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Did the Finnish depression of the early 1990s have a silver lining? The effect of unemployment on long-term physical activity

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ABSTRACT

This paper studies the impact of long-term unemployment on physical activity. We examined the effects 6 and 15 years following a severe business cycle downturn in Finland over the period 1991–1994. The study sample comprised residents of Northern Finland. The unemployed individuals were 23–26 years old during the downturn. Physical activity, measured by MET minutes and meeting WHO guidelines, was higher 15 years later among those people who experienced the longest periods of unemployment in 1991–1994. Physical activity was somewhat lower among people with relatively shorter periods of unemployment.

1. Introduction

Unemployment leads to income losses (Jacobson et al., 1993; Davis and Von Wachter, 2011; Gathmann et al., 2020) and increases health problems (Böckerman and Ilmakunnas, 2009; Browning and Heinesen, 2012; Black et al., 2015; Gathmann et al., 2020), and the risk of divorce (Charles and Stephens Melvin, 2004; Gathmann et al., 2020). Evidence regarding health behavior, however, is inconclusive. In focusing on the effects of macroeconomic conditions on health behavior, several studies have shown evidence that health behavior (physical (in)activity, weight management, and tobacco and alcohol consumption) improves when the unemployment rate is high at the national level (Ruhm, 2000; Ruhm, 2005; Ruhm and Black, 2002; Colman and Dave, 2013), whereas there is also evidence that suggests the opposite with regard to body weight (Böckerman et al., 2007; Latif, 2014) and alcohol consumption (Davalos et al., 2012). A recent study examining the relationships among regional unemployment, physical activity, and chronic health conditions suggests that different responses to regional unemployment regarding chronic health conditions (reductions in obesity) are potentially mediated by a lack of physical activity (Giri and Kumaresan, 2021). However, the use of regional aggregate unemployment instead of individual information hides compositional variations in unemployment and their effects on health behavior. Although evidence regarding individual job loss and health behavior is relatively sparse, most credible research designs show that job loss can lead to smoking initiation and obesity (Marcus, 2014).

We contribute to the literature on the effects of unemployment on health behavior by providing individual-level evidence on the medium-term and long-term effects of unemployment on leisure-time physical activity. We leverage an unusually severe economic depression in Finland in the early 1990s as a source of an abrupt negative shock to the labor market. We examine how unemployment history affected the leisure-time physical activity of young adults 6 (medium term) and 21 years (long term) after the start of labor market distress. We use self-reported information on the frequency of and time spent on leisure-time physical activity as well as the intensity of physical activity from the Northern Finland Birth Cohort 1966. The cohort data include rich survey information from the antenatal period to middle age, together with a variety of register-based data. The combination of an abrupt and severe economic depression and rich data on leisure-time physical activity provides us with a more nuanced picture of the effect of

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unemployment on leisure-time physical activity by focusing on the medium- and long-term horizons.

When considering their time allocation to leisure activities, individuals balance different options, given their time and monetary constraints. A leading theoretical explanation for countercyclical patterns in economic activity and changes in health behavior is that macroeconomic contractions are accompanied by a reduction in the implicit price of time. During an economic upturn, an increase in working hours leads to physical and/or mental exhaustion, thus reinforcing a less healthy lifestyle (Ruhm, 2005). Conversely, economic contractions lead to an increase in nonmarket leisure time, which reduces the implicit time price (i.e., opportunity cost) of time-intensive leisure-time physical activity. This view is closely related to the time use-oriented approach to health behavior, SLOTH. The framework draws on the seminal work by Becker (1965) on time allocations among activities. SLOTH considers individuals' time use in five domains: sleep, leisure, occupation, transportation, and home-based activities (Cawley, 2004). In all these domains, except sleep, individuals may perform physically active or inactive behavior. The time constraint per day is 24 h, and increased time use in one domain leads to a decrease in another domain. Time inputs in each domain affect a person's utility. When individuals allocate their resources optimally, they gain the same amount of utility for their last hour spent in all domains.

An unexpected job loss leads to a sudden and long-lasting change in time use. Unemployment decreases time use in occupation-specific tasks by approximately 8 h each day; that is, it reduces the total time allocated to work to zero. Although job search, education, or other occupation-specific tasks to maintain future employability may substitute for the vacant time previously allocated to work, U.S. evidence suggests that over 50% of foregone market work hours are absorbed by leisure (Aguiar et al., 2013), whereas reemployment results in an equivalent decrease in leisure-time activities (Krueger and Mueller, 2012b). Consequently, "the last-hour rule" predicts that unemployment leads to an increase in leisure-time physical activity. The change in time allocation toward physical activity may also shape an individual's preferences and habits, leading to the changes in time use in the long run.

In most studies that examine employment and health behavior, the measure of physical activity is a simple binary indicator of whether the respondent has been physically active for at least 20 min at least once in the last 30 days. This is a coarse measure of leisure-time physical activity and does not help to assess, for example, the impact of unemployment or reemployment on physical activity levels, which are closely related to public health concerns. In this paper, we follow Colman and Dave (2013) and examine the effect of unemployment on the total volume of leisure-time physical activity (metabolic equivalent minutes (MET)) and the probability of meeting World Health Organization (WHO) recommendations on physical activity. We depart from their approach by focusing on the impact of individual unemployment and examining the impact on physical activity in the medium and long term rather than in the short term.

We find that, for the most part, unemployment does not affect the amount of leisure-time physical activity. However, the individuals who were most severely affected by the Finnish economic depression are an important exception: those who were unemployed for over 75% of the Finnish Depression of the early 1990s have a higher rate of leisure-time physical activity and a higher probability of meeting WHO recommendations for weekly physical activity over the long run.

2. The Finnish depression of the early 1990s

Endogeneity is a major concern for researchers seeking to draw causal conclusions about the associations between unemployment and health behavior. We address this concern by using the Finnish economic recession as the source of an abrupt shock in the labor market. During this economic collapse, Finland's real GDP fell by 10% from 1990 to 1993 (Statistics Finland, 2022b), and the unemployment rate jumped from 3% (December 1990) to 20% (May 1994) within 3.5 years among the 15–64 year-olds belonging to the workforce (Statistics Finland, 2022a).

The economic collapse was the combined outcome of major internal and foreign shocks (Gorodnichenko et al., 2012; Gulan et al., 2021). Financial deregulation in the 1980s ignited a lending boom. Banks' lending rates were no longer regulated, and restrictions on private borrowing were eased. This led to a sharp increase in bank lending and resulted in a highly indebted private sector in both domestic and foreign currency. An economic boom followed, driven by private consumption and investment. However, this growth proved to be unsustainable, and the price competitiveness of Finnish industry worsened as the government followed a hard currency policy. Finland finally resorted to the devaluation of its currency, further exacerbating the debt problem for domestic holders of foreign debt. The collapse of the Soviet Union in 1991 caused another blow, and trade with Russia dropped by 70% almost overnight (Honkapohja et al., 1999).

The change in GDP was abrupt: growth declined from +5.4% in 1989 to −6.5% in 1991. Figure 1 depicts the unemployment rate among Finnish young adults during the 1990s and beyond. For young adults aged 25–29, especially those living in Northern Finland, the shock was exceptionally severe, as the unemployment rate rose from 8% to 33%. Our study sample, which focuses on those who had a foothold in the labor market prior to the severe economic downturn, closely follows the aggregate data on Finnish unemployment for 25- to 29-year-olds.

A central feature of the Finnish economic crisis was the stickiness of unemployment, which remained over 10% for over seven years. This pattern is also present in our data. The study subjects exhibit a long-term employment rate that, seven years later, is more than 10% points lower relative to the starting point of the depression. The contraction of the early 1990s was much more severe than the recession of 2008–2011, which increased unemployment by only 4.5% points among young adults living in Northern Finland and had a negligible impact on the employment rate of the cohort of individuals under study in this paper. In terms of the magnitude of changes in the unemployment rate, the Finnish depression of the early 1990s resembles the depression of the early 1930s witnessed in the US; a more recent comparison would be Argentina in the 2000s

3. Empirical strategy

The abrupt economic downturn in Finland in the early 1990s is a useful setting to examine how decreased employment affects time-consuming health behavior, such as leisure-time physical activity. The subjects in the data were 24 years old in 1990 and had just gained a foothold in the labor market on the eve of the economic downturn.

We study the effect of individual unemployment (as opposed to regional unemployment, which was commonly used in earlier studies) during the Finnish Depression of the early 1990s (which took place when the individuals in our cohort were aged 24–28) on the leisure-time physical activity of the subjects ages 31 and 46, that is, six and 21 years after the economic downturn. We refer to these outcomes as medium- and long-term outcomes. Prior research has shown that, conditional on occupation and region fixed effects, adverse labor market conditions during the depression were plausibly exogenous with respect to worker characteristics (Knüpfer et al., 2016). Based on this evidence, we include occupation fixed effects. In our study sample, we only include people who worked, or, to be exact, those who accrued pension from employment, at least two-thirds of the maximum number of days, in 1990.[1]

[1] A full 100% employment restriction during 1990 would exclude those who finished studies that year and then entered the labor market. The threshold of two-thirds for the full year ensures that instead of being restricted to the those working at the end of 1990, a large fraction of the study sample comprises individuals who fully entered the labor market and are not just seasonal workers during the summer or around Christmas.

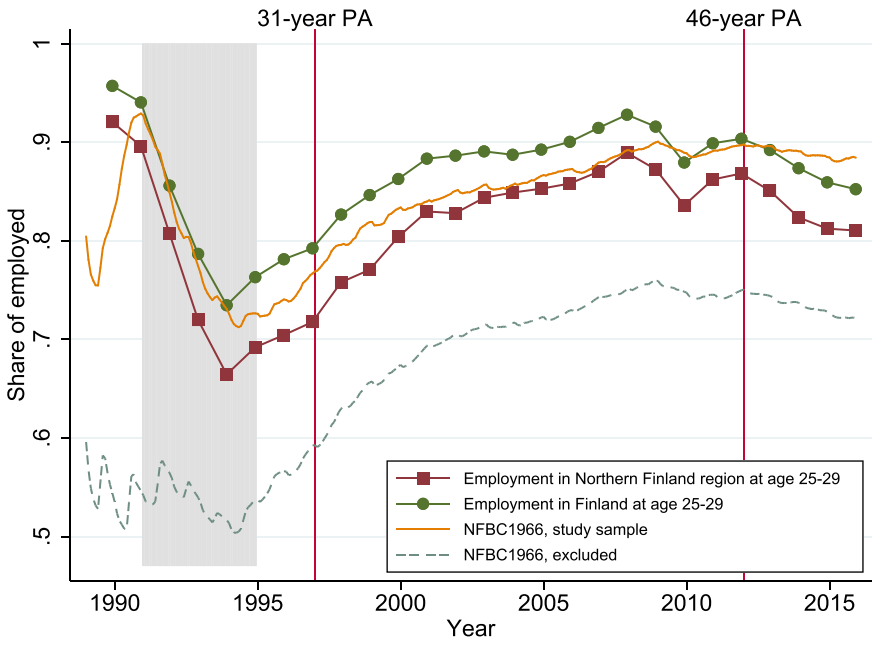

Fig. 1. Employment rates among study sample and young adults, 1989–2015. Note: Employment of the Northern Finland Birth Cohort 1966 (NFBC1966) who were employed for two-thirds of the time in 1990 and aggregate share of employed at age 25–29 in Northern Finland (15–64 year-olds in the workforce; data from Statistics Finland). The employment data for NFBC1966 are smoothened monthly averages computed from pension accrual spells. The shaded area corresponds to the years 1991–1994, the years defined as the Finnish Depression of the early 1990 s in this study.

Hence, we focus on the population already tightly attached to the labor market at the age of 24. As Figure 1 shows the excluded population, as a whole, displays considerably weaker labor market attachment prior to and after the economic contraction. Individuals in the excluded group were either studying for an academic degree, unemployed, employed only part-time, on maternity leave, or out of the labor force in 1990. For these individuals, the impact of nonemployment on physical activity is ambiguous, as they were not attached to the labor market to begin with. We therefore exclude them from the study sample.

We analyze the effect of unemployment on leisure-time physical activity by using the following specification:

$$y_i = \alpha + exposure_i + pe82_i + gpa82_i + occ90_i + X_i + \epsilon_i, \quad (1)$$

where y_i is an outcome related to leisure-time physical activity, $exposure_i$ is the measure of unemployment (or nonemployment; see discussion in the Appendix) measured as the share of nonemployment days out of the maximum number of employment days during 1991–94. The subjects were then 25–28 years old. We use both linear and categorical forms of the unemployment exposure. The latter is helpful in distinguishing the effects of short- vs. long-term unemployment exposure on leisure-time physical activity later in life. To allow for flexible nonlinear effects, the categorical measure is classified into five exposure levels according to time of nonemployment at ages 25–28:

$$exposure_i = \left\{ \begin{array}{ll} 0, & Employed(ornotemployed0-9\%ofthetotaltimeatages25-28) \\ 1, & 10-24\%\ of\ the\ time\ in\ nonemployment\ at\ ages\ 25-28 \\ 2, & 25-49\%of\ the\ time\ in\ nonemployment\ at\ ages\ 25-28 \\ 3, & 50-74\%\ of\ the\ time\ in\ nonemployment\ at\ ages\ 25-28 \\ 4, & 75-100\%\ of\ the\ time\ in\ nonemployment\ at\ ages\ 25-28 \end{array} \right\}$$

To provide relevant controls for the exposed, we use the physical exercise grade ($pe82_i$) and grade point average ($gpa82_i$) at age 16 and the imputed occupation sector code at the 1-digit level in 1990 as adjusting control variables. X_i corresponds to additional controls such as sex, marital status in 1990, an indicator of a history of psychiatric admissions, and living in Northern Finland in 1990.

The employment profiles after the Finnish Depression of the early 1990s exhibit a partial state dependence. Figures A3 and A4 reveal that the individuals who were most severely affected by the depression have, on average, 60% lower employment rate than those who stayed employed during the depression 3 years after the end of the depression and a 15% lower employment rate 20 years after the end of the depression This supports prior evidence on unemployment persistence, or scarring effect, after the macroeconomic shock (Eliason and Storrie, 2006; Verho, 2020). Therefore, the different levels of exposure to unemployment during the Finnish Depression in the early 1990s can also be interpreted as levels of risk for very long-term unemployment.

4. Data

The data from the Northern Finland Birth Cohort 1966 (NFBC1966) study constitute the basis of our study population. The cohort in this study comprises 12,058 live births in 1966 in the regions of Lapland, Kainuu, and North Ostrobothnia (corresponding to the former provinces of Lapland and Oulu), representing 96.3% of all births in the region. The investigations started during the gestation of the study population, and the individuals were followed after birth over a total of six waves. The follow-up surveys focused on health but also included comprehensive labor market information. For our outcome variables, we use information on leisure-time physical activity from the last two surveys, which were conducted in 1997–98 and 2012. In total, 5646 people responded to both of these surveys and 3328 of these individuals are included in our estimation sample.

The NFBC1966 surveys, taken when the cohort members were at the

ages of 31 and 46, asked subjects identical questions on how often, for how long, and at which intensity level they participated in physical activities during their leisure time. Following the physical activity calculations used in prior literature with NFBC data (Suija et al., 2013; Niemelä et al., 2019), we use the self-reported physical activity to compute the metabolic equivalent of task minutes (MET-mins) per week, which summarizes individuals' weekly energy expenditure in leisure-time physical activity. We also use the probability of meeting WHO recommendations for physical activity (600 MET-minutes per week) as an alternative outcome. While WHO recommendations apply to all physical activity and thus include energy consumption regarding work-related activities, this outcome is informative about leisure-time physical activity levels, which are relevant from a public health perspective. For a detailed discussion of the construction of the physical activity measures, see Appendix A.[2]

Using personal identifiers, we link register-based data to the NFBC1966 study population to obtain the measures for individual-level unemployment and relevant covariates. To reduce confounding in unemployment and leisure-time physical activity, it is important to construct adequate controls for the unemployed individuals from the group of fully employed. To adjust for the pre-recession differences in physical activity, we use school grades for physical education (PE) from the end of comprehensive school (at age 16) and grade point average (GPA) as physical activity and ability proxies.

We use comprehensive register-based information on pension accruals (related to employment spells from the Finnish Center for Pensions) linked to the Northern Finland Birth Cohort 1966. Because entrepreneurs in Finland are obliged to pay the pension payments, this data also include information on the self-employed (7.6% in the sample). We use these data to construct employment status at the monthly level as well as the measures for spells of not working at the monthly level. We then construct the main explanatory variable of interest by adding up the monthly employment indicators and calculating the share of unemployment months (later categorized) out of the total duration of the depression (48 months). While this indirect measure of unemployment may not be precise, it closely parallels the open-access aggregate employment rate for young adults (aged 25–29, Figure 1) in Northern Finland obtained from the official records of Statistics Finland.

We also obtain information on the individuals' occupation sector and psychiatric admissions (Care Register for Health Care from National Institute for Health and Welfare) before the Finnish Depression of the early 1990s. Finally, we use information on the marriages and birth dates of the children of the Northern Finland Birth Cohort 1966 from the Finnish Population Register Center. Using this information, we construct indicators for whether a respondent had a psychiatric admission history prior to the depression, was married at the end of 1990, and living in Northern Finland in 1990.

4.1. Background characteristics

Table 1 describes the sample means and standard deviations of respondents' background characteristics and the relevant outcomes. As the table shows, we focus on individuals who were employed over two-thirds of the time in 1990, the year preceding the economic downturn. Because the subjects were 24 years old at the time of the economic shock, the majority were not yet married in 1990. We see that approximately 55% of the respondents report leisure-time physical activity levels that surpass the current WHO recommendations for total physical activity at age 31 (1997–98), and over 61% levels report levels that surpass the current recommendations at age 46 (2012).

Table 1
Descriptive statistics.

Variable	N	Mean	Std. Dev.	Min	Max
Female	3328	0.53	0.5	0	1
Physical education grade at age 16	3328	7.98	1	4	10
GPA at age 16	3328	7.59	0.87	5.2	9.9
Days employed in 1990	3328	348.58	32.57	241	365
Higher tertiary education	3328	0.19	0.39	0	1
Married 1990	3328	0.26	0.44	0	1
Pre-FGD psychiatric hospitalization	3328	0.02	0.14	0	1
Total volume MET minutes at age 31	3328	901.53	869.5	0	5040
Total volume MET minutes at age 46	3328	990.27	883.08	0	5040
Meets WHO criteria for PA at age 31	3328	0.55	0.5	0	1
Meets WHO criteria for PA at age 46	3328	0.61	0.49	0	1

Note: Sample means and standard deviations of background characteristics and outcomes. We do not have access to information on year of obtaining a degree; thus, higher tertiary education indicator is obtained from highest degree information by 2015.

In Appendix Table A1, we show that the PE grades and GPAs between the exposed and nonexposed groups are fairly similar at age 16 when the groups are stratified by occupation category and exposure level. However, the Kruskal-Wallis test suggests that differences mainly occur in the services and sales occupation category. Perhaps surprisingly, the probability of obtaining a higher tertiary degree is in many cases higher among the nonemployed than among the employed. This pattern could be due to reeducation resulting from unemployment and poor local job market conditions.

4.2. Attrition

A potential worry in all survey studies is a selection into nonresponse. Appendix Table A2 reports logit regression estimates of dropping out of the study sample according to background characteristics. The first column addresses attrition, i.e., failure to respond to the surveys at both 31 and 46 years of age, which are the source of our outcome measures. The second column demonstrates how those who were excluded from the study sample due to employment criteria are different from the study sample. The third column demonstrates how the NFBC1966 population not included in the study sample due to either attrition or exclusion is different from the study population.

Most notably, men, low-performing students, and people with low income are underrepresented in the study sample. This is largely due to nonresponse. Those who moved away from Northern Finland before 1991, were less educated, were unemployed during the depression period, or whose occupation was unknown were also less likely to respond to the two surveys. Among the respondents, those who were least employed during the depression period are very much less likely to be in the study sample because these individuals were not working in 1990, either. Those excluded are also less likely to be fertile at age 24–28. Taking attrition and exclusion together (column 3 in Appendix Table A2), the study sample is positively selected in terms of school performance at age 16 and income level at age 31, and negatively selected in terms of higher education. The results are later used to create inverse probability weights for robustness checks addressing attrition with regard to observable characteristics.

[2] We acknowledge that unemployment changes time use in manifold ways. Unfortunately, NFBC1966 data do not include rich information on time spent on other time-consuming leisure-time activities, such as music, cooking, or watching TV, and thus we cannot comprehensively analyze how individuals allocate their excess free time among competing activities.

Table 2
Unemployment exposure and leisure-time physical activity: linear exposure.

Outcome	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Medium term outcomes (age 31)								
Total MET-mins	81.921	75.209	113.696†	108.557†	109.790†	110.817†	110.964†	112.230†
	[− 31.216,195.059]	[− 41.358,191.775]	[− 2.734,230.127]	[− 7.686,224.800]	[− 7.830,227.411]	[− 6.862,228.497]	[− 6.738,228.666]	[− 5.423,229.883]
Meets WHO-recommendations	0.001	-0.009	0.010	0.012	0.007	0.008	0.008	0.008
	[− 0.059,0.062]	[− 0.071,0.053]	[− 0.052,0.072]	[− 0.050,0.074]	[− 0.056,0.070]	[− 0.055,0.070]	[− 0.055,0.070]	[− 0.054,0.071]
Long term outcomes (age 46)								
Total MET-mins	-11.512	-15.190	12.979	15.895	3.388	3.214	3.638	3.515
	[− 122.881,99.856]	[− 129.148,98.768]	[− 101.233,127.192]	[− 98.395,130.185]	[− 112.180,118.956]	[− 112.308,118.736]	[− 111.939,119.214]	[− 112.093,119.123]
Meets WHO-recommendations	-0.040	-0.050	-0.034	-0.029	-0.038	-0.038	-0.038	-0.038
	[− 0.099,0.019]	[− 0.111,0.010]	[− 0.095,0.026]	[− 0.090,0.032]	[− 0.099,0.024]	[− 0.100,0.024]	[− 0.099,0.024]	[− 0.099,0.024]
Adjusted for								
Occupation		✓	✓	✓	✓	✓	✓	✓
PE at age 16			✓	✓	✓	✓	✓	✓
GPA at age 16				✓	✓	✓	✓	✓
Sex					✓	✓	✓	✓
Married in 1990						✓	✓	✓
Mental disorder diagnosis							✓	✓
Living in Northern Finland								✓
N	3328	3328	3328	3328	3328	3328	3328	3328

Note: The effect of unemployment exposure (linear form) at ages 25–28 on leisure-time physical activity (LTPA) and probability of meeting WHO recommendations for PA with 95% confidence intervals based on robust standard errors are reported below the estimates in brackets. Exposure is defined by the share of months not employed during 1991–94. †, *, **, and *** refer to statistical significance levels at the 10%, 5%, 1%, and 0.1% levels.

5. Results

Table 2 documents the association between unemployment exposure during the Finnish Depression of the early 1990s and weekly leisure-time physical activity and meeting WHO physical activity recommendations at ages 31 and 46. Here, we define unemployment exposure by the respondent as the share of unemployment months out of a total of 48 months during the depression, when the respondent was 25–28 years old. Our main finding is that in general, unemployment exposure is not strongly associated with leisure-time physical activity. In some specifications, the medium term effect on MET-minutes of physical activity is statistically significant at the 10% level and amounts to about 10 MET-minutes increase per 10% (5 months) increase in unemployment exposure.

Overall unemployment exposure does not affect long-term outcomes or meeting WHO recommendations on physical activity in the medium term. The unadjusted differences do not greatly differ from the specification with a full set of pre-recession adjustments that take into account differences in occupational sector, school grade (PE grade and GPA), sex, marital status, having a psychiatric diagnosis, and living in Northern Finland in 1990. Exposure to unemployment is not associated with meeting WHO recommendations for physical activity in the medium or the long term.

Fig. 2 shows the estimates for the unemployment effect divided into five exposure intensities. The point estimates stem from a specification that adjusts for the full set of covariates. Compared to those in the nonexposure group, individuals who were unemployed less than half of the total time during the depression did not exhibit a difference in their leisure-time physical activity. Notable patterns are detected for the groups with the largest unemployment exposure. Those who were most severely unemployed during depression (75–100% of the time) appear to be more physically active (169 MET-minutes, CI 28–309) in the medium term than those who were fully employed during the depression period. In the long run the effect fades and becomes statistically insignificant (132 MET-minutes, CI −10 to 274). An interesting contrast emerges between the two most exposed groups in terms of the long-term effect. Whereas individuals with the most severe unemployment history exhibit indicatively higher physical activity compared to the control group, those unemployed for 50–74% of the time are less active (−99 MET-mins, CI −190 to −9). These patterns are more evident for low-intensity physical activity than for high-intensity physical activity (Fig. 3 and Appendix Table A5 to A8). The overall picture is fairly similar for the probability of meeting WHO criteria; however, for the most severely unemployed group, the point estimates are no longer statistically significant. The use of inverse probability weighting to account for attrition results in negligible changes in the point estimates (Appendix Table A14 to A17). The results hardly change even when imposing a stricter sample inclusion criterion of being employed at the end of 1990 (Appendix Figure A1).

Overall, our findings are similar for men and women, especially in the medium term. The results suggest a U-shaped relationship between unemployment exposure and leisure-time physical activity for both women and men, but estimates are less precise in sex-specific analyses (Appendix Figure A2).

A major shortcoming of the dataset is the missing information of the physical activity just prior to the economic downturn. It could be that school grade for physical activity does not appropriately reflect the level of physical activity at age 24. As an auxiliary analysis, we examine a subsample of men that participated in "Health of men 1990″ within the NFBC1966 cohort. The "Health of men 1990″ survey was sent to 2500 men, and responses were received from half of them. When restrictions are imposed on our main sample, we are left with 478 men who participated in all three surveys of adulthood (1990,1997, and 2012). Among other health-related questions, the survey asked the participant to report how he participates in leisure-time physical activities. The question included 5 options: (1) 3 + times a week; (2) 2 times a week;

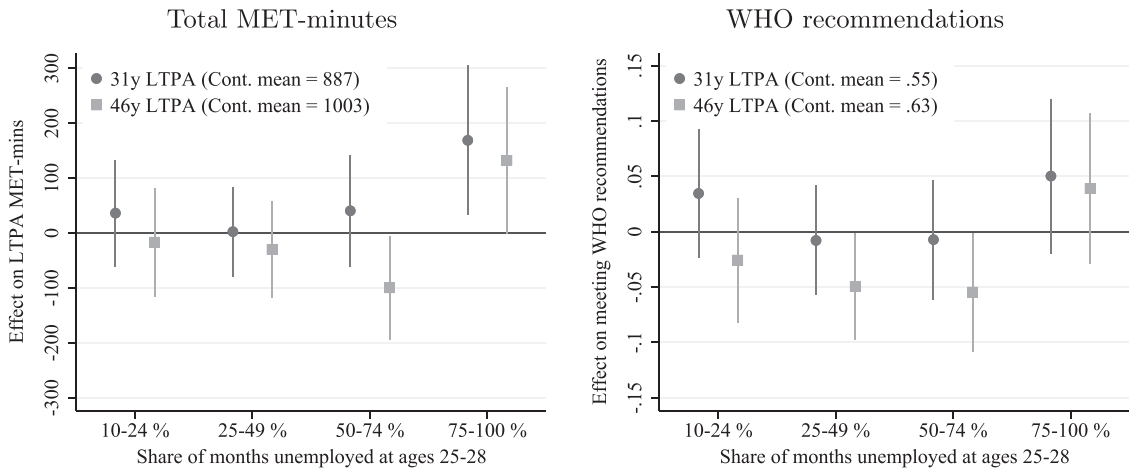

Fig. 2. Unemployment history and leisure-time physical activity: categorical exposure. Note: Effect of unemployment exposure during the Finnish Depression of the early 1990s (at ages 25–28) on leisure-time physical activity (LTPA) with 95% confidence intervals (robust standard errors). Control group comprises those who are unemployed less than 10% (about 5 months) of the time during 1991–94. Regression results are based on the specification controlling for PE grade, GPA, occupation category, sex, married in 1990, pre-recession psychiatric hospitalization, and living in Northern Finland in 1990. See Table A3, A4, A9 and A10 corresponding result tables.

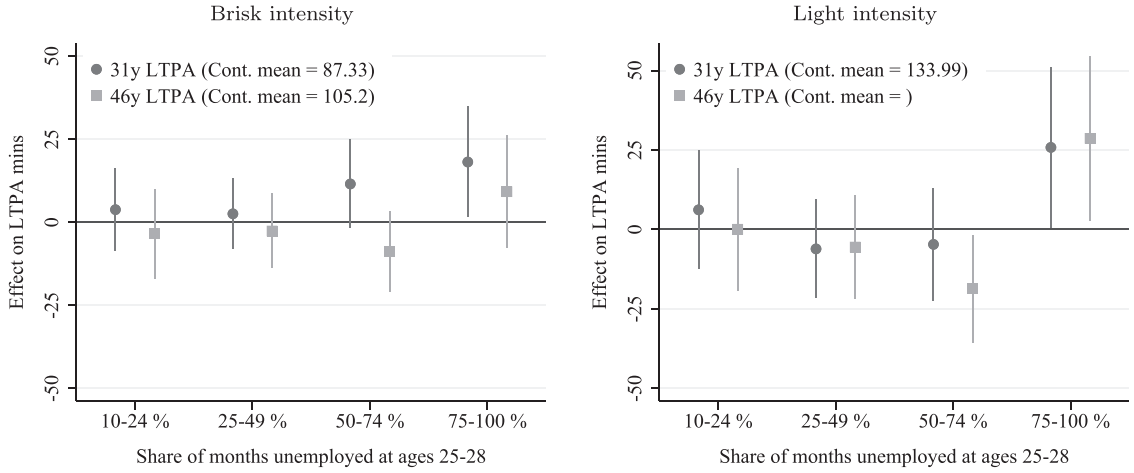

Fig. 3. Unemployment history and leisure-time physical activity by level of intensity. Note: Effect of unemployment exposure on weekly minutes of leisure-time physical activity (LTPA) by intensity with 95% confidence intervals (robust standard errors). Control group comprises those who are unemployed less than 10% (about 5 months) of the time during 1991–94. Regression results are based on the specification controlling for PE grade, GPA, occupation category, sex, marital status in 1990, pre-recession psychiatric hospitalization, and living in Northern Finland in 1990.

(3) once a week; (4) less than once a week; and (5) No leisure-time physical activity. Unfortunately, this survey did not ask for the average duration of the physical activity, and thus we are not able to calculate pre-recession MET-minutes. However, to account for possible differences in leisure-time physical activity just before the economic downturn, we can adjust for reported physical activity one year prior to economic downturn. The point estimates based on the "Health of men 1990″ sample broadly resemble those of men of the main sample; however, they are naturally more imprecise due to the substantially smaller sample size. The results related to WHO recommendations differ substantially in the long run. The most exposed group exhibits a substantially smaller probability of WHO recommendations; generally, the physical activity measures exhibit positive, albeit not significant point estimates (Appendix Figure A5). Note that in this specific sample, there are only 15 persons in the most exposed group, of which 4 reported 0 min of physical activity, while others reported relatively high physical activity. This results to contrasting results between average reported physical activity and meeting WHO recommendations.

We also tested the categorical exposure in 10-levels using 10% exposure intervals (Appendix Table A11). This exercise roughly confirms the U-shaped relationship between unemployment history and later physical activity. Strikingly, however, it also presents a stark disparity between the most exposed (90–100%) and the second most exposed (80–89%). The contrast is driven by men (Appendix Table A12), but as there are only three persons in the highest exposure category, these estimates are unreliable.

There is a three-year gap between the end of the depression and the first physical activity measurement point. Considering that youth unemployment during the depression has been shown to have had severe scarring effects (Hämäläinen, 2003), the relationship between unemployment exposure and leisure-time physical activity could be attributed to contemporary unemployment correlated with unemployment exposure. In this case, the relationship could reveal the transitory effects of current unemployment and therefore not the effects related to the depression. We examine this possibility by looking at the interaction between contemporary unemployment status and unemployment exposure. Although statistical power greatly diminishes when subgroups are analyzed, we find evidence suggesting heterogeneity in the effects of

contemporary unemployment status (Appendix Figure A6). The exposed individuals who stayed unemployed exhibit more physical activity than their reemployed peers in the medium term but less in the long term. However, because the current unemployment status is endogenous, this analysis provides only indicative evidence for the role of current employment on physical activity.

Although suggestive, these findings point out that the effect of unemployment on leisure-time physical activity could be nonlinear in terms of the exposure level. Treating all unemployed individuals as a single group may hide substantial heterogeneity in the effects of unemployment exposure. Our use of the exposure measure likely captures relevant differences in employment uncertainty that are not captured by a binary measure of current employment.

What is somewhat puzzling regarding physical activity of "scarred" individuals is that their health behavior or mental wellbeing is not better than that of nonexposed individuals on any other measure. Appendix Table A18 shows survey measures for smoking, obesity, life satisfaction, and register-based information on hospitalizations related to any mental disorders. Interestingly, the scarred individuals have the lowest level of life satisfaction, but using other measures, they appear to be healthier than 25–49% exposure group.

6. Discussion

This paper presents evidence that unemployment exposure in general during economic downturn does not lead to differences in leisure-time physical activity levels relative to the unexposed. While our results are relatively imprecise when using a linear form of unemployment exposure, the results regarding the medium-term are suggestively in accordance with previous studies that find regional unemployment rates to correlate positively with physical activity (e.g., (Ruhm, 2000; Colman and Dave, 2013). We do, however, find considerable variation in physical activity levels by the share of time unemployed, i.e., the relationship between unemployment exposure and physical activity takes a U-shaped form. Therefore, the link between the experience of unemployment and physical activity is positive for those most severely affected by unemployment. We also find suggestive evidence for reemployment decreasing leisure-time physical activity for previously unemployed individuals, which is in accordance with previous research on reemployment and leisure activity (Krueger and Mueller, 2012b). In addition, the most heavily exposed individuals seem to exhibit permanently higher physical activity despite being employed when physical activity was reported. Based on this finding, it is possible that individuals may be affected by a permanent shift in preferences towards more leisure-time physical activity after a very long unemployment spell.

Ruhm (2000) controversial article suggests that changes in health follow a countercyclical pattern, whereas Marcus (2013) shows that individual-level unemployment leads to weight gain and increases the probability of starting smoking in Germany. We find evidence that supports the German findings on the negative impact of unemployment on health behavior in the case of physical activity in general. However, as we distinguish different levels of unemployment exposure, we observe significant compositional variation in terms of the severity of unemployment exposure. The long-term unemployed are more physically active than the employed but do not exhibit better health behavior on other measures.

Our findings provide two important lessons. First, economic downturns can be accompanied by heterogeneous responses in leisure-time physical activity. We show that for the most part, the unemployed in the Finnish context do not show an increase in physical activity; however, individuals who were most severely affected by economic depression exhibited more physical activity compared to other groups. This suggests that time-intensive investments in leisure-time physical activity could be triggered by long-term unemployment rather than more transitory unemployment. Second, the increase in physical activity was most emphasized for light-intensity activity. While physical activity increased for some groups as a result of relaxed time constraints due to unemployment, this increase occurs in light activity, such as walking, and thus might not overcome the decreases in total physical exertion due to lost work-related activity, as suggested by Colman and Dave (2013).

There are limitations to our analysis that call for additional analyses. First, the sample is relatively small (N = 3266). Thus, we lose statistical power when examining the effects separately in relevant subgroups. Second, in an ideal setting, we would have access to physical activity information similar to that of 1997 and 2012 just before the economic downturn, thus allowing for the use of a differences-in-differences strategy. In our research design, we used school grades in physical exercise as a proxy for pre-recession physical activity. Although PE grade correlates with leisure-time physical activity in 2012 for men, the correlation for women is weaker (Huikari et al., 2021). Third, our inclusion criterion, i.e., being employed over two-thirds of the time in 1990, is a potential limitation. This means persons with ongoing education (especially those who are in universities) underrepresented in the study, as they are less likely to work full-time by 1990 compared to individuals with lower education levels. Fourth, our empirical strategy cannot fully rule out all potential confounders. Although we use a severe economic depression to overcome the endogeneity problem of job loss, it is evident that some selection for unemployment and long-term unemployment may still occur in this context as well. However, the Finnish depression of the early 1990s was unusually severe for a developed country and thus constitutes a very useful setting to study the scarring effects of unemployment on health with a limited role for selection bias. Fifth, given the Finnish institutional context and the unusually severe economic depression, the results are not necessarily generalizable to other countries. Most notably, the Finnish social security system contains earnings-related unemployment insurance, which allows the unemployed to have a relaxed time constraint without monetary budget constraint as tight as those in Anglo-Saxon countries. Universal health care services provide high-quality health care with affordable out-of-pocket costs for all citizens, and thus the maintenance of health is not tightly dependent on income level or on having private health insurance. Evidence also suggests that the time used on job search among the unemployed in Finland is rather low by international standards (Krueger and Mueller, 2012a). These features of social security, all of which relate to preferences over consumption, time use, and financial incentives to work, are typical of Nordic countries; thus, our results are most directly applicable to countries such as Sweden, Norway, and Denmark. Furthermore, multinational time use surveys suggest that people in Nordic countries exercise twice as much as those in the U.K. (Aliaga, 2006). Finally, it is possible that there is potential selection of workers into the public sector in terms of preferences toward job security as well as sports and exercise. While we cannot fully rule out the bias related to this selection, we do not think this is a major concern for the validity of the results. According to theoretical models of compensating wage differentials and occupational choice, this type of selection assumes full employment. This assumption does not hold in our empirical setting, because there is persistent unemployment in the study region.

On the balance, the strengths of the data, such as leisure-time physical activity reports applicable to the WHO recommendations, school information, register-based data on employment spells and mental health, make the NFBC1966 data well-suited to examining the effect of unemployment on levels of leisure-time physical activity. We contribute to the literature by more closely studying physical activity information while taking into account all three relevant dimensions of physical activity: frequency, duration, and intensity. We use a set of outcomes that correspond to the WHO recommendation criteria on physical activity instead of discretionary outcomes such as simple indicators of any physical activity or physical activity indexes. The severe and sudden Finnish economic depression offers a unique possibility to examine the effect of unemployment on physical activity. We focus on individuals who were employed at age 25, which is an age at which a

severe macroeconomic shock may cause psychological distress (Maclean, 2013), social harm (Engdahl et al., 2018), and disruptions to future career development (Genda et al., 2010; Oreopoulos et al., 2012; Haaland, 2018). Although this focus potentially decreases external validity, at the same time, our analysis deals with a group of individuals who are likely to be greatly affected in the long term and therefore arguably are the most relevant from a policy perspective.

Regardless of the limitations in external validity, our results suggest that researchers should aim for a more rigorous examination of long-term unemployment and health behavior. We present evidence suggesting that unemployment history could matter for the current state of health behavior. In view of the SLOTH model, the fact that the "long-term unemployed" are the most active group is not surprising. These individuals have experienced the largest setbacks in the labor market. The probability of working (full-time) again is substantially lower for these individuals, which also implies that their occupation-specific time constraints are more relaxed compared to less exposed individuals. The fact that this is more clearly reflected in increases in low- rather than high-intensity physical activity is also not surprising. Substitution of some of the 40 h previously allocated to work for light leisure-time physical activity such as walking is natural because unemployment increases the relative costs of other modes of mobility. Because past exposure level is also associated with contemporary levels of employment, higher levels of light physical activity are expected among the most exposed. Interestingly, there is some indication (albeit not statistically significant) of higher physical activity regardless of contemporary employment status in the most exposed group. This suggests that long-term unemployment may trigger a permanent change in physical activity. However, rigorous investigation is needed to provide more evidence for this.

We also find that individuals with the largest exposure to unemployment exhibit similar or lower levels of leisure-time physical activity than those with the strongest attachment to the labor market. This balances out the effect of unemployment on physical activity when all exposure groups are treated as a single group. These findings point out that the impact of unemployment on physical activity is likely nonlinear in terms of exposure level. Treating all unemployed individuals as a single group may obscure substantial heterogeneity in the unemployment experience that individuals face. It is possible that at the two ends of the exposure spectrum, there is less uncertainty related to labor market attachment. Those left in the middle could use their extra time for active job seeking and other occupation-specific activities that compete with a long-term commitment to time-consuming leisure activities such as physical activity.

7. Conclusion

We find that unemployment generally did not have a substantial impact on leisure-time physical activity in the context of the Finnish Depression of the early 1990s. However, after a closer inspection, we find that the most severe unemployment exposure (i.e., very long-term unemployment) is associated with increased physical activity in the medium term. There is also evidence that indicates the effect remains in the long term for women but not for men. We attribute this pattern to persistent health behavior effects that are confined to individuals with a history of long-term unemployment. Our results call for more studies that focus on the heterogeneity of the effects of economic depressions on health behavior.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ehb.2022.101139.

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