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Short communication

Depressive symptoms and long-term income: The Young Finns Study

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ABSTRACT

Background: Higher depressive symptoms have been associated with lower future income. However, studies examining this issue have had limited follow-up times and have used self-reported measures of income. Also, possible confounders or mediators have not been accounted.
Methods: 971 women and 738 men were selected from the ongoing prospective Young Finns Study (YFS) that began in 1980. Depressive symptoms were measured in 1992 when participants were from 15 to 30 years old. Information on annual income and earnings from 1993 to 2010 were obtained from the Finnish Longitudinal Employer-Employee Data (FLEED) of Statistics Finland and linked to the YFS.
Results: Higher depressive symptoms were associated with lower future income and earnings. For men, the associations were robust for controlling childhood parental socioeconomic status, history of unemployment, and adulthood health behavior, but attenuated circa 35% when three major temperament traits were taken into account. For women, similar pattern was found, however, in the models adjusted for temperament traits the associations did not remain statistically significant. The association between depressive symptoms and earnings was three times stronger for men than women.
Limitations: Previous depressive episodes could have influenced on some participants' economic and educational choices.
Conclusions: Higher depressive symptoms in adolescence and early adulthood lead to significant future losses of total income and earnings, and this association is particularly strong for men.

1. Introduction

Depressive disorders are a leading cause of global disease burden (Ferrari et al., 2013). Studies have repeatedly shown that depressive symptoms are more common among individuals in lower socioeconomic groups (Lorant, 2003). There are also some studies that have examined the effect of depressive symptoms on income later in life (Elovainio et al., 2012; Whooley et al., 2002; Zimmerman and Katon, 2005). Although these studies have shown that higher depressive symptoms or depressive disorder are associated with lower future income (Elovainio et al., 2012; Whooley et al., 2002; Zimmerman and Katon, 2005), the possible confounders or mediators that explain this association remain unaccounted. In addition, previous studies have had limited follow-up times and they have typically used single point self-reported measures of total income, which is prone to reporting biases and measurement error. Thus, average income over a longer period is a more reliable measure of economic prospects.

In this study we examined the prospective association between depressive symptoms with future income and earnings using a sample of Finnish adolescents and young adults. In addition, we examined whether childhood parental socioeconomic status (SES), participants history of unemployment, adulthood health behaviors, and adulthood temperament traits explain the examined

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associations. Annual measures of total income and earnings were obtained from comprehensive register data of Statistics Finland and they covered over 17 years of follow-up. Previous study based on the same data showed that higher depressive symptoms were associated with self-reported income at one measurement point (Elovainio et al., 2012). Thus, we hypothesized that similar association would be also found with register-based long-term income measures.

2. Methods

2.1. Participants

Participants were selected from the ongoing Young Finns Study (YFS) that began in 1980 (Raitakari et al., 2008). The original sample included 3596 children and adolescents (aged 3, 6, 9, 12, 15, and 18 in 1980) that were randomly selected from the population register of areas near five Finnish university cities and their vicinity. Up to date, several follow-up data collections have been conducted. Written informed consent was obtained from participants who were at least 9 years old and from the parents of younger participants. Research plan and data collection procedures were accepted by the participating universities review boards, and data collection was conducted according to WHO standards as well as the Helsinki Declaration.

In total, 1709 participants had complete data available from the study baseline in 1980 and from the follow-up in year 1992 when depressive symptoms were measured. To obtain comprehensive register-based information on participants' earnings, YFS was linked to the Finnish Longitudinal Employer-Employee Data (FLEED) of Statistics Finland using social security numbers. Details of the FLEED have been reported elsewhere (Pehkonen et al., 2015), but in short, FLEED records periods of employment and gathers data on income and annual earnings from the state-run pension and tax registers that cover all legal employment contracts. For the current study, total income and earnings were obtained from 1993 to 2010.

2.2. Measures

Parental SES in 1980 was assessed using years of education of mother and father, and the annual income of the household (measured on an eight-point scale). To combine two different measures, the mean of parents' years of education was calculated and then standardized. Income was also standardized and then added to the standardized years of education resulting a composite measure of SES (Pulkki et al., 2003). Participants' own education was obtained from FLEED where information whether participant had obtained tertiary education by year 2010 was available.

Depressive symptoms were assessed using a modified version of the Beck Depression Inventory (BDI) (Katainen et al., 1999), where the second mildest symptom statement of each item of the original BDI was answered using a five-point scale ranging from 1 = 'not at all' to 5 = 'very much'. Average of these items were taken, and thus the theoretical range of the scale is from 1 to 5. Modified BDI has been shown to be a reliable measure that provides more information on less severe depression cases than the BDI-II (Rosenström et al., 2012). Three major temperament traits, i.e., negative emotionality, activity and sociability, were measured using 27-item EAS-questionnaire that has been shown to have good validity (Elovainio et al., 2014). History of unemployment from 1986 to 1992 (yes/no) and smoking (yes/no) were self-reported. Alcohol consumption was calculated based on consumption of beer, strong beer, wine, cider and spirits. High alcohol consumption was defined as either (1) daily consumption of any alcohol beverages or (2) consumption of any two types of alcohol beverages (e.g., beer and wine) during the week.

Income was measured as the logarithm of the average of annual taxable income over the period of 1993–2010. Taxable income is a broad income measure, which includes annual wage and salary earnings, self-employment income, capital income (dividends and capital gains), income transfers (e.g., child allowance), and social security benefits (e.g., parental leave benefits). Social security benefits are often linked to previous earnings, typically earnings during the past 1–2 years. Annual earnings were also measured as the logarithm of the average of annual wage and salary earnings over the period of 1993–2010. Both of these measures were deflated using the consumer price index (base year 2000).

2.3. Statistical analyses

Linear regression analyses were used to examine the relationship between depressive symptoms and income and earnings. Four different models were used to examine whether confounders or mediators explained the examined association. In model 1, all analyses were adjusted for age and cohort. In model 2, additional adjustments were done for childhood parental SES. In model 3, participants' education was adjusted for. In model 4, history of unemployment was additionally adjusted for, and in model 5 additional adjustments were done for health behaviors (smoking and alcohol consumption) Finally, in model 5, additional adjustment for three major temperament traits were done. All analyses were conducted separately for men and women.

3. Results

Descriptive statistics are shown in Table 1. When compared to the original participants, current study participants were more likely to be women (53% vs. 48%, $p < 0.001$), younger ($p < 0.001$), and have higher parental SES ($p < 0.01$). Interaction analyses showed that the association between depressive symptoms with

Table 1.
Descriptive statistics of the study sample.

	Women (n = 971)		Men (n = 738)	
	Mean (or %)	SD	Mean (or %)	SD
Age in 1992	22.18	4.93	21.92	5.09
Measures from 1980				
Parental SES	0.06	1.70	0.22	1.64
Measures from 1992				
Depressive symptoms	2.21	0.63	2.03	0.56
History of unemployment (yes)	28%		37%	
Currently smoking (yes)	22%		32%	
Alcohol consumption (high)	5%		9%	
Activity	2.97	0.56	2.87	0.54
Sociability	3.97	0.71	3.71	0.70
Negative Emotionality	2.66	0.63	2.37	0.61
Measures obtained from FLEED				
Obtained tertiary education	33.78%		29.81%	
Average annual income[a] from 1993 to 2010	15,555 €	7740 €	21,388 €	16,496 €
Average annual earnings[b] from 1993 to 2010	13,322 €	7540 €	19,042 €	10,591 €

[a] Average annual income includes annual wage and salary earnings, self-employment income, capital income, income transfers, and social security benefits.
[b] Average annual earnings includes annual wage and salary earnings.