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Long-term determinants of changes in television viewing time in adults: Prospective analyses from the Young Finns Study

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ABSTRACT

Purpose: The long-term effects of sociodemographic and health characteristics on television viewing (TV) time changes have not been identified in adulthood. We aimed to examine the modifiable and non-modifiable determinants of changes in TV-time in young adults over 10 years.

Methods: Participants (N=2929) aged 24-39 years were recruited between 2001 and 2011 from the Cardiovascular Risk in Young Finns Study. Data were collected using questionnaires and a medical examination. The determinants of changes in TV-time were estimated using latent growth modeling for men and women separately.

Results: For men, inverse associations with initial levels of TV-time were observed for students becoming employed and already has children, and direct associations were observed for both those who stayed a smoker and stayed overweight/obese. Increasing attention to health habits was inversely associated with a slope of TV-time, whereas age and becoming unemployed were positively associated with the slope of TV-time. For women, inverse associations with the levels of TV-time were found for age, staying in non-manual work, and paying consistently high and increasing attention to health habits, and direct associations were found for staying unemployed, smoking and overweight/obese, and becoming employed, single and non-smoking. Increasing physical activity, becoming employed, motherhood and normal weight were inversely associated with the slope of TV-time, whereas age and staying in non-manual work were positively associated with the slope of TV-time.

Conclusions: This suggests several gender specific determinants of changes in TV-time that can help identify potential targets for interventions to prevent excessive TV-time in adulthood.

Key words: determinants, TV-time, adulthood, longitudinal, latent growth modeling

1 BACKGROUND

Sedentary behavior has increased substantially in the past few decades.[1] By definition, sedentary behavior is any waking behavior characterized by an energy expenditure ≤ 1.5 metabolic equivalents while in a sitting, lying or reclining posture.[2] This distinguishes sedentary behavior from 'physical inactivity'.[1] Evidence suggests that adults spent a considerable portion of their lives in sedentary leisure pursuits.[3,4] However, the patterns and determinants of sedentary behavior are poorly understood across Europe, and thereby a single strategy to decrease sitting is unlikely to be effective in all countries.[5–7] Understanding the barriers and facilitators of excessive sitting among adults is important to ensure the effectiveness of interventions and actions to reduce overall sedentary time.

Of the sedentary behaviors, excessive television viewing (TV) time has been shown to be directly associated with several cardiometabolic biomarkers[8,9] and all-cause mortality[10]. There is evidence that nearly three-quarters (73%) of Finns aged 10 and up still watch traditional TV daily. Daily TV watching, on average, has increased by approximately 10% from 167 min in 2004 to 184 min in 2014, particularly in adulthood.[11] Similar results have been found for long-term temporal trends of total screen time in Australian adults.[12] Although TV-time has been shown to track across youth[13] and into young adulthood[14–16] and early middle age,[17] little is known about the stability and changes that occur in the levels of TV-time and which specific factors influence changes in TV-time from young adulthood to early midlife.

Owen et al.[18] have presented an ecological model by which different determinants (e.g., intrapersonal, interpersonal, environmental and policy) may influence the domains of sedentary behavior. Some reviews have summarized the plurality of potential influences on sedentary behavior, including TV-time.[19–22] Furthermore, few longitudinal studies have revealed the patterns

and predictors of sitting time throughout adulthood,[23,24] suggesting that several factors and life events (e.g., male gender, higher education, full-time employment, staying obese, and consistently low physical activity levels, as well as changing jobs, retiring or illness) contribute to high sitting levels. Divergent associations were identified for different aged groups for women.[25] In all of these studies, both total and prolonged sitting time were limited by using subjective classification analysis, and the sample included participants with a wide range of ages. However, no studies have focused specifically on whether changes in TV-time would be substantially limited by long-term sociodemographic and health factors.

Recently, we found that TV-time was relatively stable in adults for only three older age groups (18, 21 and 24 years) and that it varied with age and gender over a 25-year period.[16] The Cardiovascular Risk in Young Finns Study (YFS) offers a unique opportunity to investigate determinants of changes in TV-time. Data have been collected three times in six age cohorts of young adults over 10 years through to early midlife. In the current study, we extend these findings to explore the long-term correlates of changes in TV-time in adult populations and to identify potential barriers and facilitators for implementation of these changes. Latent growth modeling (LGM) is a novel method that allows for the prediction of interindividual (between-person) variability in intraindividual (within-person) change over time.[26] The LGM method has been used to assess the association between changes in physical activity and changes in sedentary behavior during early adolescence.[27] We aimed to describe changes in TV-time in young adults during 2001-2011, and to examine potential modifiable and non-modifiable characteristics in relation to changes in TV-time for men and women separately. We hypothesized that advanced age, male gender, low socioeconomic status, no children, being single, smoking, physical inactivity, obese, and poor health habits would be independently associated with the intercepts (initial levels) and/or slopes (changes) of TV-time. This

may enable important information to feed into the development of effective interventions with respect to reducing TV-time in the young adult population.

2 METHODS

2.1 Study Sample

Data were obtained from the YFS,[28] an ongoing longitudinal population-based study consisting of six cohorts born in 1962, 1965, 1968, 1971, 1974 and 1977. Children and adolescents who were 3, 6, 9, 12, 15, and 18 years of age at the start of the study in 1980 were randomly selected (*N*=3596, 83%) from the five university cities with medical schools (Helsinki, Kuopio, Oulu, Tampere and Turku) and their surrounding communities. The participants completed questionnaires and a medical examination across eight consecutive surveys between 1980 and 2011. For the present study, we chose 2001 as the baseline because that was the year when TV-time was self-reported in all age groups. A sample of 1345 men and 1584 women aged 24-39 years participated in the 10-year follow-up. Ethics approval was obtained from the ethics committee of each of the five participating universities. All subjects gave written informed consent.[28]

2.2 Television viewing time

TV-time during leisure time was measured using a single question, as previously described.[29] In one of our recent studies, TV-time was based on a sample that only included 18-, 21- and 24-year-old participants in 1986. However, TV-time was not measured in the three youngest ages then.[16] In 2001, all six age groups of participants were asked to report how much time per day on average they spent watching TV. Thus, in this study we used that data set to have a larger sample and to better interpret TV-time data. Daily TV-time was measured in minutes in 2001 and in hours in 2007. The TV-time in

2011 was recorded in minutes separately for weekdays and weekend days, and the average daily TV-time was calculated as follows: (5×weekday+2×weekend)/7. Although the TV measurements varied slightly across time, all of these were constructed to convert into a one-hour increment of daily TV-time prior to analysis. Test-retest reliability coefficients of the TV-time values with 4- and 6-year intervals were more than 0.60.[16] We validated TV-time measurement of the questionnaire with waist circumference and body mass index (BMI), indicating that the increase in waist circumference and BMI was at least 2-fold in the high TV time group compared to the low TV time group ($p<0.05$).[19]

2.3 Determinants of changes in TV-time

In 2001 and 2011, occupation was divided into three categories on the basis of the criteria of the Central Statistical Office of Finland: manual (builders, metal workers, and nannies, etc.); lower non-manual (civil servants, specialized and skilled workers, etc.); and upper non-manual (administrators, managers and academics, etc.). Entrepreneurs were classified according to the level of their education as follows: entrepreneurs with low (≤ 9 years), intermediate (10-12 years), and high (>12 years) levels of education into manual, lower non-manual, and upper non-manual categories, respectively. Changes in occupation were classified as staying in manual work (reference group included those who were manual workers initially and at follow-up), staying in non-manual work, becoming in non-manual work, and becoming manual work. Employment status was specified by categories: employed, full-time students and others (part-time worker, housewife/husband, unemployed, disabled for work, and being in military service). Changes in employment status were classified as staying employed, staying unemployed, becoming employed, becoming unemployed, and student becoming employed. Marital status was divided into married (married, engaged, and cohabiting) and non-married (single, divorced, and widowed). Changes in marital status were classified as staying married/co-habiting, staying single, becoming single, and becoming married/co-habiting. We formed two categories from the number of children: having one child or more and

having no child. Changes in having children were classified as already has children, no children, and becoming father/mother.

Physical activity (PA) was measured through a questionnaire concerning the volume, frequency, intensity, and duration of PA.[30,31] All items were first computed as the average index of PA ranging from 5 to 15 and then divided into two groups (low ≤ 8 scores and high >8 scores). Changes in PA were classified as persistently low, persistently high, increasing, and decreasing. Smoking status was divided into three categories: smoker (once a day or more often), occasional smoker (once a week, but not daily, less often than once a week, and trying to give up or giving up) and non-smoker (never). Changes in smoking were classified as staying a non-smoker, staying a smoker, becoming a smoker, and becoming a non-smoker. BMI was calculated as weight (kg)/height (m^2) and divided into three groups: normal weight (<25 kg/m^2), overweight (25-29.9 kg/m^2) and obesity (≥30 kg/m^2). Changes in BMI were classified as staying normal weight, staying overweight/obese, becoming overweight/obese, and becoming normal weight. Self-rated health habits were determined by asking each participant, "How much attention do you pay to keeping personal healthy habits?" The response alternatives were very much, much, hard to say, little, and very little, of which the first two categories were combined to form the attention category of "high" and the last three to form "low." Changes in attention to healthy habits were classified consistently low, consistently high, increasing, and decreasing.

2.4 Statistical Analysis

Gender comparisons of all variable were assessed using *t* tests or χ^2 tests. Latent growth modeling (LGM) was used to estimate the effects of long-term sociodemographic and health behavior characteristics (age, occupation, employment status, marital status, having children, smoking, PA,

BMI, and attention to health habits) on the intercept and slope of TV-time from 2001 to 2011. Structural equation framework was applied to fit the growth model for men and women separately. Standardized regression coefficients reflecting the standardized mean differences between the categories of binary predictors were reported and interpreted as effect size measures. Effect size of 0.3 was considered small, 0.5 medium and 0.8 large.[32] Analyses were conducted in May 2017 and performed using SPSS 20.0 for Windows (SPSS Inc., Chicago, IL) and Mplus 7 user's guide.[33] The significance level was set at $p<0.05$.

Missing data were assumed to be missing at random (MAR) and were considered missing as a function of observed covariates and observed outcomes,[33] because exclusion of the missing data from the final analysis might have significantly reduced statistical power and could have led to biased estimation results.[34] Maximum likelihood with robust standard errors was used to estimate means and parameters of the models and produce unbiased parameter estimates under MAR. The Satorra-Bentler scaled χ^2-test, the comparative fit index (CFI), the Tucker-Lewis Index (TLI), the root mean square error of approximation (RMSEA), and the standardized root-mean-square residual (SRMR) were used to evaluate the goodness-of-fit of the models. The model fitted the data well if the p-value for the χ^2-test was non-significant, CFI and TLI values were close to 0.95, the RMSEA value was below 0.06, and the SRMR value was below 0.08.[35]

3 RESULTS

3.1 Characteristics of participants

The mean level of TV-time was higher among men than among women in all three follow-up phases (Table 1). A negative slope for TV-time was observed for both genders (all $p<0.01$), but there was individual variation around it. Men were more likely to stay in manual work and to have no children,

and were less likely to divorce than women. Men were also more likely to stay a smoker and overweight/obese, and they paid consistently less attention to health habits than women. There were no significant gender differences in the change of employment status or PA.

3.2 Determinants of the initial level and change in TV-time

In the age-adjusted models for men, most sociodemographic and health behavior characteristics had significant associations with the initial level and/or change of TV-time (Table 2). The fully adjusted models for men fitted the data well ($\chi^2(42)=54.69$, p=0.09; CFI=0.98; TLI=0.97; RMSEA=0.02; SRMR=0.01). The significant determinants of the intercept and slope only are shown in a path diagram (Figure 1a). The initial level of TV-time was predicted negatively by students becoming employed (b=-0.139, p=0.002) and already has children (b=-0.147, p=0.016), and positively by staying a smoker (b=0.109, p=0.031) and staying overweight/obese (b=0.147, p=0.001). The change of TV-time was predicted positively by age (b=0.282, p<0.001) and becoming employed (b=0.159, p=0.038), and negatively by having increasing attention to health habits (b=-0.152, p=0.022). However, the effect sizes of the observed associations were considered small.

Similar results were observed in the age-adjusted models for women (Table 3). The fully adjusted models for women fitted the data well ($\chi^2(33)=30.13$, p=0.61; CFI=1.00, TLI=1.01, RMSEA=0.00, SRMR=0.01) and the significant determinants are shown in the path diagram (Figure 1b). The initial level of TV-time was negatively predicted by age (b=-0.126, p < 0.001), staying in non-manual work (b=-0.248, p=0.012), paying consistently high and increasing attention to health habits (b=-0.168, p=0.001; b=-0.114, p=0.008, respectively), and positively by staying unemployed and becoming employed (b=0.177, p=0.017; b=0.178, p=0.002, respectively), becoming single (b=0.079, p=0.018), staying a smoker and becoming a non-smoker (b=0.092, p=0.009; b=0.101, p=0.001, respectively)

and staying overweight/obese (b=0.150, p<0.001). The change of TV-time was positively predicted by age (b=0.293, p<0.001), and negatively by becoming employed (b=-0.194, p=0.013), becoming mothers (b=-0.262, p<0.001), increasing physical activity (b=-0.143, p=0.030), and becoming normal weight (b=-0.094, p=0.032). In addition, staying in non-manual work was significantly associated with a higher slope of TV-time (b=0.299, p=0.045), although close to a marginally significant level in the age-adjusted model. The effect sizes of the observed associations were also small.

4 DISCUSSION

This is the first study to investigate changes in TV-time over 10 years in six cohorts of Finnish adults. Sociodemographic and health behavior determinants of these changes were included. The study sought to identify long-term determinants of changes in TV-time in the course of sociodemographic and health behavior changes instead of relying on one single measurement during the adult transition period. Changes in adult TV-time may be seen as an accumulative process which eventually affect individual sitting behavior throughout their life span. For example, we found individual variation around a mean level of TV-time throughout the study period for both genders. Several sociodemographic and health behavior characteristics were independently and strongly associated with initial levels of and/or changes in TV-time. Our results support the model suggested by Owen et al.[18], these characteristics such as individual characteristics, social and physical environment factors would be related not only to TV-time history but also to current TV-time, specifically long-term TV-time across adulthood.

There is evidence that male gender and older age are associated with higher TV-time levels.[19] Similar to the findings of Burton et al.[19], we found that men were more likely to report higher TV-time than did women, the magnitude of gender difference effects on TV-time was a significant continuity from

young adulthood to early midlife. Older men and women were more likely to report high TV-time level as they got older and this was especially evident in the transition between young adulthood and early midlife. It should also be noted that the levels of TV-time might vary during the transition period. The results also revealed some determinants of changes in TV-time for women only (e.g., staying in non-manual work, staying single and increased PA), although these associations were weak significant. This may contribute to a growing body of literature examining associations between gender, age and TV-time over time. Our results suggest that an increase in the average age of men and women is more important to the development of TV-time than the initial level of TV-time, particularly in women. It is noteworthy that with apparent gender differences in TV-time during adulthood, separate analyses for women and men are warranted to help develop gender-specific TV-time interventions.

Our findings may have implications for understanding employment changes in the development of TV-time. Unemployment is associated with higher TV-time in many cross-sectional studies,[19-22] and notably, many of these studies find that associations between unemployment and TV-time are consistent in both genders. Our results indicated that women who stayed unemployed had a higher initial level of TV-time and men who became unemployed had a higher slope of TV-time when compared to their stayed employed counterparts. This suggests that short- or long-term unemployment may not only increase current TV-time but also maintain high TV viewing over time in either gender. Interestingly, the transition to employment was found to be a significant determinant of TV-time. It is possible that becoming employed contributes to the reduction of TV viewing over time in both genders.

In line with previous systematic reviews,[19–22] men and women who stayed overweight/obese had a higher initial level of TV-time than those who stayed normal weight, as did those who stayed a smoker compared to those who stayed a non-smoker. For women, having past smoking experience was associated with a higher TV-time at the initial assessment point. Our findings indicate that those who have stayed a smoker and overweight/obese may spend more TV-time during young adulthood and accordingly merit attention for behavior change. Furthermore, already has children was shown to be a protective factor against prolonged TV-time. Although Finnish women continue to take greater responsibility for caring for their children, men also share domestic chores in the family, which can be seen in a significant reduction in TV-time for both young parents.

Our results also highlight the importance of attention to healthy habits. Maintaining and increasing attention to healthy habits were inversely associated with the initial level of TV-time in women, while it was inversely associated with the slope of TV-time in men. This may mean that both men and women who perceived themselves to have healthy habits would respond more favourably to descriptions of healthy lifestyles. This was supported by our findings that staying a non-smoker and staying normal weight were inversely associated with higher prevalence of TV-time. A possible explanation is that reducing TV-time may enhance body awareness and may lead adults to pay more attention, for instance, to dietary habits and PA as having a positive impact on health and well-being. A greater awareness of sedentary lifestyles, and the risk these pose for weight gain and other health risks, may also be a factor.

In the final LGM regression analysis, the associations of some socioeconomic and health factors with changes in TV-time for both genders disappeared after adjusting for the other covariates. The association is explained by the fact that these factors mutually influence and interact with one another over time to produce TV-time. For example, unemployment may affect both unhealthy

behaviors and prolonged TV-time. Unemployed adults may be more likely to smoke regularly or gain weight, which, in turn, could increase daily TV-time. On the other hand, unemployment may contribute to the amount of prolonged TV-time and unemployed adults are more willing to maintain smoking and to eat unhealthy foods. Therefore, TV-time variation may partly be explained by the combination of covariates.

The strengths of the present study include its prospective study design with three measurements over a 10-year period, a representative population-based sample covering six birth cohorts, and various potential long-term determinants. This allowed us to use a LGM approach to analyse the intercepts and slopes of TV-time from young adulthood to early midlife and to offer the possibility of identifying major factors for changes in TV-time, resulting in substantial reductions in the misclassification bias. However, several potential limitations should also be considered. First, men and women at the group level tended to decrease in TV-time during the 10-year period. This may be due to a single-item self-report question tapping using a slightly different data collecting method (hour vs. minute and the average daily TV-time in 2001/7 vs. the average daily TV-time for weekdays and weekend days in 2011) across the three occasions, thus resulting in an underestimate of the relative stabilization of TV-time because of social desirability bias.[36] In order to focus precisely on the specific time to watch TV at each phase, minor modification is necessary because of the possibility of differences in TV-time over the years. Despite this, the tracking coefficients of TV-time have been shown to be parallel to the correlation coefficients during the adult transition.[17] This means that the latent variable of TV-time can be measured using a single question in a slightly different way.

Second, as the participants' ages ranged from 24 to 49 years (i.e., from young adulthood to early middle age) in the present study, the results may not be generalized to the older population (≥50 years). Although our results indicate that changes in sociodemographic and health behavior

characteristics are associated with the initial level and development of TV-time in a relatively young segment of the population, these findings do not rule out the possibility that non-differential misclassification bias may lead to an underestimation of the true association between exposure and outcome. In addition, it should be noted that the study included only TV-time during leisure time as a measure of screen time but did not capture other domains (e.g., movies, video games, computer uses, tablet devices, and smart phones). However, TV-time during leisure time remains the most common and highly prevalent (90%) in the Finnish population until 2011, one in three Finns has used computers. The number of tablet and smartphone users has increased in recent years.[37] Future studies should take into account a broad range of sedentary behaviors assessed by both self-report and accelerometry. Finally, the study was conducted with predominantly homogeneous Finnish samples of highly educated adults with a high level of occupational sitting time. Thus, the results cannot be generalized to other populations, especially those with low socioeconomic status or with substantial ethnic differences.

5 PERSPECTIVE

This study provides insight into the modifiable and non-modifiable determinants of TV-time in a large population-based cohort of Finnish adults with 10 years of follow-up. It also highlights the important role that a range of changes in sociodemographic and health behavior characteristics can influence the TV-time of young adults and their subsequent behavior in early midlife. The results imply that several gender specific determinants of changes in TV-time can help identify potential targets for social and health behavioral interventions to prevent excessive TV in adulthood.

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Legend of Figure 1. Path diagram of the adjusted latent growth models for men (Figure 1a) and for women (Figure 1b). Statistically significant regression coefficients (standard errors) were only given when controlling for age and mutually for all presented variables. Circles denoted latent variables and squares denoted observed variables. Explanatory variables were allowed to be correlated. *p<0.05, **p<0.01, and ***p<0.001.

Table 1. Descriptive statistics of the study variables in Finland, 2001-2011

Variable	Men (*n* = 1345) *n* (%)	*n*	Women (*n* = 1584) *n (%)*	*n*	*p*[†]
TV time in 2001 (h/d, mean (*sd*))	2.1 (1.2)	1163	2.0 (1.1)	1431	0.001
TV time in 2007 (h/d, mean (*sd*))	1.9 (1.2)	1001	1.7 (1.1)	1223	0.001
TV time in 2011 (h/d, mean (*sd*))	2.0 (1.3)	875	1.8 (1.1)	1095	<0.001
Socio-demographic characteristics					
Change in occupation (2001-2011)		604		800	
Staying a manual worker	171 (28.5)		41 (5.1)		
Staying a non-manual worker	305 (50.5)		608 (76.0)		
Becoming a non-manual worker	81 (13.4)		123 (15.4)		
Becoming a manual worker	46 (7.6)		28 (3.5)		<0.001
Change in employment status (2001-2011)		659	669		
Staying employed	565 (85.7)		549 (82.1)		
Staying unemployed	7 (1.1)		8 (1.2)		
Becoming employed	19 (2.9)		26 (3.9)		
Becoming unemployed	21 (3.2)		17 (2.5)		
Student becoming employed	47 (7.1)		69 (10.3)		0.206
Change in having children (2001-2011)		758		1008	
No children	193 (25.5)		196 (19.4)		
Already has children	363 (47.9)		598 (59.3)		
Becoming mother/father	202 (26.6)		214 (21.2)		<0.001
Change in marital status (2001-2011)		765	997		
Staying married/co-habiting	480 (62.7)		621 (62.3)		
Staying single	102 (13.3)		120 (12.0)		
Becoming single	53 (6.9)		107 (10.7)		
Becoming married/co-habiting	130 (17.0)		149 (14.9)		0.035
Health behavior characteristics					
Change in smoking (2001-2011)		749	986		
Staying a non-smoker	492 (65.7)		739 (74.9)		

Staying a smoker	131 (17.5)	125 (12.7)	
Becoming a smoker	23 (3.1)	30 (3.0)	
Becoming a non-smoker	103 (13.8)	92 (9.3)	<0.001
Change in physical activity (2001-2011)	704	919	
Persistently low	180 (25.6)	192 (20.9)	
Persistently high	305 (43.3)	398 (43.3)	
Increasing	119 (16.9)	189 (20.6)	
Decreasing	100 (14.2)	140 (15.2)	0.075
Change in body mass index (2001-2011)	748	941	
Staying normal weight	231 (30.9)	439 (46.7)	
Staying overweight/obese	356 (47.6)	312 (33.2)	
Becoming overweight/obese	129 (17.2)	167 (17.7)	
Becoming normal weight	32 (4.3)	23 (2.4)	<0.001
Change in attention to health habits (2001-2011)	765	999	
Consistently low	280 (36.6)	178 (17.8)	
Consistently high	262 (34.2)	566 (56.7)	
Increasing	135 (17.6)	158 (15.8)	
Decreasing	88 (11.5)	97 (9.7)	<0.001

[†]The *p*-value for gender difference (Student's t-test or Pearson's chi-squared test)

Table 2. The results of unadjusted latent growth curve modeling for the level and change of TV time between 2001 and 2011 in men (n = 1345) in Finland, 2001-2011

	Level†			Slope†		
Variable	*b*	s.e.	*p*	*b*	s.e.	*p*
Age in 2001	**-0.083**	**0.036**	**0.021**	**0.284**	**0.080**	**<0.001**
Change in occupation (2001-2011)						
Staying a manual worker	ref					
Staying a non-manual worker	**-0.189**	**0.061**	**0.002**	0.001	0.075	0.993
Becoming a non-manual worker	-0.030	0.057	0.599	0.081	0.086	0.343
Becoming a manual worker	-0.088	0.057	0.124	-0.045	0.067	0.503
Change in employment status (2001-2011)						
Staying employed	ref					
Staying unemployed	0.098	0.055	0.073	0.098	0.071	0.172
Becoming employed	**0.135**	**0.058**	**0.019**	-0.105	0.090	0.242
Becoming unemployed	-0.001	0.041	0.983	**0.154**	**0.077**	**0.046**
Student becoming employed	**-0.134**	**0.045**	**0.003**	0.016	0.058	0.785
Change in having children (2001-2011)						
No children	ref					
Already has children	**-0.218**	**0.056**	**<0.001**	0.048	0.072	0.511
Becoming father	-0.104	0.060	0.084	-0.066	0.078	0.397
Change in marital status (2001-2011)						
Staying married/co-habiting	ref					
Staying single	**0.177**	**0.053**	**0.001**	-0.036	0.074	0.627
Becoming single	0.037	0.045	0.414	0.008	0.057	0.885
Becoming married/co-habiting	0.046	0.047	0.331	0.076	0.062	0.220
Change in smoking (2001-2011)						
Staying a non-smoker	ref					
Staying a smoker	**0.132**	**0.055**	**0.016**	0.063	0.064	0.324
Becoming a smoker	-0.014	0.032	0.668	-0.069	0.052	0.183
Becoming a non-smoker	0.074	0.043	0.086	0.107	0.071	0.133
Change in physical activity (2001-2011)						
Persistently low	ref					
Persistently high	0.097	0.060	0.106	**-0.209**	**0.085**	**0.014**
Increasing	0.036	0.060	0.552	-0.126	0.086	0.142

Decreasing	0.078	0.059	0.186	-0.124	0.077	0.110
Change in body mass index (2001-2011)						
Staying normal weight	ref					
Staying overweight/obese	**0.125**	**0.051**	**0.015**	0.049	0.068	0.470
Becoming overweight/obese	**0.118**	**0.054**	**0.028**	-0.077	0.077	0.314
Becoming normal weight	**-0.080**	**0.039**	**0.042**	0.035	0.064	0.581
Change in attention to health habits (2001-2011)						
Consistently low	ref					
Consistently high	**-0.105**	**0.048**	**0.029**	-0.091	0.068	0.183
Increasing	-0.027	0.050	0.592	**-0.178**	**0.069**	**0.010**
Decreasing	-0.040	0.049	0.414	-0.063	0.057	0.267

[†]Model was adjusted for age. Statistically significant ($p < 0.05$) estimates were presented in bold.

b, standardized regression coefficient; s.e., standard error; ref, reference class.

Table 3. The results of unadjusted latent growth curve modeling for the level and change of TV time between 2001 and 2011 in women (n = 1584) in Finland, 2001-2011

	Level†			Slope†		
Variable	*b*	s.e.	*p*	*b*	s.e.	*p*
Age in 2001	**-0.123**	**0.031**	**<0.001**	**0.307**	**0.080**	**<0.001**
Change in occupation (2001-2011)						
Staying a manual worker	ref					
Staying a non-manual worker	**-0.299**	**0.095**	**0.002**	0.267	0.140	0.057
Becoming a non-manual worker	-0.139	0.089	0.119	0.237	0.130	0.068
Becoming a manual worker	-0.067	0.051	0.186	0.104	0.079	0.189
Change in employment status (2001-2011)						
Staying employed	ref					
Staying unemployed	**0.242**	**0.072**	**0.001**	0.005	0.082	0.947
Becoming employed	**0.201**	**0.062**	**0.001**	**-0.166**	**0.075**	**0.027**
Becoming unemployed	**0.090**	**0.040**	**0.025**	0.015	0.066	0.818
Student becoming employed	-0.006	0.052	0.909	0.061	0.062	0.331
Change in having children (2001-2011)						
No children	ref					
Already has children	0.001	0.057	0.980	-0.123	0.071	0.082
Becoming mother	0.052	0.053	0.326	**-0.290**	**0.073**	**<0.001**
Change in marital status (2001-2011)						
Staying married/co-habiting	ref					
Staying single	-0.010	0.046	0.832	0.077	0.058	0.184
Becoming single	**0.097**	**0.037**	**0.009**	-0.054	0.052	0.296
Becoming married/co-habiting	-0.009	0.040	0.820	**0.119**	**0.055**	**0.031**
Change in smoking (2001-2011)						
Staying a non-smoker	ref					
Staying a smoker	**0.140**	**0.043**	**0.001**	0.026	0.059	0.655
Becoming a smoker	0.050	0.027	0.059	0.018	0.047	0.702
Becoming a non-smoker	**0.144**	**0.040**	**<0.001**	-0.029	0.048	0.539
Change in physical activity (2001-2011)						
Persistently low	ref					
Persistently high	**-0.147**	**0.057**	**0.010**	0.002	0.071	0.979
Increasing	-0.058	0.053	0.278	**-0.136**	**0.066**	**0.040**

Decreasing	**-0.102**	**0.051**	**0.045**	0.004	0.062	0.951
Change in body mass index (2001-2011)						
Staying normal weight	ref					
Staying overweight/obese	**0.209**	**0.041**	**<0.001**	-0.089	0.052	0.086
Becoming overweight/obese	0.074	0.041	0.069	0.039	0.053	0.463
Becoming normal weight	-0.004	0.037	0.924	**-0.098**	**0.048**	**0.040**
Change in attention to health habits (2001-2011)						
Consistently low	ref					
Consistently high	**-0.272**	**0.058**	**<0.001**	-0.004	0.071	0.957
Increasing	**-0.194**	**0.050**	**<0.001**	0.051	0.066	0.434
Decreasing	-0.083	0.048	0.082	-0.006	0.059	0.919

[†]Model was adjusted for age. Statistically significant ($p < 0.05$) estimates were presented in bold.

b, standardized regression coefficient; s.e., standard error; ref, reference class.

Figure 1A

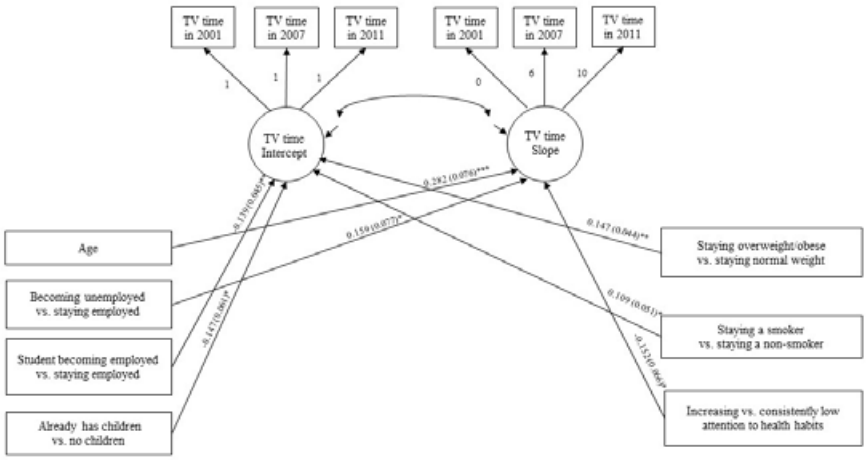

Figure 1b