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Effects of childhood adversities on alexithymia features vary between sexes. Results of a prospective population study

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ABSTRACT

Introduction: Adverse childhood experiences (ACEs) associate with various mental disorders, including personality features. Our understanding of how ACEs influence alexithymia features in the general population is limited. In a prospective population setting, we studied whether ACEs associate with alexithymia, and the role of sex and emotional symptoms in this association.

Methods: In a Finnish population-based prospective study, 3,142 individuals aged between 30 and 64 years completed eleven ACE questions and the Toronto Alexithymia Scale in 2000 and 2011, and the Hopkins Symptoms Checklist in 2011. The effect of ACEs on alexithymia and its subdomains – difficulty identifying feelings (DIF), difficulty describing feelings (DDF), and externally oriented thinking (EOT) in 2000 and 2011 – was analysed using repeated measures ANOVA.

Results: The number of ACEs and their main component, childhood social disadvantage, associated positively with total alexithymia scores and its subdomains DIF and DDF, and negatively with EOT. After controlling for the effect of depression and anxiety, the strength of these associations was reduced, but the effect of social disadvantage on DIF and EOT remained significant in females. Childhood family conflicts associated positively with DIF in males and negatively with EOT in females. Additionally, maternal mental problems associated positively with DIF and DDF in females.

Discussion: In the general population, ACEs, particularly social disadvantage, are associated with adult alexithymia features. Alexithymia features, detectable from youth, may predispose individuals to emotional disturbances caused by childhood adversities. The effect of family conflicts and maternal mental problems on alexithymia features varies between sexes.

Los efectos de las adversidades infantiles sobre los rasgos de la alexitimia varían según el sexo. Resultados de un estudio poblacional prospectivo

Introducción: Las experiencias adversas en la infancia (ACEs en su sigla en inglés) se asocian con diversos trastornos mentales, incluyendo rasgos de personalidad. Nuestra comprensión de cómo las ACEs influyen en las características de la alexitimia en la población general es limitada. En un contexto poblacional prospectivo, estudiamos si las ACEs se asocian con la alexitimia, y el papel del sexo y los síntomas emocionales en esta asociación.

Método: En un estudio prospectivo en población finlandesa, 3.142 individuos de entre 30 y 64 años completaron once preguntas ACEs y la Escala de Alexitimia de Toronto en 2000 y 2011, y la Lista de Comprobación de Síntomas de Hopkins en 2011. El efecto de las ACEs sobre la alexitimia y sus subdominios – dificultad para identificar sentimientos (DIF en su sigla en inglés), dificultad para describir sentimientos (DDF en su sigla en inglés) y pensamiento orientado externamente (EOT en su sigla en inglés) en 2000 y 2011 – se analizó mediante ANOVA de medidas repetidas.

Resultados: El número de ACEs y su componente principal, la desventaja social infantil, se asociaron positivamente con las puntuaciones totales de alexitimia y sus subdominios DIF y DDF, y negativamente con EOT. Tras controlar el efecto de la depresión y la ansiedad, la fuerza de estas asociaciones se redujo, pero el efecto de la desventaja social sobre DIF y EOT siguió siendo significativo en las mujeres. Los conflictos familiares en la infancia se asociaron positivamente con la DIF en los varones y negativamente con la EOT en las mujeres. Además, los problemas mentales maternos se asociaron positivamente con DIF y DDF en las mujeres.

Discusión: En la población general, las ACEs, particularmente las desventajas sociales, están asociadas con rasgos de alexitimia en la edad adulta. Los rasgos de alexitimia, detectables desde la juventud, pueden predisponer a los individuos a trastornos emocionales causados por adversidades infantiles. El efecto de los conflictos familiares y los problemas mentales maternos sobre los rasgos de alexitimia varía según el sexo.

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Adverse childhood experiences; alexithymia; prospective population study; sex; depression; anxiety


PALABRAS CLAVE

Experiencias adversas en la infancia; alexitimia; estudio poblacional prospectivo; sexo; depresión; ansiedad

HIGHLIGHTS

- Childhood social disadvantage, a main component of adverse childhood experiences, is associated with increased difficulties in identifying and describing feelings in both sexes, and with decreased externally oriented thinking in females.
- Childhood family conflicts are associated with increased difficulties in identifying feelings in males, but decreased difficulties in describing feelings and decreased externally oriented thinking in females.
- Maternal mental problems during childhood are associated with increased difficulties in identifying and describing feelings in females.

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1. Introduction

Childhood adversities or adverse childhood experiences (ACEs) refer to a wide range of circumstances or events that pose a serious threat to a child's physical or psychological well-being before the age of 16. ACEs can profoundly and lastingly affect an individual's physical and mental health (Hughes et al., 2017). ACEs are linked to poor overall health, physical diseases, risk factors such as unemployment and low socioeconomic status (e.g. Bellis et al., 2019; Hughes et al., 2020; Petruccioli et al., 2019; Sonu et al., 2019; Waehrer et al., 2020), and various mental disorders including personality disorders, depression, anxiety, dissociative symptoms, and suicidal behaviour (e.g. Crişan et al., 2023; Ferguson & Dacey, 1997; Salokangas et al., 2016; Soloff et al., 2002). Research also suggests a possible association between ACEs and alexithymia (Honkalampi et al., 2004).

The term alexithymia (Sifneos, 1973), refers to a stable personality trait described as 'no words for feelings'. It involves a limited ability to identify, describe and communicate one's feelings, which may reflect difficulties in affective self-regulation (Taylor et al., 1997). Alexithymia comprises three subscales: 1. difficulty identifying feelings (DIF), 2. difficulty describing feelings (DDF), and 3. externally oriented thinking (EOT) (Bagby et al., 1994). The individuals with externally oriented thinking focus their attention on external events and tend to avoid internal experiences.

Alexithymia has been identified as a stable personality trait in the general population across long-term follow-ups (Salminen et al., 2006; Tolmunen et al., 2011). Epidemiological and clinical studies have linked alexithymia to factors such as male sex, age, living alone, and lower levels of education and income (Kokkonen et al., 2001; Mattila et al., 2006; Salminen et al., 1999). It is also associated with both psychosomatic and psychiatric disorders (Bankier et al., 2001; Honkalampi et al., 2010; Karukivi et al., 2010, 2014; Mattila et al., 2008). Additionally, alexithymia may sometimes emerge as a reaction to emotional stress, caused by illness, depression, and anxiety (Mattila et al., 2006).

The association between ACEs and alexithymia remains underexplored. In a 2-year follow-up of psychiatric patients, long-lasting alexithymia features were associated with harsh discipline and unhappiness in childhood homes (Honkalampi et al., 2004). However, studies found no association between physical or sexual abuse and alexithymia in psychiatric patients (Kooiman et al., 2004). Similarly, in psychiatric outpatients, there was no association between childhood abuse and alexithymia, while among primary-care patients, childhood emotional, sexual, and physical abuse were associated with higher alexithymia total

scores, including DIF and DDF (Joukamaa et al., 2008).

Among undergraduate students, emotional abuse was linked to DIF and EOT, while emotional neglect was specifically associated with DIF (Brown et al., 2018). In parents with new-born babies, childhood emotional neglect specifically correlated with alexithymia, whereas depression was related to several types of ACEs (Kajanoja et al., 2021). Additionally, in male parents, dysfunctional paternal bonding, especially paternal overprotection, was indirectly associated with psychological symptoms through alexithymia (Li et al., 2023).

Previous studies have focused on the associations between subjectively perceived ACEs and alexithymia in specific, selected samples. Using the Health 2000 survey of the Finnish general population, we investigated whether objectively stated ACEs and their dimensions are associated with alexithymia and its subdomains longitudinally over an eleven-year follow-up (Supplementary Figure 1). We hypothesised that the effects of ACEs on alexithymia may vary between sexes and therefore conducted separate analyses for males and females. Secondly, we hypothesised that current emotional symptoms, depression, and anxiety, which previous studies have associated with alexithymia, may act as mediators in these associations between ACEs and alexithymia features.

2. Material and methods

2.1. Ethics

The study is carried out according to the Helsinki Declaration, and the study protocols are reviewed and approved by the Ethics Committee of the Hospital District of Helsinki and Uusimaa. All participants provided written informed consent.

2.2. Participants and study design

This study is based on two multidisciplinary epidemiological surveys conducted in Finland by the Finnish Institute for Health and Welfare (2000-2011), named Health 2000 and Health 2011. In the Health 2000 study, a regionally stratified sample representative of the Finnish population aged 30 years and older ($n = 8,028$) was randomly selected, with an 88% participation rate in the interview. Of these participants 6321 provided information on ACEs. All participants from the Health 2000 Survey, who were alive and had not declined further contact, were invited to participate in the Health 2011. A total of 5,784 subjects participated in both studies, and of these, 3496 (59.2%) had provided information on ACEs in 2020. Participants older than 64 years ($n = 354$) were excluded from this study due to possible recall errors (Pirkola

et al., 2005), leading to a final sample of 3,142 (1,762 females), which forms the present study sample.

2.3. Instruments

2.3.1. ACE questions

In 2000, the baseline survey presented subjects with questions about ACEs. Participants were instructed to respond with 'no' (= 0), 'yes' (= 1), or 'cannot say' (= 2) to each of the following questions: 'When you think about your growth years i.e. before you were aged 16 ...?' (1) Did your family have long-term financial difficulties? (2) Was your father or mother often unemployed although they wanted to work? (3) Did your father or mother suffer from some serious disease or disability? (4) Did your father have alcohol problems? (5) Did your mother have alcohol problems? (6) Did your father have any mental health problem, e.g. schizophrenia, other psychosis, or depression? (7) Did your mother have any mental health problem, e.g. schizophrenia, other psychosis, or depression? (8) Were there serious conflicts within your family? (9) Did your parents divorce? (10) Were you yourself seriously or chronically ill? and (11) Were you bullied at school? The sum of 'yes' answers (range 0–11) represents childhood adversities. The list of ACEs forms a rather heterogenic instrument with low consistency (Cronbach's alpha 0.573).

2.3.2. Alexithymia and its subdomains

For measuring alexithymia, participants completed the Toronto Alexithymia Scale (TAS-20) (Bagby et al., 1994) in both 2000 and 2011. TAS-20, the most commonly used instrument for alexithymia evaluation, includes 20 items rated on 5-point Likert scale. The scale yields total scores ranging from 20 to 100 and is divided into three subscales: 1. difficulty identifying feelings (DIF), 2. difficulty describing feelings (DDF), and 3. externally oriented thinking (EOT) (Bagby et al., 1994). The TAS-20 has shown good internal consistency, reliability, and validity (Taylor et al., 2003), and its structure has been validated in Finnish adult and adolescent populations (Joukamaa et al., 2001; Säkkinen et al., 2007). The measurement of alexithymia using the TAS-20 in the Health 2000 survey has been previously described (Hiirola et al., 2017). In the present study, TAS-20 showed acceptable reliability with Guttman split-half coefficient 0.663 and Cronbach's alpha 0.737 in 2000, and correspondingly 0.708 and 0.771 in 2011.

2.3.3. Symptoms

Depression and anxiety were measured using the Hopkins Symptom Checklist (Derogatis et al., 1974) in 2011. The Hopkins Symptom Checklist with 25 items (HSCL-25) is a shortened version of the 90-item Symptom Checklist, used for measuring current

depressive and anxiety symptoms. In the HSCL-25, participants rated the severity of each symptom on a 4-point scale ranging from 1 (not at all) to 4 (extremely). Sum scores were calculated separately for 10 anxiety symptoms and 15 depressive symptoms. The anxiety symptoms include: (1) suddenly scared for no reason, (2) feeling fearful, (3) faintness, dizziness, or weakness, (4) nervousness or shakiness inside, (5) heart pounding or racing, (6) trembling, (7) feeling tense or keyed up, (8) headaches, (9) spells of terror or panic, (10) feeling restless, can't sit down. The depressive symptoms are: (1) feeling low in energy – slowed down, (2) blaming yourself for things, (3) crying easily, (4) loss of sexual interest or pleasure, (5) poor appetite, (6) difficulty falling asleep, staying asleep, (7) feeling hopeless about the future, (8) feeling blue, (9) feeling lonely, (10) feeling trapped or caught, (11) worrying too much about things, (12) feeling no interest in things, (13) thoughts of ending your life, (14) feeling everything is an effort, and (15) feelings of worthlessness. The HSCL-25 has been validated in Finnish population samples (Joukamaa et al., 1994; Veijola et al., 2003), and both instruments showed acceptable reliability with Guttman split-half coefficient 0.797 and Cronbach's alpha 0.770 for anxiety, and correspondingly 0.868 and 0.885 for depression.

2.3.4. Background data

The basic interview comprised extensive data on participants' background, health, and functioning. In this study, sex (Male/Female), age, marital status (Single/Married/Cohabitant/Divorced or Separated/Widowed), education level (Primary/Secondary/Higher), and daily income measured in Finnish Marks (FIM) with categories: Less than 2000, 2001–10,000, 10,001–15,000, 15,001–25,000, over 25,001 were used as confounders. The original questions are shown in Supplementary Material.

2.4. Statistical analyses

2.4.1. Sociodemographic descriptives

Initially, the means (SD) of alexithymia at baseline and follow-up were calculated according to participants' background, and differences were assessed using Student's T-test. The correlations between the number of ACEs, depression, and anxiety were also calculated.

2.4.2. Factor analysis

Given the heterogeneity of the ACE items, they were factorised, and 3 varimax-rotated component scores with eigenvalues greater than 1 were interpreted: 1. Family conflicts, 2. Social disadvantage, and 3. Mother's mental problems. Dimension loadings greater than 0.4 are reported, hence, the loading of father's mental problems on the Social disadvantage dimension (0.365) is not included (see Supplementary

Table 4). These three ACE dimensions were used as explanatory variables for variance in alexithymia and its subscales.

2.4.3. Repeated measures analysis of variance

In the repeated measures ANOVA, the variance of alexithymia in 2000 and 2011, along with their subscales, was initially explained by the sum of ACEs and its factor dimensions, while controlling for confounders such as sex, age, levels of basic and occupational education, and income. Marital status was excluded from the final analyses due to its lack of significant effect in preliminary analyses. In the second phase, depression and anxiety were also included as independent variables. Analyses were conducted for all participants and then separately males and females. Effect sizes (partial eta squared, hp^2), confidence intervals (CI), and p -values were reported.

2.4.4. Path analyses

For path analyses, the PROCESS macro in SPSS (model template 4) by Hayes (2020) was used. In cross-sectional samples, this macro tests the direct and indirect effects of an independent variable (X) on a dependent variable (Y) while modelling a process in which X affects mediators (M), which in turn affects Y. In the present study, we applied a prospective model to analyse the effect of X (ACEs) on Y (alexithymia and its subdomains) with M (depression and anxiety in 2011) as mediators. The total effect of X on Y, as well as the direct and indirect effects through the mediators, are reported. These analyses were controlled for sex, age, education, and income.

The data were analysed using SPSS software (version 28.0 for Windows). P -values less than 0.05 (two-tailed) were considered statistically significant.

3. Results

3.1. Alexithymia features and their association with participants' background

At baseline, the participant reported an average of 51.4 (SD 8.3) alexithymia points, with subdomain scores of 12.7 (SD 4.6) for DIF, 12.4 (SD 2.9) for DDF, and 26.4 (SD 3.5) for EOT. In 2011, the scores slightly changed to 51.0 (SD 8.9) for alexithymia, 12.4 (SD 4.9) for DIF, 12.2 (SD 3.0) for DDF, and 26.4 (SD 3.7) for EOT. Between 2000 and 2011, alexithymia scores correlated strongly ($r = 0.558$), suggesting it is a stable personality trait.

In both 2000 and 2011, males reported higher alexithymia, DDF, and EOT scores than females; however, no sex differences were observed for DIF (Table 1 and Supplementary Table 1). Females reported significantly ($p < .001$) higher depression (19.4 [SD 4.9]) and anxiety (12.3 [SD 2.5]) scores compared to males (18.5 [SD 4.7]

for depression and 11.8 [SD 2.4] for anxiety). Alexithymia scores increased with age and decreased with higher levels of education and income (Table 1). Marital status showed no significant association with alexithymia scores. The number of ACEs showed a slight correlation with alexithymia scores in both 2000 and 2011 but a strong correlation with depression and anxiety in 2011 (Table 1).

3.2. Individual ACEs and their associations with alexithymia

Regarding individual ACEs, issues like parents' diseases, financial difficulties, father's alcohol problems, family conflicts, being bullied at school, parents' divorce, and unemployment were the most frequently reported ACEs (> 5%). Over 40% of participants reported no ACEs, 25% reported one, 15% two, and 17% three or more. Financial difficulties, parents' diseases, the participant's own illness, and being bullied at school were significantly associated with alexithymia scores in both 2000 and 2011. Parents' unemployment was also associated with alexithymia scores in 2011 (Table 2).

Table 1. Means (SD) of alexithymia (Toronto Alexithymia Scale, TAS-20) scores in 2000 and 2011 by background information and correlations of adverse childhood experiences (ACEs) with alexithymia scores in 2000 and 2011 and with depression and anxiety in 2011.

	N = 3142 %	TAS-20 in 2000		TAS-20 in 2011	
		Mean	SD	Mean	SD
Total	100.0	51.4	8.3	51.0	8.9
Sex (p)		<0.001		<0.001	
Male	43.9	52.6	8.4	51.8	9.0
Female	56.1	50.5	8.1	50.3	8.8
Age (p)		<0.001		<0.001	
30–34	13.7	49.9	6.8	48.5	7.0
35–39	15.3	50.7	7.7	49.6	8.1
40–44	14.6	51.5	7.7	50.6	8.2
45–49	16.5	51.2	8.1	50.6	8.5
50–54	17.3	52.3	9.0	51.8	9.2
55–59	12.4	52.2	8.7	52.9	9.7
60–64	10.2	52.7	9.7	53.7	11.0
Marital status (p)		0.062		0.063	
Single	14.0	51.8	8.5	51.6	9.3
Married	64.5	50.8	7.7	50.4	8.7
Cohabitant	5.7	51.4	8.9	52.0	9.8
Divorced/Separated	0.2	54.2	9.9	55.1	10.6
Widowed	15.7	51.7	8.3	52.0	9.0
Basic education (p)		<0.001		<0.001	
Primary	25.4	53.0	9.0	53.6	10.0
Secondary	36.0	52.1	8.4	51.3	9.2
Higher	38.6	49.8	7.3	48.9	7.3
Income (FIM) (p)		<0.001		<0.001	
Less than 5000	5.0	53.4	9.3	54.5	9.4
5001–10000	15.7	52.9	8.9	52.7	10.3
10001–15000	20.4	51.7	8.4	52.1	9.4
15001–25000	36.4	51.3	8.2	50.3	8.3
25001+	22.5	50.0	7.3	48.9	7.6
Correlations with TAS-20		r	p	r	p
Number of ACEs		0.070	<0.001	0.053	0.003
Depression in 2011				0.341	<0.001
Anxiety in 2011				0.282	<0.001
Correlations with ACEs					
Depression in 2011				0.210	<0.001
Anxiety in 2011				0.179	<0.001

3.3. Associations of the sum of ACEs with alexithymia

A repeated measures ANOVA, controlling for sex, age, education, and income, showed that the total sum of ACEs was positively associated with alexithymia ($hp^2 = 0.002$; $p = .001$), DIF ($hp^2 = 0.013$; $p < .001$), and DDF ($hp^2 = 0.002$; $p < .020$), but negatively associated with EOT ($hp^2 = 0.002$; $p = .007$) (Table 3, Supplementary Table 2). When anxiety and depression were also included as factors, only the negative association with EOT ($hp^2 = 0.002$; $p = .009$) remained significant (Table 3, Supplementary Table 2). The lack of a significant association between ACEs and alexithymia, particularly in the DIF and DDF subdomains, indicated that anxiety and depression acted as mediators between ACEs and alexithymia features. This was further confirmed through path analyses (Supplementary Table 3a).

3.4. Factor analysis of ACE items

Factor analysis of 11 ACE items yielded three dimensions: 1. Family conflicts, 2. Social disadvantage, and 3. Mother's mental health problems (Supplementary Table 4). Financial difficulties, father's alcohol problems, family conflicts, and parents' divorce were loaded on the Family conflicts dimension. Financial difficulties, parents' unemployment, parents' diseases, the participant's chronic illness, and being bullied at school were loaded on the Social disadvantage dimension, mother's alcohol and mental health problems were grouped under the mother's mental health problems dimension. Females reported more family

conflicts and mother's mental health problems than males (Supplementary Table 5).

3.5. Associations of ACE dimensions with alexithymia and its subdomains

3.5.1. Social disadvantage

Repeated ANOVAs with ACE dimensions indicated that childhood social disadvantage was positively associated with alexithymia ($hp^2 = 0.005$; $p < .001$), DIF ($hp^2 = 0.012$; $p < .001$), and DDF ($hp^2 = 0.004$; $p < .001$). When depression and anxiety were also considered, social disadvantage remained positively associated with DIF ($hp^2 = 0.002$; $p = .008$). The effects of social disadvantage on the alexithymia subdomains were further detailed in Supplementary Figure 2. Path analyses confirmed that depression and anxiety acted as mediators between social disadvantage and the alexithymia subdomains DIF and DDF (Supplementary Table 3b).

3.5.2. Family conflicts

Family conflicts were associated positively with DIF ($hp^2 = 0.002$; $p = .023$) but negatively with EOT ($hp^2 = 0.001$; $p = .038$) (Table 3, Supplementary Table 6). When depression and anxiety were also considered, family conflicts were negatively associated with alexithymia ($hp^2 = 0.002$; $p = .012$), DDF ($hp^2 = 0.003$; $p = .004$), and EOT ($hp^2 = 0.001$; $p = .044$).

3.6. Sex-specific analyses

3.6.1. Males

In males, after controlling for age, education, and income, ACEs ($hp^2 = 0.006$; $p = .003$) and social disadvantage ($hp^2 = 0.006$; $p = .005$) were associated with

Table 2. Alexithymia (TAS-20) scores in 2000 and in 2011 by adverse childhood experiences (ACEs).

ACE items		ACEs <i>n</i> = 3142 (%)	TAS-20 in 2000			TAS-20 in 2011		
			Mean	SD	<i>p</i>	Mean	SD	<i>p</i>
1. Financial difficulties	No	77.2	51.11	8.13	50.76	8.87		
	Yes	22.8	52.57	8.66	51.61	9.08	.026	
2. Parents' unemployment	No	93.8	51.39	8.21	50.83	8.90		
	Yes	6.2	52.35	9.28	52.84	9.15	.002	
3. Parents' diseases	No	76.4	51.28	8.15	50.67	8.91		
	Yes	23.6	51.97	8.66	51.88	8.93	.001	
4. Father's alcohol problems	No	83.6	51.41	8.22	50.99	8.91		
	Yes	16.4	51.65	8.58	50.80	9.03	.658	
5. Mother's alcohol problems	No	98.7	51.45	8.26	50.96	8.93		
	Yes	1.3	50.88	9.57	50.70	8.96	.856	
6. Father's mental problems	No	96.7	51.40	8.26	50.93	8.92		
	Yes	3.3	52.74	8.77	51.67	9.09	.405	
7. Mother's mental problems	No	96.5	51.43	8.28	50.92	8.90		
	Yes	3.5	51.85	8.23	52.05	9.65	.192	
8. Family conflicts	No	82.8	51.34	8.24	51.02	8.99		
	Yes	17.1	51.98	8.44	50.66	8.61	.399	
9. Parents divorced	No	91.0	51.49	8.30	51.00	8.90		
	Yes	9.0	51.05	8.12	50.51	9.23	.382	
10. Subject's chronic illness	No	95.5	51.37	8.25	50.84	8.91		
	Yes	4.5	53.11	8.74	53.38	8.97	<.001	
11. Subject bullied at school	No	84.8	51.21	8.17	50.77	8.95		
	Yes	15.2	52.75	8.77	51.97	8.76	.007	
Number of ACEs	0	42.0	50.91	8.13	50.51	8.83	.091	
	1	25.1	51.46	8.08	51.10	9.08		
	2	15.5	51.84	8.45	51.28	9.18		
	3+	17.4	52.36	8.68	51.54	8.67		

Table 3. Repeated measures ANOVA for the effect of number and dimensions of adverse childhood experiences (ACEs) on alexithymia and its subscales. Confidence intervals of parameter estimates. Significant associations only.

	TAS-20 95% CI		DIF 95% CI		DDF 95% CI		EOT 95% CI	
A.								
ACEs, 2000	0.152*	0.539*	0.229*	0.447*	0.019*	0.155*	-0.161*	0.002*
ACEs, 2011	0.024*	0.436*	0.178*	0.404*	-0.016*	0.124*	-0.202*	-0.026*
B.								
ACEs, 2000							-0.163*	0.003*
ACEs, 2011							-0.200*	-0.021*
A.								
Family conflicts, 2000			0.063*	0.378*			-0.156*	0.079*
Family conflicts, 2011			-0.053*	0.273*			-0.302*	-0.050*
Social disadvantage, 2000	0.252*	0.828*	0.306*	0.630*	0.090*	0.291*		
Social disadvantage, 2011	0.227*	0.840*	0.273*	0.609*	0.033*	0.241*		
Mother's mental problems, 2000								
Mother's mental problems, 2011								
B.								
Family conflicts, 2000	-0.381*	0.164*			-0.191*	0.003*	-0.156*	0.081*
Family conflicts, 2011	-0.782*	-0.222*			-0.250	-0.055*	-0.299*	-0.044*
Social disadvantage, 2000			0.088*	0.396*				
Social disadvantage, 2011			-0.039*	0.261*				
Mother's mental problems, 2000								
Mother's mental problems, 2011								

Note. A. The effect of sex, age, education and income controlled, B. The effect of sex, age, education, income and anxiety and depression controlled. TAS-20 = Alexithymia, DIF = Difficulty Identifying Feelings, DIF = Difficulty Describing Feelings, EOT = Externally-Oriented Thinking. Significant ($p < .05$) confidence intervals **bolded**. * Significant ($p < .05$) between-subjects effects.

Table 4. Repeated ANOVA for the effect of number and dimensions of adverse childhood experiences (ACE) on alexithymia and its subdomains in males and females separately. Confidence intervals of parameter estimates. Significant associations only.

	Male		Female			
	Model 1 95% CI	Model 2 95% CI	Model 1 95% CI	Model 2 95% CI	Model 1 95% CI	Model 2 95% CI
Alexithymia (TAS-20)						
ACEs, 2000	0.197*	0.825*				
ACEs, 2011	0.003*	0.670*				
Family conflicts, 2000					-0.670*	0.023*
Family conflicts, 2011					-0.994*	-0.279*
Social disadvantage, 2000	0.107*	0.989*	0.171*	0.932*		
Social disadvantage, 2011	0.114*	1.050*	0.100*	0.913*		
Mother's mental problems, 2000						
Mother's mental problems, 2011						
DIF						
ACEs, 2000	0.237*	0.588*	0.152*	0.428*		
ACEs, 2011	0.133*	0.488*	0.129*	0.422*		
Family conflicts, 2000	0.120*	0.628*				
Family conflicts, 2011	-0.079*	0.435*				
Social disadvantage, 2000	0.195*	0.689*	0.279*	0.708*	0.096*	0.507*
Social disadvantage, 2011	0.153*	0.652*	0.245*	0.701*	-0.027*	0.382*
Mother's mental problems, 2000			-0.083*	0.299*		
Mother's mental problems, 2011			0.040*	0.444*		
DDF						
ACEs, 2000						
ACEs, 2011						
Family conflicts, 2000					-0.272*	-0.031*
Family conflicts, 2011					-0.298*	-0.054*
Social disadvantage, 2000	0.021*	0.337*	0.073*	0.335*		
Social disadvantage, 2011	-0.048*	0.274*	0.024*	0.296*		
Mother's mental problems, 2000			-0.023*	0.209*		
Mother's mental problems, 2011			0.028*	0.269*		
EOT						
ACEs, 2000			-0.211*	-0.005*	-0.214*	-0.004*
ACEs, 2011			-0.281*	-0.065*	-0.269*	-0.049*
Family conflicts, 2000			-0.236*	0.061*	-0.239*	0.061*
Family conflicts, 2011			-0.395*	-0.085*	-0.381*	-0.068*
Social disadvantage, 2000						
Social disadvantage, 2011						
Mother's mental problems, 2000						
Mother's mental problems, 2011						

Note. DIF = Difficulty Identifying Feelings, DIF = Difficulty Describing Feelings, EOT = Externally-Oriented Thinking. Model 1: Sex, age, education and income controlled, Model 2: Sex, age, education, income and anxiety and depression controlled. Significant ($p < .05$) confidence intervals **bolded**. * Significant ($p < .05$) between-subjects effects.

alexithymia. Moreover, ACEs ($hp^2 = 0.015$; $p < .001$), family conflicts ($hp^2 = 0.004$; $p = .017$), and social disadvantage ($hp^2 = 0.010$; $p < .001$) were positively associated with DIF, and social disadvantage ($hp^2 = .003$; $p = .038$) was also associated with DDF (Table 4).

3.6.2. Females

In females, the sum of ACEs had no significant association with alexithymia. Instead, the social disadvantage dimension was significantly associated ($hp^2 = 0.005$; $p = .003$) with alexithymia. After controlling for anxiety and depression, childhood family conflicts were negatively associated with alexithymia ($hp^2 = 0.005$; $p = .002$) (Table 4, Supplementary Table 7).

Furthermore, in females, ACEs ($hp^2 = 0.011$; $p < .001$), social disadvantage ($hp^2 = 0.013$; $p < .001$), and mother's mental health problems ($hp^2 = 0.003$; $p = .019$) were positively associated with DIF, while social disadvantage ($hp^2 = 0.005$; $p = .002$) and mother's mental health problems ($hp^2 = 0.003$; $p = .020$) were also associated with DDF. After controlling for anxiety and depression, social disadvantage remained positively associated with DIF ($hp^2 = 0.004$; $p = .008$) (Table 4, Supplementary Table 6).

Notably, in females, ACEs ($hp^2 = 0.006$; $p = .002$) and family conflicts ($hp^2 = 0.004$; $p = .012$) were negatively associated with EOT, and these associations remained significant even after controlling for anxiety and depression (correspondingly: $hp^2 = 0.003$; $p = .017$ and $hp^2 = 0.005$; $p = .004$) (Table 4, Supplementary Table 7).

4. Discussion

4.1. ACEs associate with alexithymia

We studied the associations between childhood adversities and alexithymia, along with its subdomains, in general population over an eleven-year follow-up period. Our findings indicate that ACEs are positively associated with alexithymia and its subdomains DIF and DDF. This finding aligns with previous research linking childhood abuse and neglect to alexithymia, as well as its specific subdomains (Brown et al., 2018; Joukamaa et al., 2008; Kajanoja et al., 2021). Our study extends these findings to the general population. By employing a more comprehensive definition of ACEs, we were able to demonstrate a broader applicability of childhood adversities in investigating the associations between ACEs and alexithymia features.

4.2. ACE dimensions

Among the ACE dimensions, childhood social disadvantage (including parental unemployment and diseases, the individuals' chronic illness, and experiences

of being bullied at school) emerged as a significant factor associating with increased alexithymia and difficulties in identifying and describing feelings. Supporting our second hypothesis, we found that the influence of ACEs, particularly social disadvantage, on alexithymia and its subdomains, DIF and DDF, was largely mediated through emotional disturbances such as depression and anxiety.

This suggests that alexithymia features may predispose individuals to emotional disturbances stemming from childhood adversities. Kajanoja et al. (2021) also observed that individuals with depression and co-occurring alexithymia reported a higher prevalence of emotional neglect and attachment issues than those without alexithymia.

The extent of ACEs' effect on alexithymia varied across its subdomains. ACEs, and specifically social disadvantage, had a strong effect on DIF and a moderate effect on DDF. Remarkably, the effect of childhood social disadvantage on DIF persisted even after adjusting for emotional symptoms, indicating that childhood adversities, especially social disadvantage, profoundly disturb the ability to recognise and identify emotions. This disruption may partially explain the observed difficulties in describing emotions, positioning the effect on DIF as primary and that on DDF as more secondary. Contrary to these findings, ACEs were negatively associated with EOT, a relationship not explained by emotional disturbances. This indicates a complex interplay between childhood adversities and the development of alexithymia features.

Our analysis revealed that the associations between ACEs with alexithymia features were largely independent of sociodemographic factors such as sex, age, education, and income level. This aligns with previous studies, which have found these factors to be associated with alexithymia and its subdomains (Kokkonen et al., 2001; Mattila et al., 2006; Salminen et al., 1999). Likewise, emotional symptoms, such as depression and anxiety, which have been repeatedly associated with childhood adversities (Ferguson & Dacey, 1997; Salokangas et al., 2016), are also associated with alexithymia and its subdomains, DIF and DDF. Thus, current emotional disturbances that impair individuals' ability to identify and consequently describe their feelings may be partially attributed to childhood adversities.

4.3. Sex differences

According to our first hypothesis, the effect of ACEs on alexithymia and its subdomains differed between males and females. Males reported higher levels of alexithymia, DDF, and EOT than females, but no sex difference was observed in DIF. Additionally, while the alexithymia-increasing effects of ACEs in males were explained by emotional symptoms, some effects

in females appeared to diminish when controlling for emotional symptoms. Interestingly, females reported more ACEs, particularly family conflicts and mother's mental health problems, than males. This disparity might not reflect sex-dependent experiences but rather a greater recognition or reporting of these adversities by females. The lack of sex difference in social disadvantage suggests a more nuanced relationship between ACEs, alexithymia, and sex.

In both sexes, childhood social disadvantage was associated with DIF and DDF, and particularly with DIF in females, even when controlling the effect of emotional symptoms. These findings indicate that childhood social disadvantage may disrupt children's ability to acknowledge their emotional experiences, affecting both males and females equally. This emphasises the significance of social disadvantages in childhood families in shaping children's personality development, including brain development, academic achievements, and psychological well-being (Evans & De France, 2022; Hair et al., 2015). Notably, participants' education and their own socioeconomic status, assessed by monthly income, did not mitigate these effects, highlighting the lifelong effect of childhood socioeconomic circumstances on neural development (Kim et al., 2013).

Family conflicts – including father's alcohol problems and parents' divorce – were associated with alexithymia and emotional symptoms differently in males and females, suggesting that the nature and impact of these adversities may vary depending on sex and emotional state. Males reported less family conflicts than females. Thus, it is possible that the family conflicts reported by males directly disturb or block their ability to identify their emotions, and this inability persist into adulthood. In females, current emotional symptoms may mask or cover their readiness to describe their feelings, but when the effect of emotional symptoms is 'treated' away, females may be open to talk about their painful experiences related to childhood family conflicts.

Females also reported mother's mental health problems more frequently than males, and in females, these problems associated with both DIF and DDF. Young girls may have a closer relationship with their mother, and consequently may become more aware of or feel more deeply affected by their mother's mental health problems compared to their brothers. Studies have shown that females tend to exhibit greater interpersonal care and responsibility than males in early interactions with their mother (Kochanska, 1997), and girls more often act to alleviate maternal distress and to maintain or restore relational harmony (Butler & Shalit-Naggar, 2008). Additionally, emotional state plays a central role in these associations, indicating that experiencing mother's mental health problems is associated with

adult emotional symptoms. Recovery from emotional disturbances may reduce these alexithymia features and improve the therapeutic healing process.

The study also identified a sex difference in EOT. Individuals with difficulties in describing feelings and externally oriented thinking often show deficits in linguistic expression and verbal communication (Luminet et al., 2001). A substantial body of research has confirmed that females generally possess superior verbal abilities compared to males (Vogel, 1990), and that also reflected in the present 2000 Health population (Aromaa & Koskinen, 2004). Thus, the sex difference in alexithymia features, such as externally oriented thinking and difficulties describing feelings, may not necessarily stem from males' inability to identify feelings but rather from their tendency to use concrete verbal expressions, resulting in less rich and diverse expressions when describing their feelings.

In males, ACEs had no effect on EOT, indicating that externally oriented thinking represents a primary personality feature unaffected by environmental factors in childhood or adulthood. In females, however, ACEs, particularly family conflicts, were associated with decreased externally oriented thinking, and emotional state had no effect on these associations. This indicates that childhood family conflicts may sensitise young girls to scrutinise their emotions more closely, predisposing them later in adulthood to internal rather than external thinking. This internal focus may prepare them to process their childhood experiences, for example, within therapeutic relationships.

Difficulties in identifying and describing feelings functioned similarly to total alexithymia scores, as they form the main components of the alexithymia construct (Cerutti et al., 2018). However, the domain of externally oriented thinking behaved differently. Generally, individuals with externally oriented thinking focus their attention on external events and tend to avoid or remain disconnected from their internal emotional experiences. Noteworthy, in the main analyses, externally oriented thinking was consistently associated with male sex and low education, but not with depression and anxiety. Similarly, in a sample of young healthy individuals, an externally oriented, concrete way of thinking was not associated with either positive or negative affect (Suslow & Donges, 2017).

4.4. Advantages and limitations

The Health 2000 data encompasses Finnish individuals aged 30 or older. In this study, participants older than 64 years were excluded, meaning our sample primarily represents the working-age population. However, because alexithymia refers to personality traits, the findings may also be applicable to

younger individuals. The prospective design and the large number of participants stand out as clear advantages of this study. However, we did not control for the effects of psychosomatic or psychiatric disorders, which may limit the generalisability of our conclusions.

The observation that females reported more family conflicts and maternal mental health problems indicate potential sex biases in observation, recall, or reporting. The ACE items focus on objective events, which typically show weaker associations with outcome factors than subjective experiences. This aspect could be seen as a limitation or an advantage, depending on the perspective. A catalogue of objective events might provide more reliable data than subjective, self-reported questionnaires of childhood experiences (Hovens et al., 2010).

However, our study did not cover all aspects of ACEs, such as childhood maltreatment, including emotional, physical, or sexual abuse, or emotional neglect and childhood trauma (Fares-Otero & Seedat, 2024), potentially diminishing the comprehensiveness of our findings on the effect of ACEs on alexithymia. An important limitation relates to the lack of childhood maltreatment. Additionally, the duration of ACEs was not available, limiting our ability to assess their long-term effects. To the best of our knowledge, this is the first study to explore the effects of ACEs on alexithymia and its subdomains in a prospective, population-based setting, highlighting the need for further research in this area.

5. Clinical implications

According to a recent review, various psychotherapeutic interventions can alleviate alexithymia features, including difficulty to identify and describe feelings, and external oriented thinking, as well as alexithymia-related somatoform symptoms, depression and anxiety (Boecking & Mazurek, 2023; Freiherr von Schoenhueb et al., 2023). The results of the present study emphasise the significance of childhood adversities and emotional symptoms.

Firstly, it is important to explore patients' childhood living conditions, their childhood family's emotional atmosphere, and how they perceived these experiences. In case of social disadvantage, such as unemployment, poverty, deprivation, or family members' illnesses, improving the patient's self-esteem and self-confidence, along with therapeutic efforts to address obstacles in identifying and describing emotions, is essential.

In female patients, particularly, the relationship with their mother may require therapeutic attention. Psychotherapeutic and pharmacotherapeutic interventions directed towards alleviating emotional disturbances may also reduce alexithymia features and

improve patient's overall functioning. In patients with pronounced externally oriented thinking, neurocognitive and cognitive-behavioural interventions may be considered.

6. Conclusions

In a prospective population study, we investigated the associations between ACEs and alexithymia features. We found that the number of ACEs, particularly childhood social disadvantage, was positively associated with alexithymia and its subdomains – difficulty to identify and describe feelings – and negatively with externally oriented thinking. Depression and anxiety acted as mediators between social disadvantage and difficulty to identify and describe feelings.

Childhood family conflicts were positively associated with difficulty to identify feelings in males, negatively associated with externally oriented thinking in females, and maternal mental health problems were positively associated with difficulty to identify and describe feelings in females. In the treatment of patients with alexithymia, it is important to investigate their childhood living conditions, the emotional atmosphere of their childhood family, and how they perceived these experiences, as well as sex differences in the associations between childhood adversities and alexithymia features.

Data availability statement

Data not available due to ethical and legal restrictions.

Ethical standards

The study had approval of the Ethics Committee of the Hospital District of Helsinki and Uusimaa. Participants provided written informed.

Authors' contributions

Raimo K. R. Salokangas: Conceptualisation, methodology, formal analyses, writing-original draft preparation, writing-reviewing and editing. Tiina From: data curation, writing-reviewing and editing. Henri R. W. Salokangas, Lara Lehtoranta, Matti Joukamaa: writing-reviewing and editing. Jaana Suvisaari and Max Karukivi: Conceptualisation, writing-reviewing and editing. Seppo Koskinen: Resources, project administration, writing-reviewing and editing. Jarmo Hietala: writing-reviewing and editing, supervision.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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