on psychological distress (Landstedt, Gustafsson, Johansson, & Hammarström, 2016; Muller, 2016; Sheikh, Abelsen, & Olsen, 2016a; Shevlin et al., 2015), and one study reported that this effect is greater than that of actual level of social support (Dunkel-Schetter & Bennett 1990). However, a distinction must be drawn between quantity and quality of social support (E. Ford, Clark, & Stansfeld, 2011; Friis, 2010), also referred to as the structural and functional aspects of social support (Cohen & Wills, 1985). The structural aspect refers to the quantity of social support, i.e., the number of friends available to provide emotional support and aid with tangible needs (Cohen & Wills, 1985; Friis, 2010). However, mere quantity of social support may not fulfil the ‘unmet’ social needs of an individual, as those reporting a certain number of friends may still feel social isolation. Therefore, the functional aspect of social support may be more important. The functional aspect refers to the quality of social support, i.e., that friends are supportive, caring, and trustworthy (Friis, 2010), and requires a subjective evaluation from respondents (Barrera, 1986; Henry, Thornberry, & Lee, 2015).

Despite the growing interest in understanding the life course mechanisms of childhood adversity, few studies (E. Ford et al., 2011; Kessler & Magee, 1994; Korkeila et al., 2005; Muller, 2016; Nurius, Green, Logan-Greene, & Borja, 2015; Nurius, Logan-Greene, & Green, 2012; Sheikh et al., 2016a; Tani et al., 2016; Turner & Butler, 2003) have assessed the mediating role of social support in the association between childhood adversity and psychological distress in adulthood, and the results of these studies were not consistent. Moreover, there are caveats. First, assessing mediation with cross-sectional data can lead to questionable inferences (Sheikh, Abelsen, & Olsen, 2016b, 2017). Despite this, most previous studies (E. Ford et al., 2011; Kessler & Magee, 1994; Korkeila et al., 2005; Muller,

2016; Nurius et al., 2015; Nurius et al., 2012; Sheikh et al., 2016a; Turner & Butler, 2003) have either assessed both social support and psychological distress at the same time point, or assessed both childhood adversity and psychological distress at the same time point. Second, several studies (Kessler & Magee, 1994; Muller, 2016; Turner & Butler, 2003) based their conclusions on very small, selective samples, which makes it impossible to generalise the findings. Third, previous studies (Korkeila et al., 2005; Nurius et al., 2015; Sheikh et al., 2016a; Tani et al., 2016) used several mediators (indicators of social support, among others) *en bloc*, i.e., included together in the regression models to assess the attenuation in the estimate of childhood adversity. This makes it impossible to assess whether indicators of social support *independently* mediate the association between childhood adversity and psychological distress in adulthood (Sheikh, 2017b). Several studies have shown that social support is closely associated with education, as well as socially patterned differences in lifestyle factors such as alcohol intake and smoking (Coleman et al., 2016; Sheikh et al., 2017; Widom, Horan, & Brzustowicz, 2015), and others have shown that lower education, a higher alcohol intake, and smoking are likely associated with childhood adversity (Campbell, Walker, & Egede, 2016; Nurius, Green, Logan-Greene, Longhi, & Song, 2016; Sheikh, 2017b; Sheikh et al., 2016a) and psychological distress in adulthood (Lin, Chou, Wu, & Lin, 2014; Sheikh, 2017b; Sheikh et al., 2016a, 2017). If education, alcohol intake, and smoking, are not included in the model, any observed indirect effects may be due to the association between social support and these factors (Sheikh, 2017b; Sheikh et al., 2016a, 2017), not the ‘independent’ indirect effect (Sheikh, 2017b) of childhood adversity on psychological distress via indicators of social support. Fourth, other studies (E. Ford et al., 2011; Korkeila et al., 2005; Muller, 2016; Nurius et al., 2015; Nurius et al., 2012; Tani et al., 2016; Turner & Butler, 2003) that assessed the mediating role of social support in the association between childhood adversity and psychological distress did not present indirect effect estimates and

corresponding confidence intervals. Finally, no previous study has differentiated the mediating mechanisms of the childhood adversity-psychological distress link for both quantity and quality of social support.

A review of the existing literature indicated that the mediating role of quantity and quality of social support in the association between child adversity and psychological distress in adulthood has not been assessed in a thoroughly comprehensive and systematic manner in any large dataset. Therefore, using data from the Tromsø Study, the aim of the present study was to assess the mediating role of quantity and quality of social support in adulthood in the association between childhood adversity and psychological distress in adulthood.

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Material and Methods

Study population

The Tromsø Study is a longitudinal prospective cohort study which contains data from 40,051 individuals, and its participants are considered representative of the adult population residing in the municipality of Tromsø (Jacobsen, Eggen, Mathiesen, Wilsgaard, & Njølstad, 2012). Between 1974 and 2007-2008, six waves or surveys of the Tromsø Study were conducted (referred to as Tromsø I-VI) (Jacobsen et al., 2012). The present analysis includes data collected from 1994 to 2008.

The present study has a three-wave design. To be eligible for the present analyses, participants had to have attended all of the following surveys: Tromsø IV (1994-95), Tromsø V (2001-02), and Tromsø VI (2007-08) (N=4,530). The study sample included respondents aged 25-74 years at Tromsø IV, 32-81 years at Tromsø V, and 38-87 years at Tromsø VI.

Study variables

Exposure (childhood adversity)

Since indicators of childhood adversity are correlated and tend to cosegregate in such a way that being exposed to one type of childhood adversity increases the risk of exposure to another (Sheikh, 2017a; Sheikh et al., 2016b), a dose-response effect of childhood adversity on psychological distress is more meaningful (Björkenstam et al., 2015; Markkula et al., 2017; Sheikh, 2017b). Six indicators of childhood adversity (mother's education, father's education, subjective childhood financial conditions, and three kinds of adverse childhood experiences) were measured retrospectively in Tromsø VI, to create a childhood adversity score. Participants received 1 point for each adversity that was present in their childhood, thus scores ranged from 0 to 6. The independent association between each childhood

adversity and psychological distress in adulthood has been shown in earlier publications using data from the Tromsø Study (Sheikh, 2017b; Sheikh, Abelsen, & Olsen, 2014; Sheikh et al., 2016a, 2016b, 2017).

Self-reported measurement of parental education is expected to be fairly reliable (Krieger, Okamoto, & Selby, 1998) and was used as an indicator of social background. Mother's and father's education were measured separately on a 5-point scale in Tromsø VI as: 1) college or university (4 years or more); 2) college or university (less than 4 years); 3) high school diploma; 4) vocational school or technical school; and 5) primary and secondary school or similar (i.e., 7-10 years of schooling). A parental education level of primary and secondary school or similar was considered a childhood adversity (Sheikh et al., 2014). Subjective childhood financial conditions was used as the indicator of economic background (Sheikh et al., 2014), and was measured in Tromsø VI by the question, "How was your family's financial situation when you were a child?" Respondents replied using a 4-point scale ranging from 'very difficult' (1) to 'very good' (4). Those who answered difficult or very difficult were considered to have this childhood adversity. The test-retest reliability of subjective childhood financial conditions was good ($Kappa_{weighted}$: 0.61, 95% confidence interval [CI] 0.59-0.63) in Tromsø Study (Sheikh, 2017a, 2017b; Sheikh et al., 2016b). Self-reported information on adverse childhood experiences was measured in Tromsø VI by the question, "Have you over a long period experienced any of the following? (as a child)," followed by three types of traumatic experiences: (i) being tormented, or threatened with violence; (ii) being beaten, kicked, or the victim of other types of violence; and (iii) someone in your close family using alcohol or drugs in such a way that caused you worry. Respondents who reported one or more of these alternatives were classified as exposed to psychological abuse, physical abuse, and substance abuse distress, respectively (Sheikh, 2017b; Sheikh et al., 2016a), and each of these adverse childhood experiences was considered

a childhood adversity (Sheikh, 2017b). The internal reliability of these adverse childhood experiences was good in Tromsø Study (Sheikh, 2017a). A composite variable was constructed as sum of the six childhood adversities (mean: 2.13, standard deviation [SD]: 1.11).

Mediator (social support in adulthood)

In the present study, we looked at subjective social support in adulthood, i.e., participants' perception of the quantity (number of friends) and quality (perceived social isolation) of social support (Thoits, 1995). These variables were measured in Tromsø IV (mean age: 54.7 years) by the questions, "How many good friends do you have whom you can talk confidentially with and who give you help when you need it?" and "Do you feel that you have enough good friends?" (yes, no). Those who reported 'no' to the second question were categorised as socially isolated.

Outcome (psychological distress)

Psychological distress (Ross & Mirowsky, 2006; Taylor et al., 2012) was measured in Tromsø V (mean age: 61.7 years). The Hopkins Symptom Checklist (HSCL-10) scale was used to measure psychological distress (i.e., depressive and anxious symptomatology), which is widely used in epidemiological studies. Respondents rated each of the 10 items in the HSCL-10 on a four-point scale, ranging from 'not at all' (1) to 'extremely' (4). The HSCL-10 had an acceptable degree of internal consistency in this sample (Cronbach's alpha: 0.86, mean inter-item correlation: 0.42, McDonald's omega coefficient for composite reliability: 0.87). An HSCL-10 score between 10 and 40 was calculated by summing the 10 indicators, where 40 represented the highest and 10 represented the lowest score for psychological distress (mean: 12.69, SD: 3.74).

Confounding variables (Tromsø IV)

The associations between childhood adversity, social support, and psychological distress in adulthood are likely confounded by age, gender, and genetic disposition (Fandiño-Losada, Bangdiwala, Lavebratt, & Forsell, 2016; Sheikh, 2017a, 2017b; South, Schafer, & Ferraro, 2015). Indeed, parental psychopathology is a risk factor for emotion dysregulation, deficits in social cognition, and psychological distress in offspring (Nomura, Warner, & Wickramaratne, 2001). Other studies have indicated that parental psychopathology may partially explain the association between childhood adversity and psychological distress among children (Briggs-Gowan et al., 2010). Alcohol intake, smoking, and education were considered mediator-outcome confounders (Sheikh, 2017b). Valid information on age and gender was obtained from Statistics Norway by using the unique personal identification number of each participant. The test-retest reliability (between Tromsø IV and Tromsø V) of mother's history of psychiatric disorders and father's history of psychiatric disorders in this sample were Kappa: 0.57 (95% CI: 0.52–0.62) and Kappa: 0.61 (95% CI: 0.53–0.69), respectively (Sheikh, 2017a, 2017b).

Respondent's education was measured on the same 5-level scale used for parental education (mean: 3.87, SD: 1.35). Although the education level of the respondents may have since increased, the test-retest reliability was very good (Kappa: 0.91, 95% CI: 0.91, 0.92) in this sample (Sheikh, 2017b; Sheikh et al., 2017). Daily smoking was measured by the question, "Do you smoke cigarettes daily?" (yes=1/no=0). Although the smoking status of the respondents may have since changed, the test-retest reliability was good (Kappa: 0.67, 95% CI: 0.63–0.71) in this sample (Sheikh, 2017b). Alcohol intake was measured with four indicators: alcohol frequency (times/month), beer frequency (times/fortnight), wine frequency (times/fortnight), and spirit frequency (times/fortnight).

Ethical approval: This investigation was carried out in accordance with the latest version of the Declaration of Helsinki. The Tromsø Study has been approved by the Regional

Committee for Medical and Health Research Ethics, the Data Inspectorate, and the Norwegian Directorate of Health. Written informed consent was obtained from all individual participants included in the study.

Statistical analysis

All analyses were conducted using Stata version 14. Missing values were generated with multiple imputation with chained equations (Sheikh et al., 2017) (see Table 1). The association between childhood adversity and quantity of social support was assessed by ordinary least square (OLS) regression analysis. The association between childhood adversity and quality of social support was assessed by Poisson regression analysis with a robust error variance (Barros & Hirakata, 2003; Sheikh et al., 2017; Zou, 2004) (see Table 2). The association between quantity and quality of social support, and psychological distress was assessed by OLS regression analysis. OLS estimates (β), relative risks (RRs), and 95% CIs are presented (see Table 3). No statistically significant multiplicative interactions between childhood adversity, age, gender, and indicators of social support were observed in this study sample. Mediation was assessed with path analysis (product-of-coefficients method) (MacKinnon, Fairchild, & Fritz, 2007; Preacher & Hayes, 2008; Shrout & Bolger, 2002). SEs were derived with bias-corrected bootstrapping (Carpenter & Bithell, 2000; Sheikh et al., 2017) for hypothesis testing, and 95% CIs are presented (see Table 4). In order to assess whether the inferences are independent of the statistical method, we also assessed mediation with the difference-in-coefficients method as supplementary analysis (Sheikh et al., 2016b, 2017) (see eTable 1).

Results

The percentage of missing information for each variable was as follows: living in Norway at age 1 year (8.5%), alcohol frequency (15.2%), beer frequency (17.3%), wine frequency (17.1%), spirit frequency (16.9%), daily smoking (0.1%), education (0.4%), childhood adversity (13.3%), number of friends (18.4%), perceived social isolation (8.3%), and psychological distress (16.7%). Participants with missing information on variables of childhood adversity tended to be older and to have psychological distress ($p < 0.05$). Participants with missing information on number of friends also tended to be older, to have lower education, and to experience social isolation ($p < 0.05$). Participants with missing information on psychological distress tended to be female, older, have a higher frequency of beer intake, and lower education ($p < 0.05$).

The majority of the respondents in our study sample were aged 55 and over (56.2%) in Tromsø IV and were female (59.2%). The average number of childhood adversities in this sample was over 2 (mean: 2.13, SE: 0.01). Only 6.4% of the respondents reported none of the childhood adversities considered in this study, while 13.5% of the respondents had experienced one. The average self-reported number of friends was over 5 (SE: 0.07). Over 16.1% of the respondents were categorised as socially isolated, and the mean score on psychological distress was 12.7 (SE: 0.06) in Tromsø V (Table 1).

The attenuation between unadjusted ($\beta = -0.40$, $p < 0.001$) and adjusted ($\beta = -0.23$, $p < 0.001$) estimate of childhood adversity indicate that a large proportion of the crude association between childhood adversity and number of friends is driven by confounding variables (Table 2). However, for perceived social isolation, confounding variables had a minor influence ($RR_{\text{Unadjusted}} = 1.19$ vs $RR_{\text{Adjusted}} = 1.17$) (Table 2).

After adjusting for confounding variables, childhood adversity was negatively associated with number of friends (β : -0.23 $p < 0.05$), and conferred a 17% higher risk of being socially isolated in adulthood (RR: 1.17, 95% CI: 1.10, 1.25) (Table 2). In turn, number of friends was associated with lower psychological distress in adulthood ($p < 0.001$), while perceived social isolation was associated with higher psychological distress in adulthood ($p < 0.001$) (Table 3). There were minor attenuation in estimates after controlling for confounding variables, which indicates that the association between indicators of social support and psychological distress is quite robust (Table 3).

Mediation was assessed with both product-of-coefficients method (Table 4) and difference-in-coefficients method (eTable 1). After controlling for age, gender, living in Norway at age 1 year, mother's/father's history of psychiatric disorders, daily smoking, indicators of alcohol intake, and education, childhood adversity was associated with psychological distress in adulthood ($\beta_{\text{Total Effect}}$: 0.44, 95% CI: 0.32, 0.56) (Table 4). After controlling for age, gender, living in Norway at age 1 year, mother's/father's history of psychiatric disorders, daily smoking, indicators of alcohol intake, education, quantity and quality of social support, the direct effect of childhood adversity on psychological distress was $\beta_{\text{Direct Effect}} = 0.37$ (95% CI: 0.25, 0.49) (Table 4). The indirect effect of childhood adversity via both the quantity and quality of social support was $\beta_{\text{Indirect Effect}} = 0.04$ (95% CI: 0.03, 0.06). However, the indirect effect of childhood adversity via only quantity of social support was $\beta_{\text{Indirect Effect}} = 0.01$ (95% CI: 0.01, 0.02); and via only quality of social support was $\beta_{\text{Indirect Effect}} = 0.04$ (95% CI: 0.03, 0.06) (Table 4).

Assessing mediation with difference-in-coefficient method showed that the estimates remained in the same direction (eTable 1). Decomposition of the total effects showed that number of friends and perceived social isolation mediated over 15.75% (95% CI: 10.09, 23.29) of the effect of childhood adversity on psychological distress in adulthood (eTable 1).

Separating the proportion mediated effects for both indicators of social support showed that number of friends mediated 3.72% (95% CI: 1.54, 6.63), while perceived social isolation mediated 10.26% (95% CI: 5.51, 16.73) of the effect of childhood adversity on psychological distress in adulthood (eTable 1).

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Discussion

In this study, we examined the relationship between childhood adversity, indicators of social support, and psychological distress in adulthood, using a large population-based sample of Norwegian respondents. This study supports the assumption that much of the association between childhood adversity and psychological distress in adulthood is independent of social support. These findings are consistent with a developmental psychopathology model of psychological distress, in which one pathway to vulnerability is through social and emotional impairments attributable to childhood adversity (Stikkelbroek et al., 2016). Furthermore, the results suggest that childhood adversity influences psychological distress in adulthood via both the structural (quantity) and functional (quality) aspects of social support.

Other studies (Nurius et al., 2015; Nurius et al., 2012) assessed the indirect effect of childhood adversity on psychological distress in adulthood via social support, despite observing statistically significant, multiplicative interactions between childhood adversity and social support. This approach may not be appropriate, as it is well established that traditional approaches for assessing mediation assume no multiplicative interaction between the exposure and the mediator (Sheikh et al., 2017).

Our results should be interpreted in the context of some limitations. Childhood adversity is assessed retrospectively, based on many fewer items than most other research of this nature. Several studies have shown that retrospective measurement of childhood adversity is fairly reliable and valid (Dube, Williamson, Thompson, Felitti, & Anda, 2004; Goodman et al., 2016; Havari & Mazzonna, 2015; Krieger et al., 1998; Robins et al., 1985; Ward, 2011). Other studies have shown that the association between retrospectively measured childhood adversity and psychological distress in adulthood is not driven by differential recall bias

(Brown, Craig, Harris, Handley, & Harvey, 2007; Fergusson, Horwood, & Boden, 2011).

Only six childhood adversities are used, including three measuring low parental education and financial situation. Adversity therefore overlaps here with socio-economic position, unlike some other studies where the two are considered separately.

Social support is a multidimensional construct (Barrera, 1986; Cohen & Wills, 1985; Oetzel et al., 2007), and the present study dealt with participants' perceived quantity and quality of social support rather than the whole construct. The two mediators quantity (number of friends) and quality of social support are assessed in a study wave prior to the outcome measure, but rely on single items and a binary response in the case of quality of social support.

The strengths of this study are its three-wave design and representative sample of the adult population of Tromsø. Methodologically, this study improves on existing research. The Tromsø Study includes a representative, population-based cohort of men and women without regard to their health status.

The results of this study indicate the need to take quantity and quality of social support over the life course into account when considering the long-term impact of childhood adversity on psychological distress in adulthood. These findings imply that some of the effect of childhood adversity on psychological distress can be eliminated by interventions aimed at increasing social support. Understanding how childhood adversity continues to adversely influence psychological distress can help shape social service and public health interventions that are designed to alleviate the burden carried by individuals who have had adverse childhood experiences.

Author disclosures

Contributors:

Mashhood Ahmed Sheikh (MAS) is the sole author of this manuscript, and all aspects of this research and manuscript were performed by MAS.

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Table 1. General characteristics of the study sample (n=4,530).

Characteristics		Complete-	Imputed
		case dataset	dataset
		n (%)	(%)
Age (in 1994)	Mean (SE)	54.69 (0.15)	– ^b
	25-34	302 (6.7)	– ^b
	35-44	352 (7.8)	– ^b
	45-54	1327 (29.3)	– ^b
	55-64	1852 (40.8)	– ^b
	65-74	697 (15.4)	– ^b
Gender	Male	1849 (40.8)	– ^b
	Female	2681 (59.2)	– ^b
Living in Norway at age 1year ^a	Yes	4081 (98.4)	98.3
History of psychiatric disorders, mother	Yes	262 (5.8)	– ^b
History of psychiatric disorders, father	Yes	90 (2.0)	– ^b
Alcohol frequency ^a	Mean (SE)	3.00 (0.07)	2.90 (0.06)
Beer frequency ^a	Mean (SE)	1.21 (0.04)	1.13 (0.04)
Wine frequency ^a	Mean (SE)	1.58 (0.05)	1.56 (0.04)
Spirit frequency ^a	Mean (SE)	1.31 (0.04)	1.22 (0.04)
Daily smoking ^a	Yes	29.0	29.0
Education ^a	Mean (SE)	3.87 (0.02)	3.87 (0.02)
Exposure			
Childhood adversity ^a	Mean (SE)	2.14 (0.02)	2.13 (0.01)
	0	253 (6.4)	6.4
	1	543 (13.8)	13.5

	2	1849 (47.1)	47.4
	3	1051 (26.7)	27.2
	4	171 (4.4)	4.0
	5	58 (1.5)	1.4
	6	5 (0.1)	0.1
Mediators			
Number of friends^{a, c}	Mean (SE)	5.10 (0.08)	5.09 (0.07)
Perceived social isolation^{a, d}	Socially isolated	16.1	16.1
	Not socially isolated	83.9	83.9
Outcome			
Psychological distress (HSCL-10)^a	Mean (SE)	12.2 (0.05)	12.7 (0.06)

^aThe numbers for some variables do not add up to 4,530 due to missing values.

^bThere were no missing values, so no imputations were made for these variables.

^cIndicator of quantity of social support

^dIndicator of quality of social support. Those who reported not having enough good friends were categorised as socially isolated.

SE: standard error.

Table 2. Association between childhood adversity and mediators (n=4,530).

	Number of friends ^a	
	Crude	Adjusted
β	95% CI	β 95% CI
-0.40 ^b	-0.54, -0.27	-0.23 ^{c, d} -0.37, -0.10
Perceived social isolation^e		
RR	95% CI	RR 95% CI
1.19 ^b	1.11, 1.28	1.17 ^{b, f} 1.10, 1.25

^aIndicator of quantity of social support.

^b p<0.001

^c p<0.05

^dAdjusted for age, gender, living in Norway at age 1 year, mother's/father's history of psychiatric disorders, daily smoking, indicators of alcohol intake, education, and perceived social isolation.

^eIndicator of quality of social support. Those who reported not having enough good friends were categorised as socially isolated.

^fAdjusted for age, gender, living in Norway at age 1 year, mother's/father's history of psychiatric disorders, daily smoking, indicators of alcohol intake, education, and number of friends.

RR: relative risk; CI: confidence interval.

Table 3. Association between mediators and psychological distress in adulthood (n=4,530).

	Psychological distress	
	Crude	Adjusted
No. of friends^a	β	β
	95% CI	95% CI
	-0.09 ^b	-0.06 ^{b, c}
	-0.11, -0.07	-0.08, -0.04
Perceived social isolation^d	β	β
	95% CI	95% CI
	1.50 ^b	1.41 ^{b, c}
	1.14, 1.86	1.06, 1.76

^aIndicator of quantity of social support.

^bp<0.001

^cAdjusted for childhood adversity, age, gender, living in Norway at age 1 year, mother's/father's history of psychiatric disorders, daily smoking, indicators of alcohol intake, and number of friends/perceived social isolation

^eIndicator of quality of social support. Those who reported not having enough good friends were categorised as socially isolated.

CI: confidence interval; HSCL-10: Hopkins Symptom Check List-10; scale (10–40), where 10 represents lowest score on psychological distress, and 40 represents highest score on psychological distress.

Number of friends, and perceived social isolation were measured in 1994-95, while psychological distress was measured in 2001-2002.

Table 4. Total, direct, and indirect effect (product-of-coefficients method) of childhood adversity on psychological distress (HSCL-10) in adulthood (n=4,530).

Number of friends^c and perceived social isolation^d		
Total effect	Direct effect	Indirect effect
β (95% CI)	β (95% CI)	β (95% CI)
0.44 (0.32, 0.56) ^a	0.37 (0.25, 0.49) ^b	0.04 (0.03, 0.06) ^b
Only number of friends^c		
Childhood adversity	0.44 (0.32, 0.56) ^a	0.37 (0.25, 0.49) ^b
	0.01 (0.01, 0.02) ^b	
Only perceived social isolation^d		
	0.44 (0.32, 0.56) ^a	0.37 (0.25, 0.49) ^b
	0.04 (0.03, 0.06) ^b	

^aAdjusted for age, gender, living in Norway at age 1 year, mother's/father's history of psychiatric disorders, daily smoking, indicators of alcohol intake, and education.

^bAdjusted for age, gender, living in Norway at age 1 year, mother's/father's history of psychiatric disorders, daily smoking, indicators of alcohol intake, education, number of friends, and perceived social isolation.

^cIndicator of quantity of social support.

^dIndicator of quality of social support. Those who reported not having enough good friends were categorised as socially isolated.

CI: confidence interval; HSCL-10: Hopkins Symptom Check List-10; scale (10–40), where 10 represents lowest score on psychological distress, and 40 represents highest score on psychological distress.

Highlights

- This study revisits the link between childhood adversity and psychological distress in adulthood to clarify the interpretation of this widely-reported association.
- Childhood adversity influences psychological distress in adulthood via social support in adulthood.