Association between childhood health, socioeconomic and school-related factors and effort-reward imbalance at work: a 25-year follow-up study

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Abstract

Objectives: Stress pathways can have origins in childhood but few early predictors have been explored in relation to adult job stress. This study examined whether childhood school, health or socioeconomic factors were associated with adult job stress.

Methods: Data came from the Childhood Determinants of Adult Health study that began in 1985 with children aged 7 to 15 years who reported effort-reward imbalance (ERI) scales at ages 31-41 years. Linear regression assessed the association between childhood factors and adult ERI adjusted for age and socioeconomic position (SEP) in childhood and adulthood.

Results: There were between 999 and 1,390 participants in each analysis. Lower adulthood ERI, indicating less job stress, was predicted by several school-related factors in men. For example, each higher category of learner self-concept was associated with a 19% (95%CI -32%, -6%) reduction in adult ERI and each unit increase in academic attainment was associated with a 15% (95%CI -28%, -3%) reduction in adult ERI. Childhood health was associated with adult ERI. For example, in women, overweight children had 14% (95% CI: 5%, 22%) higher adult ERI scores compared to healthy weight children and each unit of negative affect was associated with 2% (95%CI: 1%, 4%) increase in adult ERI. Adult SEP had no effect on these associations for men, but explained some of the effect in women. Childhood SEP had inconsistent associations with adult ERI.

Conclusion: Our findings suggests that a range of childhood socioeconomic, school- and health-related factors might contribute to the development of job stress in adulthood.

Key words: effort-reward imbalance, childhood related factors

Job stress is a well-recognised risk factor for poor physical and mental health in working populations [1 2]. Job stress is measured by instruments that assess objective aspects of the work environment and subjective individual perceptions of their work environment. An individual's perception of job stress, and potentially its effects on their mental and physical health, may therefore be a function of both the work environment but also individual resources to cope with any stress related to the work environment. As such, the established risk factors of job stress in adults include unfavourable working conditions [2-4], as well as individual characteristics such as personality, coping style and socioeconomic factors that might increase susceptibility to job stress [4]. Our resilience as adults is shaped by our experiences and environment from early in life [5]. Based on this, a small number of studies have suggested that childhood experiences and environment could also be determinants of adult job stress as part of a broader literature examining its 'pre-employment' predictors[6]. Understanding pre-employment factors for job stress is important for identifying workers at risk of job stress but also for understanding the mechanisms by which it develops.

School is where children acquire interpersonal skills that may be beneficial for coping with job stress later in life [7]. Further, children spend a large amount of their time at school and it has some parallels with the workplace in adulthood. Elovainio et al. reported that negative aspects of school such as a lower academic score, repeating a class and absences were associated with lower job control, higher job demand or greater job strain in early midlife [6]. We have previously shown that some positive school experiences, namely higher childhood school engagement, predicted higher adult education and occupation status,[8] so they may also be important for job stress but this has not been examined.

Family also greatly influences the development of children and there is some evidence that higher parental socioeconomic position (SEP) in childhood is associated with lower job stress

in adulthood in several studies from Finland [6 9 10]. In one study, the association between higher parental SEP and lower job stress in adulthood was mediated by attained education in adulthood [9]. The attainment of education through schooling also provides more opportunities to attain higher levels of education and better status jobs that appear to protect against exposure to job stress later in life [11]. Other measures of childhood SEP, such as area-level SEP, have not been investigated as risk factors for job stress and the relevance of childhood SEP to adult job stress to cohorts outside of Scandinavia is uncertain.

Poorer health in childhood may affect cognitive and social development, including educational attainment, into adulthood and increase a person's risk of exposure to job stress in adulthood [11]. A small body of literature has examined whether markers of health in childhood predict adult job stress. Being physically inactive in leisure time in adolescence was an independent risk factor for higher job strain in adulthood compared to being persistently active over 3 years [12]. Elovainio *et al.* also reported that alcohol consumption and smoking in adolescence predicted adult job control, job demand and job strain, but not job stress [6]. Lower psychological wellbeing in childhood may also predict adult job stress. Stansfeld *et al.* examined employed 45 year olds from a British birth cohort and reported that participants with psychological problems in childhood were 20% less likely to report higher demands but were 51% more likely to report low decision latitude than those without psychological problems [13]. This provides evidence for the importance of indirect effects of childhood factors on adult job stress through the selection of people into jobs at higher risk of job stress. It highlights the need for careful consideration of the role of attained levels of education and occupation when considering these associations [9 10].

Given the limited literature on childhood predictors of adult job stress, there is an opportunity for greater understanding of the role of these factors in other populations. The aim of this

exploratory study was to examine whether childhood SEP, school- and health-related factors were associated with adult ERI in a longitudinal cohort study from Australia and to understand the role of adult SEP in explaining any associations found.

Method

Participants

The Childhood Determinants of Adult Health (CDAH) study is a cohort study of participants in the 1985 Australian Schools Health and Fitness Survey (ASHFS). The methods for ASHFS are described elsewhere [14]. In brief, there were 8,498 participants in ASHFS aged 7-15 years with body weight, height, girth and fitness measures and a subset of children aged from 9 to 15 years (n=6,559) who also completed a questionnaire (see 'childhood factors' below) on sociodemographic and school- and health-related factors. In the first follow-up, during 2004-2006, participants retrospectively reported childhood SEP when aged 26-36 years. In a second follow-up during 2009-2011, participants completed questionnaires and a telephone interview when aged 31-41 years.

Childhood Factors

School related factors

School-related factors included a school engagement index (SEI), learner self-concept, academic attainment and enjoyment of physical activity. The SEI (range *'0'* to *'6'* with 6 meaning more engaged) combined items asking *'Do you enjoy school?'* and *'During past few weeks how often have you felt bored?'* [15]. Academic attainment was assigned by a representative from the school and collapsed into four groups (*'poor/below average'*, *'average'*, *'above average'* and *'excellent'*). Learner self-concept was measured from children's responses to the question: *'How good are you at school work compared to others of your age?'* with responses being *'better than most'*, *'about the middle'* or *'not as good as*

most'. Children also reported whether they enjoyed school physical education (PE) or sports (response options: '*very much'* to *'don't do'*) and physical activity in general (response options: *'yes'* or *'no'*).

Childhood SEP

In 2004-2006, participants retrospectively reported childhood SEP at the age of 12 years including highest education level (categories: *'less than 12 years', 'diploma/trade'* or *'equivalent/ higher than university degree'*) and occupation status (categories: *'manager/professional', 'clerical'* or *'labourer /no paid job'*) of their parents; how many rooms in their house (categories: *'less than 7', '8-10'* or *'more than 10 rooms'*), whether their parents owned the house in which they lived, (response options: *'yes'* or *'no'*), how often they moved (categories: *'0', '1-3'* or *'more than 3 times'*) and number of siblings (categories: *'0-1', '2-3'* or *'more than 3 siblings'*) [16 17]. In addition, area-level SES was assigned using data from the Australia Bureau of Statistics' 1986 Census of Population and Housing using children's residential postcodes [8].

Health-related factors

Children self-rated their fitness compared with their peers (categories: *'better than most', 'the same as others'* or *'worse than others'*) and overall health (5 categories: *'very good'* to *'very poor')*. BMI was calculated from measured height and weight and collapsed into normal and overweight defined using age- and sex-specific cut points [18]. Current smoking status was defined as either *'yes'* (≥1 cigarette/week) or *'no'* (non-smoking) and alcohol consumption as *'yes'* (any level of alcohol consumption) or *'no'* (non-drinking). The Bradburn Affect Balance Scale measured psychological well-being [19]. It includes 10 items on positive affect (5 items, Chronbach's alpha: boys = ;0.58 girls = 0.60) and negative affect (5 items, Chronbach's alpha: boys = 0.56; girls = 0.60). Physical activity was measured by self-report from children

including riding and walking to or from school, in school or out of school sports and physical education in the past 7 days [20].

Adult Effort-Reward Imbalance

Participants completed the ERI scale at follow-up, which has good reliability and validity [21]. This measure includes 17 items (6 effort items and 11 reward items) [22], with the effort scale (Chronbach's alpha: men = 0.79; women = 0.80) covering workplace interruptions, job responsibility, pressure to work overtime, physical demands and increasing job demands and the reward scale (Chronbach's alpha: men = 0.76; women = 0.74) including esteem, job security and job promotion. Score on each item ranged from '1' to '5' and the sum score of effort ranged from 6 to 30 and reward ranged from 11 to 55. As per scoring guidelines, the ERI ratio was calculated as effort/(reward×6/11) and was used ERI ratio as a continuous variable (higher scores indicates higher job stress) [22].

Covariates

Age, childhood SEP (area-level SES and paternal occupation status) and adult SEP (participants' highest education level and current occupation status) were considered as potential covariates when assessing the association between childhood factors and adult ERI. We used participants' education level and occupation status to estimate adult SEP. These were collected during 2009-2010 when participants were aged 31-41 years. Participants' education level was collapsed into three categories: less than 12 years, diploma/trade and equivalent or higher than university degree. The occupation status of participants was also collapsed into three categories: manager/professional, clerical and labourer.

Data analysis

Linear regression was used to assess the association between childhood factors and adult log transformed ERI. A benefit of the log transformation of the ERI ratio is that the β coefficients from the linear regression models can be interpreted as the percentage difference in ERI ratio for a given exposure category compared to the reference category. Models are presented adjusted for age (Model 1), age and childhood SEP (Model 2) and additionally adjusted for adulthood SEP (Model 3). We used multiple imputation with chained equations and with 30 estimations to impute missing data on covariates. Further details of the statistical analyses are presented in the online supplement.

Previous studies implied a gender difference in job stress [23] and that the components of the ERI scale independently predict disease [1]. Therefore, we performed analyses separately in male and females, and also for the different ERI components, with results for the effort and reward scales in the online supplement. Analyses were conducted with STATA version 12.1 (Statacorp, 2012).

Ethics

ASHFS was approved by the Director General of Education in each state and territory and all participating children and their parents' consented. The CDAH follow-up waves were approved by the Southern Tasmanian Health and Medical Human Research Ethics Committee and participants' provided written informed consent.

Results

A flow chart of participation in the study is shown in Figure 1. The characteristics of participants are presented in Supplementary Tables 1, 2 and 3.

School-related factors

Better learner self-concept and academic attainment in childhood predicted lower ERI for men (Table 2). These associations were not changed by adjustment for childhood (model 2) or adulthood SEP (model 3). For women, those with better learner self-concept had higher ERI compared to those that reported worse learner self-concept. The magnitude of the association was greatly reduced and was no longer statistically significant once adult SEP was included (model 3).

Similar predictors were associated with the effort scale, as shown in the online supplement (Supplementary Table 4). However, for the reward scale, better academic attainment and enjoyment of physical activity were independently associated with higher reward for men. Whereas in women, increasing SEI predicted higher reward and adult SEP slightly weakened this association (Supplementary Table 5).

Childhood SEP

Compared with those that lived in low SES areas, those men that lived in higher SES areas in childhood had lower ERI ratios and this association was independent of adult SEP (Table 3). For women, lower grade paternal occupations were independently associated with lower ERI. The association between frequency of moving and higher ERI was only significant for moving 1-3 times compared to never moving in childhood in women, but this association was weakened by adjusting for adult SEP. There were similar associations found for the reward and effort components of the ERI scale, as shown in the online supplement (Supplementary Table 6 and Supplementary Table 7). Of note was that there was some evidence of an association between higher maternal education and lower reward in women.

Health-related factors

In men, worse self-rated fitness and poorer self-rated health in childhood were associated with higher ERI in adulthood (Table 4). These associations were independent of childhood (model 2) and adulthood SEP (model 3) measures. Men who did more physical activity in childhood had lower ERI in adulthood, independent of childhood and adulthood SEP.

For women, those who reported worse fitness reported lower ERI, but this association was partly explained by child and adult SEP. Being overweight, drinking alcohol and higher negative affect in childhood were also associated with higher ERI in women. Smoking in childhood was associated with higher ERI in women but only in a model adjusted for adult SEP. There was no association between physical activity and ERI in women. Again, there were consistent associations between these same predictors and the separate effort (Supplementary Table 8) and reward (Supplementary Table 9) scales.

Discussion

In these exploratory analyses in a unique 25-year follow-up study, we found that a broad range of childhood factors were associated with adult measures of job stress. These included aspects of the school experience, childhood SEP and some markers of physical and mental health. Different associations were evident in men and women and we found some suggestion that adult SEP played a mediating role in the relationship of childhood factors and adult ERI, particularly in women.

Positive school experiences were associated with lower adult ERI. This is supported by previous research that showed better academic attainment and higher school attendance were associated with lower job stress, measured with the Demand-Control model [6]. Our study extends this work by showing that children's rating of their own abilities (i.e. learner self-concept) and how much they enjoy school (i.e. school engagement index) also predicted lower adult job stress using the ERI model. In men, the associations between childhood school-

related factors and adult job stress were not explained by adult SEP. A possible explanation for these associations is that men with a better learner self-concept have more confidence and better socio-emotional skills, which are protective for the harmful effects of job stress [24 25]. Individuals with resilient personalities are reported to cope better with stress, which might manifest as lower reported job stress in adulthood [26]. School can be considered a microcosm of society and our findings suggest that those children with more positive school experiences might go on to be more engaged in the workplace in adulthood and experience lower job stress.

There were weak and inconsistent associations between childhood SEP and measures of job stress. In men, but not women, higher childhood area-level SEP was associated lower ERI in adulthood. This appeared to be due to an association with effort and was not explained by adult SEP. The extent to which this is a true finding is uncertain but the effect independent of adult SEP suggests that environmental factors in childhood might directly effect a person's risk of experiencing job stress. A possible mechanism is that exposure to more socioeconomically disadvantaged areas in childhood influences cognitive styles (e.g. beliefs, expectations and aggression) and aspirations in ways that predispose to job stress through individual and community level attitudes and beliefs [27]. In general, parental SEP had little effect on adult job stress. There was some suggestion in women that higher maternal and paternal education levels were associated lower reward in adulthood, which is counter to what was expected. These associations were not explained by adult education or occupation. The unexpected association between higher parental education in childhood and higher adult job stress might be explained by other factors, potentially from adulthood, that were not the focus of this study.

A range of markers of health in childhood including better self-rated health and fitness, not drinking, higher physical activity, lower negative affect and being a healthy weight were associated with lower job stress in adulthood, independent of adult SEP. The lack of mediation

by either childhood or adulthood SEP suggests a more direct link, rather than an indirect pathway through selection into certain occupations. It is possible that better health in childhood tracks to better health in adulthood, which is then associated with higher productivity and better performance in their work, resulting in less perceived job stress [12]. Several of these unfavourable childhood health markers are also associated with poorer mental health in adulthood, which increases the risk of experiencing job stress [6 13]. Further, negative affect in childhood was also associated with higher adult job stress, particularly in women, which is consistent with previous studies in adults suggesting that traits such as unhealthy emotionality are associated with different components of ERI [28]. Greater negative affect in childhood might indicate a generally negative disposition that results in greater perceptions of stressors in the workplace as adults [29]. The gender difference in supported by a recent systematic review with researchers reporting a stronger association between occupational exposures and mental health in women than men [30]. This might be because women have more affective reactivity and greater stress perception than men [31 32] as well as a higher prevalence of depressive disorders [33]. Our findings regarding physical activity in childhood and job stress in adulthood are supported by findings by Yang et al. from Finland [12]. Physical activity across the life course might enhance resilience to stress by facilitating neuroplasticity of certain brain structures [34]. The wider health benefits of physical activity might also lead to improved productivity and a greater ability to cope with stress in the workplace[12 35].

Being overweight in childhood was associated with higher job stress in women. Associations between weight and job stress have been reported in adults [36]. In one study, SEP was found to account for much of the association suggesting that lower educational attainment in children who are overweight or obese might select them into jobs associated with higher job stress [36]. This did not appear to be the case in our study with minor changes between models adjusted for childhood or adulthood SEP. There is some evidence of reduced cognitive abilities in

children who are overweight or obese, which may be related to other psychological factors, such as self-efficacy [37]. There is also strong tracking of overweight over the life course and it is possible that people who remained overweight or obese into adulthood remain overweight in adulthood [38]. This could result in marginalisation that may reduce job opportunities or reflect as greater perceived job stress [39].

There are several limitations in this study. First, the participants in our study are relatively young (31 to 41 years) and the range of scores on the ERI scale were lower than those reported in a review of working populations in Europe [22]. This could be due to younger age, which is lower than the peak age (45 to 49 years) of Australian workers reporting job stress [40]. Second, in this 25-year follow up study with data collected over three time periods, loss to follow up was inevitable. We compared participants and non-participants and found that most baseline characteristics were similar. We also used multiple imputation to replace missing data on covariates to increase the included sample size. Nonetheless, this may mean that these analyses are mostly relevant to more highly educated, healthier individuals rather than the wider population. We only examined SEP in childhood and adulthood as potential covariates of the associations examined here. We acknowledge that there is a range of individual and work-related factors in adulthood that are associated with higher levels of job stress. Such adult factors may to lie on the pathway between these childhood factors and adult job stress, so adjusting for them may over-adjust models. We made a large number of statistical comparisons. There is no agreement regarding the best way to account for multiple comparisons and we acknowledge that some findings may have occurred by chance. There are also several strengths of this study. To our knowledge, this is the first longitudinal study on job stress measured with the ERI model, particularly in a non-Scandinavian population. The study was exploratory in nature and we were able to examine a comprehensive range of childhood factors, many of which had not been examined previously. Our measure of job stress

in adulthood was a validated and reliable measure of the full Effort Reward Imbalance scale, where previous studies have used incomplete measures. We were also able to adjust for a range of different markers of SEP.

In conclusion, our study provides new information about a range of childhood antecedents of job stress in adulthood. The associations were only partially explained by adult SEP in women but not in men. Our results show that healthy childhood experiences contribute to a healthy, productive work life into adulthood. These findings highlight that job stress in adults is complex and multifactorial and associated with a range of individual factors across the life course, not just proximal work-related factors.

What this paper adds

- Stress pathways can have origins in childhood but few early life predictors have been explored in relation to adult job stress.
- We found that a range of positive health and school-related factors were associated with lower levels of job stress in adulthood. These were not greatly influenced by SEP across the life course.
- Our results show that healthy childhood experiences contribute to a healthy, productive work life into adulthood. Employers and those researching job stress in adults should consider the influence of pre-employment factors and not just proximal work-related predictors of job stress.

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Author contributions

All authors provided final approval for the work to be published and agree to be accountable for all aspects of the work. SW conducted analysis and interpretation of data and drafted the work, KS designed the work, interpreted data and revised it for intellectual content, AV designed the work, acquired data, interpreted data and revised it for intellectual content, TD designed the work, acquired data, interpreted data and revised it for intellectual content and SG acquired the data, interpreted data and revised it for intellectual content.

Competing interests

The authors have no competing interests to declare.

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Table 1. Percent difference* in adult ERI for men and women by school-related factors

Variable	Model 1		Model 2		Model 3	
	% Δ	**95% CI**	**% Δ**	**95% CI**	**% Δ**	**95% CI**
Men						
School Engagement Index	-2	(-5, 1)	-2	(-4, 1)	-2	(-4, 1)
Learner self-concept						
Worse than others	Ref.		Ref.		Ref.	
Same as others	-11	(-23, 1)	-12	(-24, 1)	-12	(-24, 1)
Better than others	**-19**	**(-31, -6)**	**-19**	**(-31, -6)**	**-19**	**(-32, -6)**
Academic Attainment						
Poor/below average	Ref.		Ref.		Ref.	
Average	**-9**	**(-18,-0.1)**	**-10**	**(-18, -1)**	**-10**	**(-19, -1)**
Above average	**-12**	**(-21, -2)**	**-12**	**(-21, -2)**	**-12**	**(-22, -2)**
Excellent	**-14**	**(-26, -2)**	**-15**	**(-27, -2)**	**-15**	**(-28, -3)**
Enjoyment of school PE						
Don't do/don't have	Ref.		Ref.		Ref.	
Not at all/not much	9	(-11, 30)	10	(-10, 31)	11	(-10, 31)
Sometimes	9	(-6, 24)	8	(-6, 23)	8	(-6, 23)
Quite a lot/very much	5	(-8, 19)	5	(-8, 19)	5	(-8, 19)
Enjoyment of school sports						
Don't do/don't have	Ref.		Ref.		Ref.	
Not at all/not much	-9	(-31, 12)	-9	(-31, 13)	-10	(-32, 13)
Sometimes	-1	(-16, 14)	-1	(-16, 14)	-1	(-17, 14)
Quite a lot/very much	-5	(-19, 8)	-5	(-18, 8)	-5	(-18, 9)
Enjoyment of physical activity						
No	Ref.		Ref.		Ref.	
Yes	3	(-13, 18)	2	(-14, 18)	2	(-13, 18)
Women						
School Engagement Index	-1	(-4, 1)	-1	(-4, 1)	-2	(-4, <0.1)
Learner self-concept						
Worse than others	Ref.		Ref.		Ref.	
Same as others	15	(3, 28)	15	(2, 27)	11	(-2, 23)

Variable	Model 1		Model 2		Model 3	
	% Δ	**95% CI**	**% Δ**	**95% CI**	**% Δ**	**95% CI**
Better than others	14	(1, 27)	13	(-0.1, 26)	7	(-6, 20)
Academic Attainment						
Poor/below average	Ref.		Ref.		Ref.	
Average	5	(-6, 15)	4	(-6, 15)	1	(-9, 11)
Above average	2	(-8, 13)	2	(-8, 12)	-3	(-13, 7)
Excellent	1	(-10, 12)	1	(-10, 12)	-4	(-15, 7)
Enjoyment of school PE						
Don't do/don't have	Ref.		Ref.		Ref.	
Not at all/not much	-4	(-23, 16)	-4	(-23, 15)	-4	(-23, 14)
Sometimes	3	(-10, 16)	1	(-12, 14)	1	(-12, 14)
Quite a lot/very much	2	(-10, 15)	0.2	(-12, 13)	-1	(-13, 11)
Enjoyment of school sports						
Don't do/don't have	Ref.		Ref.		Ref.	
Not at all/not much	6	(-12, 25)	5	(-14, 24)	8	(-10, 26)
Sometimes	-2	(-14, 11)	-3	(-15, 10)	-3	(-15, 9)
Quite a lot/very much	-1	(-13, 10)	-3	(-14, 9)	-3	(-14, 8)
Enjoyment of physical activity						
No	Ref.		Ref.		Ref.	
Yes	12	(-5, 30)	11	(-7, 29)	6	(-12, 23)

Bold denotes p<0.05. Ref.= reference category; PE = physical education; * % Δ: percentage differences in ERI between exposure categories due to log transformation of ERI measure in linear regression model with missing SEP variables replaced by multiple imputation. Model 1: adjusted childhood age; Model 2: adjusted childhood age and childhood SEP; Model 3: Model 2 + adult SEP

Table 2. Percent difference* in adult ERI for men and women by childhood SEP

Variable	Model1		Model 2	
	% Δ	95% CI	% Δ	95% CI
Men				
Maternal education				
Low (≤12 years)	Ref.		Ref.	
Middle(trade/certificate)	-7	(-15, 2)	-7	(-16, 1)
High(≥university)	-3	(-11, 5)	-4	(-12, 5)
Paternal education				
Low (≤12 years)	Ref.		Ref.	
Middle(trade/certificate)	-4	(-11, 4)	-4	(-11, 3)
High(≥university)	5	(-3, 13)	5	(-3, 13)
Maternal occupation				
High (Manager/professional)	Ref.		Ref.	
Middle (Clerical)	-2	(-10, 6)	-2	(-10, 6)
Low (Labourer)	8	(-2, 18)	8	(-3, 19)
No paid job	2	(-6, 10)	2	(-6, 10)
Paternal occupation				
High (Manager/professional)	Ref.		Ref.	
Middle (Clerical)	9	(-5, 23)	9	(-5, 23)
Low (Labourer)	-1	(-8, 5)	-2	(-8, 5)
No paid job	-7	(-47, 33)	-8	(-48, 32)
Rooms in home				
≤7 rooms	Ref.		Ref.	
8~10 rooms	4	(-3, 11)	4	(-4, 11)
>10 rooms	5	(-2, 13)	6	(-2, 14)
House rental				
Owned	Ref.		Ref.	
Rented	-3	(-13, 7)	-3	(-13, 7)
Unsure	-5	(-53, 44)	-6	(-54, 43)
Number of times moved house				
0 times	Ref.		Ref.	
1-3 times	3	(-3, 10)	3	(-4, 10)
3+ times	0.5	(-9, 8)	-1	(-9, 8)
Siblings				
0-1	Ref.		Ref.	
2-3	-3	(-10, 4)	-3	(-10, 4)
3+	-6	(-12, 1)	-6	(-12, 1)
Area socioeconomic status				
Low	Ref.		Ref.	
Mid-low	-0.11	(-23, 2)	-11	(-24, 2)
Mid high	-0.14	(-27, -1)	-14	(-27, -1)
High	-0.11	(-24, 2)	-11	(-24, 2)
Women				
Maternal education				
Low (≤12 years)	Ref.		Ref.	
Middle(trade/certificate)	2	(-4, 9)	-0.5	(-7, 6)

Variable	Model1		Model 2	
	% Δ	95% CI	% Δ	95% CI
High(≥university)	7	(-0.5, 14)	2	(-5, 9)
Paternal education				
Low (≤12 years)	Ref.		Ref.	
Middle(trade/certificate)	-1	(-8, 5)	-1	(-8, 5)
High(≥university)	0.5	(-6, 7)	-4	(-11, 3)
Maternal occupation				
High (Manager/professional)	Ref.		Ref.	
Middle (Clerical)	-5	(-12, 2)	-2	(-9, 5)
Low (Labourer)	-4	(-12, 5)	2	(-6, 10)
No paid job	-7	(-14, 0.2)	-3	(-10, 4)
Paternal occupation				
High (Manager/professional)	Ref.		Ref.	
Middle (Clerical)	**-17**	**(-29, -5)**	**-12**	**(-24, -0.3)**
Low (Labourer)	-3	(-9, 2)	0.4	(-5, 6)
No paid job	-8	(-44, 27)	-2	(-36, 33)
Rooms in home				
≤7 rooms	Ref.		Ref.	
8~10 rooms	-3	(-9, 4)	-4	(-11, 2)
>10 rooms	-0.1	(-7, 6)	-3	(-10, 3)
House rental				
Owned	Ref.		Ref.	
Rented	-3	(-11, 5)	-2	(-10, 6)
Unsure	-7	(-42, 29)	-15	(-49, 20)
Number of times moved house				
0 times	Ref.		Ref.	
1-3 times	**6**	**(0.5, 12)**	4	(-1, 10)
3+ times	2	(-5, 10)	1	(-6, 8)
Siblings				
0-1	Ref.		Ref.	
2-3	1	(-5, 6)	2	(-4, 7)
3+	0.1	(-6, 6)	-0.5	(-6, 5)
Area socioeconomic status				
Low	Ref.		Ref.	
Mid-low	8	(-4, 20)	4	(-7, 16)
Mid high	-4	(-16, 8)	-8	(-19, 4)
High	3	(-9, 16)	-3	(-15, 9)

Bold denotes p<0.05. Ref.=reference category; % Δ: percentage differences in ERI between exposure categories due to log transformation of ERI measure in linear regression model with missing SEP variables replaced by multiple imputation.
Model 1: adjusted childhood age; Model 2: adjusted childhood age and adult SEP

Table 3. Percent difference* in adult ERI for men and women by childhood health-related factors

Variable	Model1		Model 2		Model 3	
	% Δ	95% CI	% Δ	95% CI	% Δ	95% CI
Men						
Self-rated fitness						
Better than others	Ref.		Ref.		Ref.	
Same as others	**9**	**(2, 16)**	**10**	**(3, 17)**	**10**	**(3, 17)**
Worse than others	3	(-10, 17)	3	(-11, 16)	3	(-11, 16)
Self-rated health (per unit)[a]	**5**	**(1, 9)**	**5**	**(1, 9)**	**5**	**(0.5, 9)**
BMI						
Healthy	Ref.		Ref.		Ref.	
Overweight or obese	8	(-3, 19)	8	(-3, 19)	8	(-2, 19)
Alcohol Consumption						
No	Ref.		Ref.		Ref.	
Yes	**7**	**(0.1, 13)**	6	(-0.3, 13)	6	(-0.4, 13)
Smoking						
No	Ref.		Ref.		Ref.	
Yes	0.5	(-11, 12)	1	(-11, 13)	0.4	(-12, 13)
Eating breakfast						
Yes	Ref.		Ref.		Ref.	
No	-3	(-13, 7)	-3	(-13, 6)	-3	(-13, 7)
Positive affect (per unit)[b]	-0.3	(-2, 2)	-0.4	(-2, 1)	-0.4	(-2, 2)
Negative affect (per unit)[b]	1	(-0.5, 3)	1	(-1, 3)	1	(-1, 3)
Total physical activity						
<180 min	Ref.		Ref.		Ref.	
180-360 min	-6	(-16, 3)	-6	(-16, 3)	-6	(-15, 4)
360-540 min	**-15**	**(-26, -4)**	**-14**	**(-25, -3)**	**-15**	**(-26, -3)**
>540 min	**-13**	**(-22, -3)**	**-13**	**(-22, -3)**	**-12**	**(-22, -3)**
Women						
Self-rated fitness						
Better than others	Ref.		Ref.		Ref.	
Same as others	-4	(-11, 3)	-3	(-10, 5)	-3	(-7, 7)

Variable	Model1		Model 2		Model 3	
	% Δ	95% CI	% Δ	95% CI	% Δ	95% CI
Worse than others	**-12**	**(-22, -1)**	**-10**	**(-21, 0.1)**	**-6**	**(-16, 5)**
Self-rated health (per unit)[a]	-0.4	(-4, 3)	<-0.1	(-4, 4)	2	(-2, 5)
BMI						
Healthy	Ref.		Ref.		Ref.	
Overweight or obese	**14**	**(5, 23)**	**13**	**(4, 22)**	**14**	**(5, 22)**
Alcohol Consumption						
No	Ref.		Ref.		Ref.	
Yes	**10**	**(3, 16)**	**9**	**(3, 15)**	**9**	**(3, 15)**
Smoking						
No	Ref.		Ref.		Ref.	
Yes	6	(-4, 16)	7	(-3, 17)	10	(1, 20)
Eating breakfast						
Yes	Ref.		Ref.		Ref.	
No	1	(-6, 8)	1	(-6, 8)	1	(-6, 8)
Positive affect (per unit)[b]	1	(-1, 2)	1	(-1, 2)	<0.1	(-1, 2)
Negative affect (per unit)[b]	**2**	**(1, 4)**	**2**	**(1, 4)**	**2**	**(1, 4)**
Total physical activity						
<180 min	Ref.		Ref.		Ref.	
180-360 min	3	(-5, 11)	3	(-5, 11)	3	(-5, 10)
360-540 min	-2	(-10, 7)	-3	(-11, 6)	-2	(-11, 6)
>540 min	2	(-7, 11)	1	(-8, 10)	-1	(-10, 7)

Bold denotes p<0.05. Ref = reference category; BMI: body mass index; % Δ: percentage differences in ERI between exposure categories due to log transformation of ERI measure in linear regression model with missing SEP variables replaced by multiple imputation; a: range from *'very good'* to *'very poor'*; b: higher scores mean higher positive or negative affect. Model 1: adjusted childhood age; Model 2: adjusted childhood age and childhood SEP; Model 3: Model 2+adult SEP

Figure legend

Figure 1. Flow chart of participation in the CDAH study