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Association of Childhood Adversities and Home Atmosphere with Physical Functioning in Old Age: The Helsinki Birth Cohort Study

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Abstract

Objective—Childhood adversities have been linked with adverse health outcomes, but less is known about the long-term consequences of childhood home atmosphere. We investigated whether childhood adversities and home atmosphere were associated with physical and mental functioning in older age.

Methods—In the Helsinki Birth Cohort Study 2003 participants born 1934–44 had data available on 9 childhood home atmosphere items e.g. whether it was supportive and warm (sum score ranged between 0 and 36, higher score indicating better atmosphere), and 9 childhood adversities e.g. unemployment and divorce (sum score 0–9, coded into no; one; and two or more adversities) assessed in 2001–04. Of those, 835 had data on physical and mental functioning assessed using the Short Form 36 questionnaire in 2011–13.

Results—Those who had experienced two or more childhood adversities were more likely to have poorer physical and mental functioning in older age compared to those with no adversities. A better home atmosphere score was associated with better mental functioning (per one unit higher score β 0.24, 95% CI 0.16 to 0.32, $p < 0.001$). In models including both childhood adversities and

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Conflict of interest

The authors have no competing interests.

home atmosphere, a more favorable home atmosphere was associated with better mental functioning while the association for childhood adversities attenuated. There were no associations between childhood adversities or home atmosphere and physical functioning in the models that included both childhood exposures.

Conclusions—Childhood adversities and home atmosphere have long-term associations with physical and mental functioning in older age.

Keywords

physical functioning; mental functioning; childhood adversities; home atmosphere; healthy ageing

Introduction

Adverse childhood experiences typically include poverty, various forms of household dysfunction such as parental divorce or substance abuse. Several studies have shown that the adversities that children experience at a young age might contribute to a higher burden of chronic illnesses in adulthood such as cardiovascular disease and mental disorders [1–4], decreased physical performance and functioning [5–7], cognitive decline [8] and decreased mental wellbeing [9,10]. Childhood adversities have been linked with negative life events in adulthood such as severe financial difficulties, severe conflicts at work and divorce [11], homelessness [4,12], an unhealthy lifestyle including excessive use of alcohol [13] and early exit from the workforce [14], thus subsequently having considerable negative implications also on the society in general. Negative life events in adulthood also increase the prevalence of chronic illnesses. For example, unemployment has been linked with negative health outcomes [15].

Childhood home atmosphere, i.e. whether it was e.g. supportive or warm, has been less studied in terms of long-term health outcomes. There is evidence that various characteristics related to parenting such as low maternal care [16] and a poor relationship with mother and/or father [17] are associated with mental health problems in adulthood. In women belonging to the 1946 British birth cohort, a higher level of parental care was associated with better psychological well-being, and, conversely, higher parental non-engagement and control were associated with poorer well-being at age 52 years [18]. It is likely that childhood adversities will negatively contribute to home atmosphere. However, it has been shown in previous studies that high adversity can be mitigated through the presence of a warm and supportive relationship with at least one parent [19]. So far, to the best of our knowledge, the role of childhood home atmosphere in functioning in later life has been less studied. This is of interest because a more favorable childhood home atmosphere does not necessarily depend upon adversities experienced in the childhood family such as unemployment. We have shown in an earlier study [20] that early life exposures, indicated as body size at birth and growth in childhood, were associated with poorer physical functioning in older age. The aim of this study was to investigate further the long-term association between childhood adversities and home atmosphere and physical and mental functioning in older age. Furthermore, we investigated if home atmosphere attenuated the association between childhood adversities and functioning in old age. Retrospective and prospective data from the Helsinki Birth Cohort Study were used to investigate these associations.

Materials and Methods

Participants

Data come from the Helsinki Birth Cohort Study of individuals who were born between 1934 and 1944 in Helsinki, Finland at the Helsinki University Central Hospital and who were living in Finland in 1971 when a unique personal identification code was assigned to all Finnish residents [21]. Between 2001 and 2004, 2003 cohort members participated in clinical study at an average age of 61.5 years [22]. In the year 2011, from this clinical study cohort, 1404 individuals who were alive and resided within a 100 km distance from the study clinic in Helsinki were invited to take part in a follow-up clinical examination. A total of 1094 participants visited the clinic between 2011 and 2013 at an average age of 71 years [23]. Of those, 835 had data available on childhood exposures inquired retrospectively between 2001 and 2004, on the Short Form 36 (SF-36) inquired between 2011-2013 and on covariates ascertained between 2001 and 2004. Compared to those with missing data, those with complete data available were younger and they had better scores on home atmosphere in childhood and better physical and mental functioning at the first clinical examination (all $p < 0.001$) but there were no differences in childhood adversities ($p < 0.60$). The study was approved by the Ethics Committee of Epidemiology and Public Health of the Hospital District of Helsinki and Uusimaa and that of the National Public Health Institute, Helsinki.

Childhood adversities and home atmosphere

Between 2001 and 2004 at the baseline clinical study visit at an average age of 61.5 years, cohort members were asked retrospectively a set of questions on their childhood home atmosphere and adversities when they were 16 years old. The members reported whether they had experienced any of the following 9 adversities: unemployment of one parent, serious illness of a parent, father's alcohol problems, mother's alcohol problems, father's psychiatric illness (e.g. schizophrenia, depression), mother's psychiatric illness (e.g. schizophrenia, depression), parental divorce, own serious or long-term illness or having been bullied at school [11,14]. One point was given for each adversity that the members had experienced and they were coded as: no adversities; 1 adversity; and 2 or more adversities. The cohort members reported on 9 features of the home atmosphere asking whether it had been: warm, caring, inspiring, supportive, quarrelsome, trusting, understanding, strict, open, unfair, happy or uninterested. The answering alternatives ranged between 0=does not describe at all and 4=describes exactly, the answers for quarrelsome, strict, unfair and uninterested were reverse-coded. A summary score ranging between 0-36 was calculated with a higher score indicating a more favorable home atmosphere, Cronbach's alpha was 0.88.

Physical and mental functioning

Self-reported physical and mental functioning were ascertained using the validated 36-Item Short Form Health Survey version 1.0 (SF-36) questionnaire at an average age of 71 years [24,25]. The SF-36 items were organized into eight domains: physical functioning (10 items), role limitations caused by physical health problems (4 items), bodily pain (2 items), general health (5 items), role limitations caused by emotional problems (3 items), vitality (4 items), mental health (5 items) and social functioning (2 items). The single items in the

questionnaire were coded to range between 0 and 100, with 100 representing the best level of functioning or wellbeing. Physical and mental health summary scores were aggregated by using US reference population (1990) to standardize the eight domains and for factor score coefficients. Finally, the summary scores were standardized using a mean of 50 and a standard deviation of 10.

Covariates

We used the framework described by Baron and Kenny [26] in selecting the covariates for the present analyses. Childhood socioeconomic status was ascertained based on father's highest occupational status extracted from birth, child welfare and school healthcare records and coded as upper middle class, lower middle class and labourers based on the original social classification system issued by Statistics of Finland [27]. Register data from Statistics Finland at 5-year intervals between 1970 and 2000 was used to indicate adult socioeconomic status. Highest occupational status in adulthood was coded as upper middle class, lower middle class, self-employed and labourers [27]. At the first clinical examination the cohort members were asked about physical activity which was coded as sedentary; physical activity 1-2 times/week; and at least 3 times/week. Smoking was coded as current; former; and never and alcohol use was coded as 3 times/month or more; 2 times/month at most; and does not use. Cohort members were asked about whether they had been diagnosed with hypertension or diabetes by a physician.

Statistical methods

Characteristics of the cohort members were compared across childhood adversity groups using analyses of variance for continuous variables and χ^2 -square test for categorical variables. The interaction terms of 'gender*childhood adversities' and 'gender*home atmosphere' on physical and mental functioning were tested in linear regression models, but since they were statistically non-significant (all $p > 0.175$), analyses were pooled by gender. We tested for multicollinearity for the two childhood exposures on functioning but found no evidence of it (variance inflation factor < 1.2). Using generalized linear regression analyses, we investigated in a separate set of models the associations between childhood adversities and physical and mental functioning in old age and then between childhood home atmosphere and physical and mental functioning in old age. Adjustment was first made for socioeconomic status in childhood and then for socioeconomic status in adulthood, lifestyle factors (physical activity, smoking and alcohol consumption) and chronic illnesses (diabetes and hypertension). The interaction term of 'childhood adversity*home atmosphere' on physical and mental functioning was non-significant (all $p > 0.38$). Thus, we did not perform moderation analyses, but analyzed the two childhood exposures and functioning in the same model. All tests were performed two-tailed, the level of significance was set at $p < 0.05$ and analyses were carried out with SPSS IBM version 20.0 (SPSS, Armonk, NY, IBM Corp).

Results

The average age of the cohort members at the first clinical study visit was 61.5 years (SD 2.8) and 45.6% of them were men. The characteristics of the cohort members across the childhood adversity groups are presented in Table 1. Those with two or more childhood

adversities had more often a father who had been a labourer, they had lower scores on childhood home atmosphere, indicating that they grew up in a less favorable childhood environment, and their alcohol consumption in adulthood was higher compared to those with one or no childhood adversities.

Associations between childhood adversities and home atmosphere and physical functioning in older age are presented first separately and then in the same model in Table 2. After adjustment for age and sex, cohort members who had experienced two or more childhood adversities were more likely to have poorer physical functioning in older age compared to those with no adversities, β -2.21, 95% CI -3.76 to -0.67, $p=0.005$. Those with a higher home atmosphere score had better physical functioning, β difference in mean physical functioning score 0.11, 95% CI 0.03 to 0.19, $p=0.010$. Adjustment for childhood SES attenuated the association somewhat as did further adjustment for adult SES, adult lifestyle factors, and chronic illnesses rendering the association of for home atmosphere non-significant.

Next, childhood adversities and home environment were both included in the regression models (Table 2). After adjustment for age and sex, those with two or more childhood adversities had poorer physical functioning, β -1.83, 95% CI -3.49 to -0.17, $p=0.030$. Further adjustments rendered the associations statistically non-significant. There was no association between childhood home atmosphere and physical functioning in old age.

In analyses investigating the two childhood exposures separately, those cohort members who had experienced two or more childhood adversities had poorer mental functioning in old age compared to those who had no adversities, (age and gender adjusted β -1.96, 95% CI -3.41 to -0.52, $p=0.008$) (Table 3). Those with a better home atmosphere score had better mental functioning in old age, β difference in mean mental functioning score was 0.25, 95% CI 0.18 to 0.33, $p<0.001$. Additional adjustment for covariates did not markedly alter these associations.

In the analyses that included both childhood adversities and home atmosphere and mental functioning, a better home atmosphere score was associated with better mental functioning (β 0.17, 95% CI 0.08 to 0.27, $p<0.001$) and further adjustments did not change the association (Table 3). There was no association between childhood adversities and mental functioning. We furthermore adjusted for the so called war child status (during the Second World War 269 people of the Helsinki Birth Cohort Study clinical study cohort were evacuated abroad as children without their parents) but that did not change the results.

Discussion

Findings from this birth cohort study indicated that having experienced several adversities in childhood was associated with poorer, while a more favorable childhood home atmosphere, was associated with better mental and physical functioning in older age. Adjustment for socioeconomic status, lifestyle factors and chronic illnesses explained some of the association between childhood adversities and home atmosphere and physical functioning but less so for mental functioning. In analyses that included both childhood exposures, the

association for childhood adversities and mental functioning was attenuated. These findings indicate that although one would have experienced adversities in childhood, a more favorable home atmosphere may attenuate this negative association with mental functioning in older age. Allowing for socioeconomic status in childhood and adulthood, lifestyle and presence of chronic diseases did not change this association. The finding is of importance while they indicate that in spite of experiencing adversities in childhood, offering a warm and nurturing home atmosphere was related to better mental functioning in older age.

Our results contribute to and take further earlier findings on the association between childhood adversities and mental functioning [9] by showing that the association extends into old age. We found a long-term relationship between childhood adversities and physical functioning which have been less studied previously [6,28]. Both associations were clinically important given that a difference of 3–5 points in the SF-36 score is considered to be clinically significant [29]. Childhood home atmosphere has been studied mainly by looking at parenting but home atmosphere captures the entire home surrounding not just the parent/child relationship. A caring parental relationship has been linked with better psychological well-being in older age and conversely low engagement and high control were negatively associated with well-being [18]. The current findings are, to the best of our knowledge, the first to look at the long-term relation between home atmosphere and physical functioning in older age.

Several mechanisms might underlie the long-term association between childhood adversities and home atmosphere and subsequent functioning. Exposure to childhood adversities is likely to lead to further negative exposure later in life [31]. This was reported by Korkeila et al. who showed that childhood adversities were related to financial difficulties in adulthood [11]. It has also been shown that warm family environment can protect against labor market difficulties among high-risk children [32]. Further, it is plausible that children who grow up in a negative childhood home atmosphere accompanied by adversities are likely to be more vulnerable to stress [33,34] and thus are at risk of health adversities compared to the children who did not have such experiences [34,35]. Childhood adversities have been found to be related to a higher allostatic load [36] i.e. the wear and tear on the body which represents the physiological consequences of chronic exposure to neuroendocrine response that results from stress [37]. Children who experience adversity or less favorable parenting are also more prone to adopt an unhealthy lifestyle [38] which further contributes to worse functioning in later life. Childhood intelligence has been found to be a strong predictor of an outcome of a triad of impairments including cognition, depression, physical health in older age and the association was independent of occupation [39]. The finding indicates that the association in our study might also be brain embedded.

The study had several strengths. First, the cohort is well-characterized and we were able to use register-based data on socioeconomic status in childhood and adulthood. We used a validated measure on self-reported functioning, the Short Form 36 questionnaire [25]. There were also limitations which need to be mentioned. First, we used a self-reported retrospective assessment of childhood adversities [11,14] and home atmosphere which might introduce recall bias, although e.g. the fact that siblings had retrospectively recalled similarly parenting styles in childhood in a study [40], provide some evidence on the validity of these

type of data. Furthermore, the exposure data were assessed prospectively 10-years before the outcome measures were made and we did not have data on some potential childhood adversities such as parental death [41] or confounders such as childhood poverty.

In conclusion, we found evidence on the long-term associations between childhood adversities and childhood home atmosphere and older age functioning. Further, a better childhood home atmosphere attenuated the negative associations of childhood adversities in relation to mental functioning in older age. The finding emphasizes the importance of a more favorable childhood home atmosphere, which was reflected in better mental functioning in older age in spite of childhood adversities. These findings highlight the importance of the childhood home environment and early exposures in the prevention of adverse health and functioning and stress the importance of studying childhood environment with a holistic approach not only focusing upon adversities.

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Key points

- Having experienced several adversities in childhood was associated with poorer while a more favorable childhood home atmosphere was associated with better mental and physical functioning in older age.
- In model that included the two childhood exposures, a better childhood home atmosphere was associated with better mental functioning.
- The findings indicate that in spite of experiencing adversities in childhood (e.g. economic hardship) offering a warm and nurturing home atmosphere was related to better mental functioning in older age.

Table 1
Characteristics of the study population (mean and standard deviation unless stated otherwise) across childhood adversity groups

	Childhood adversities			p-value
	None n=352	One n=289	At least two n=194	
Father's occupational status, %				0.022
Upper middle	21.6	21.1	15.5	
Lower middle	26.7	18.3	21.1	
Labourer	51.7	60.6	63.4	
Home atmosphere score at age 16*	27.1 (5.3)	24.5 (5.9)	21.3 (7.0)	<0.001
Age at first clinical exam	61.4 (2.8)	60.8 (2.7)	61.5 (2.7)	0.004
Adult occupational status, %				0.10
Upper middle	21.3	16.3	14.9	
Lower middle	40.1	49.5	44.8	
Self-employed	8.8	10.0	7.7	
Labourer	29.8	24.2	32.5	
Smoking status, %				0.31
Never	46.0	48.4	46.9	
Former	34.7	29.4	37.1	
Current	19.3	22.2	16.0	
Alcohol consumption, %				0.051
None	59.9	53.3	49.5	
2 times per month at most	36.4	42.6	42.8	
3 or more times per month	3.7	4.2	7.7	
Level of physical activity, %				0.84
Moderate 3 times/week or more	43.8	42.2	45.4	
Moderate 1-2 times/week	45.7	45.0	44.8	
Sedentary	10.5	12.8	9.8	
Hypertension	31.5	28.4	36.6	0.16
Diabetes	5.4	5.5	7.2	0.66

* Higher score indicating better childhood home atmosphere

Table 2
Unstandardized regression coefficients (β) and 95% confidence intervals (CI) for physical functioning in old age according to childhood adversities and home atmosphere

	Model 1		Model 2		Model 3	
	β	(95% CI)*	p	β	(95% CI)*	p
Childhood adversities and home atmosphere modelled separately						
Childhood adversities						
None	1.00			1.00		1.00
One	-0.94	(-2.32, 0.45)	0.19	-0.83	(-2.21, 0.55)	0.24
At least two	-2.21	(-3.76, -0.67)	0.005	-2.04	(-3.59, -0.50)	0.010
Home atmosphere score	0.11	(0.03, 0.19)	0.010	0.10	(0.20, 0.18)	0.014
Childhood adversities and home atmosphere in the same model						
Childhood adversities						
None	1.00			1.00		1.00
One	-0.76	(-2.17, 0.65)	0.29	-0.66	(-2.06, 0.74)	0.36
At least two	-1.83	(-3.49, -0.17)	0.030	-1.68	(-3.33, -0.03)	0.046
Home atmosphere score	0.06	(-0.04, 0.16)	0.26	0.06	(-0.04, 0.16)	0.27

Model 1 adjusted for age and gender; Model 2 adjusted for Model 1 plus childhood socioeconomic status; Model 3 for Model 2 plus adult socioeconomic status, lifestyle factors and chronic illnesses

Table 3
Unstandardized regression coefficients (β) and 95% confidence intervals (CI) for mental functioning in old age according to childhood adversities and home atmosphere

	Model 1		Model 2		Model 3				
	β	(95% CI)*	p	β	(95% CI)*	p	β	(95% CI)*	p
Childhood adversities and home atmosphere modelled separately									
Childhood adversities*									
None	1.00			1.00			1.00		
One	-1.32	(-2.61, -0.03)	0.045	-1.31	(-2.60, -0.01)	0.048	-1.21	(-2.51, 0.10)	0.069
At least two	-1.96	(-3.41, -0.52)	0.008	-1.94	(-3.39, -0.49)	0.009	-1.96	(-3.42, -0.51)	0.008
Home atmosphere score*	0.25	(0.18, 0.33)	<0.001	0.25	(0.18, 0.33)	<0.001	0.24	(0.16, 0.32)	<0.001
Childhood adversities and home atmosphere in the same model									
Childhood adversities									
None	1.00			1.00			1.00		
One	-0.87	(-2.18, 0.44)	0.19	-0.86	(-2.17, 0.45)	0.20	-0.78	(-2.10, 0.54)	0.25
At least two	-0.99	(-2.53, 0.55)	0.21	-0.97	(-2.52, 0.57)	0.22	-1.03	(-2.58, 0.52)	0.193
Home atmosphere score	0.17	(0.08, 0.27)	<0.001	0.17	(0.08, 0.27)	<0.001	0.17	(0.08, 0.26)	0.001

Model 1 adjusted for age and gender; Model 2 adjusted for Model 1 plus childhood socioeconomic status; Model 3 for Model 2 plus adult socioeconomic status, lifestyle factors and chronic illnesses