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Disconnected Lives: Trends in Time Spent Alone in Finland

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Abstract

Discussions about social isolation have been extensive over the past few decades. A less sociable nature of social ties has been identified in Western societies. The phenomenon has been associated with demographic changes such as aging and living alone as well as changes in the use of new technologies. In this study we employ representative Finnish Time Use Surveys from three decades, 1987–1988 (n = 1887), 1999–2000 (n = 2673) and 2009–2010 (n = 1887) to examine the trends in social isolation, measured as time spent alone. Our results showed that between 1987 and 2010 the time spent alone increased by 124 min per day. The increase was linear and occurred in nearly all population groups. Structural factors, such as aging and an increase in the number of single households, are strongly associated with increased time spent alone. Time spent alone has increased, especially during leisure activities. Specifically, time spent watching television and using computers is associated with the decreasing tendency for face-to-face interaction.

Keywords Social isolation · Time use · Time spent alone · Technology · Finland

1 Introduction

The trends and consequences of social isolation—along with the parallel concept of loneliness—have been debated and analysed in a lively manner during the last few decades. For example, studies from the United States have reported major declines in interpersonal and community networks (Putnam 2000). In 2006, McPherson and colleagues published a paper in the American Sociological Review analysing 20 years of social network data collected using the General Social Survey (GSS) and showed that from the mid-1980s to the mid-2000s, the average size of Americans' conversational network shrunk by a third. In addition, the number of people who reported having nobody to talk to tripled. The critics raised some methodological issues (Paik and Sanchagrin 2013) and contradictory evidence (Hampton et al. 2009, 2011).

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More recently, nationally representative surveys of US adolescents 1976–2017, showed that compared to previous generations, adolescents in the 2010s spent less time on in-person (face-to-face) social interaction with peers. In 2016, college-bound high school seniors (vs. the late 1980s) spent an hour less a day engaging in in-person social interaction (Twenge et al. 2019). Surveys indicated that adolescents' feelings of loneliness increased sharply after 2011. Adolescents with low in-person social interaction and those with extensive use of social media reported the most loneliness. Another related study (Twenge et al. 2018) focused on adolescents' psychological well-being and showed that those who spent more time on electronic communication and screens and less time on non-screen activities, for example in-person social interaction, had lower psychological well-being.

Some studies have used time use data to estimate trends in social isolation. Turcotte's (2007) study analysed the four waves of the Canadian GSS on time use. He found that between 1986 and 2005 the time that Canadian workers spent alone increased by 40 min per day. Another study looking at the entire Canadian population aged 15 or older showed a 1.5-h increase in time spent alone between 1986 and 1998 (Clark 2002).

Many social, political and economic indicators from the industrialized countries point towards the trend of atomization and privatization of modern life. The trend has occurred in both the public domain and within homes (Williams 2006). Researchers (e.g. DiMaggio et al. 2001) consider the change in social relations along the continuum of social specialization that started from the industrialization and urbanization of modern society (Durkheim 1893/1984). Social ties detach from the bounded local networks of close family and kin (mechanical solidarity) and reorganize into more specialized and voluntary-based social ties (organic solidarity). Sociologists have tied social isolation to the capitalistic mass society, and modern city, with its atomized social relationships. Thus, social isolation may be regarded as a malaise of modernity and of urban life (Parigi and Henson 2014). Putnam's (2000) major concern, in his seminal book *Bowling Alone*, was how the changes in social networks affect social capital, the benefits that human beings gain from being part of communities. According to his view, a by-product of run-down social networks is the weakening of trust relations among citizens.

In parallel, digital technologies open up new social media and reformulate social interaction (DiMaggio et al. 2001; Stern 2008; Hampton et al. 2011), perhaps reducing the need for, or possibility of, face-to-face connections. A recent study comparing the daily time use of Swedish young adults (20–29 years old) since 1990s showed a considerable increase in ICT use and at the same time period (1990–2011) a consistent decline in offline social activities such as visiting and meeting at home or in public spaces. Young adults performed more free-time activities alone (Vilhelmson et al. 2018). Another time use study compared young (15–24 years old) heavy, medium, and light digital media users and their time use patters. The results indicated that heavy ICT users spend more time performing offline activities alone, and spend more time at home. Researchers concluded that heavy use of ICTs reflected spatially and socially introverted and home-centred ways of living (Thulin and Vilhelmson 2019).

The beneficial effects of shared social time are widely acknowledged in the literature. Time spent with others strengthens social relationships, provides opportunities to support and is generally enjoyable. The presence of social networks facilitates coping with adverse events, for example dealing with existing health issues (Cohen 2004). Social isolation is associated with the scarcity of social contact and related health resources (absence of practical support). Consequently, social isolation has been associated with serious detrimental effects on health (Cornwell and Waite 2009; Coyle and Dugan 2012; Holt-Lunstad et al. 2015). In addition, close social relationships, such as marriages, are dependent on

the degree of their nearness, that is, on the degree to which social relationships occur in face-to-face situations (Berger and Kellner 1964; Kingston and Nock 1987). Maintaining a fulfilling family life also entails family members spending time together 'face to face' (Strazdins et al. 2004).

In this study we employ Finnish Time Use Surveys (FTUS) from three decades to examine the phenomenon of social isolation, measured as time spent alone, along with societal changes, focusing on demographical changes and new technologies. We use the information the FTUS gathers on with whom the respondent was over the course of each day, to calculate trends in time spent alone. We will also identify groups at risk of social isolation.

We suggest, firstly, that the risks of social isolation—in the form of time spent alone—are connected with living alone, changes in marital and childbearing patterns and the age structure of society. Secondly, we assume that the changing social forms in using new (and old) technologies affect time use.

1.1 Time Spent Alone

Social isolation is typically defined by small social networks, infrequent social contacts, an absence of confidante connections, living alone and a lack of participation in social activities (Cornwell and Waite 2009; Holt-Lunstad et al. 2015). Social isolation is characterized by the opportunities and restrictions related to the living environment. While sometimes public discussion, media and even scientific scholars refer to social isolation and loneliness as interchangeable concepts, it is important to distinguish between them. Social isolation refers to an objective situation where a person does not have any, or only a few, people to interact with, and it can be measured with objective measures (e.g. Wenger et al. 1996), while loneliness is a subjective experience or a feeling of distress stemming from being without the type of relationships one desires (e.g. Weiss 1973). Several studies have established that there is only a low correlation ($r = 0.10$–0.25) between loneliness and social isolation (Cornwell and Waite 2009; Coyle and Dugan 2012; Tanskanen and Anttila 2016; Steptoe et al. 2013).

In time use survey data, being alone refers to situations where a respondent is not in the same room or space as a person he/she knows, such as a family member or a friend. This definition of being alone does not exclude the presence of unknown others such as other passengers on a bus (Roeters et al. 2014). This kind of time spent alone can have both positive and negative perceptions and impacts on individuals. It helps individuals to unwind and recharge and provides more autonomy, but on the other hand, solitude limits individual access to social resources and support, and—if not voluntary—can raise the feelings of loneliness (Long and Averill 2003; Roeters et al. 2014). Time alone cannot be judged as a purely good or bad phenomenon. For example, people may seek solitude from home as it enables them to be free of social judgement and thus to relax. Sometimes, however, time alone can be felt as being more negative, especially if it is unwanted. For example, in public places like cafes there are stronger expectations of social interaction and therefore being alone in the crowd can be felt as being more negative (Lay et al. 2018).

1.2 Disconnecting Tendencies of Social Relationships

The risk of social isolation is associated with growing social differentiation between social groups. Elevated risks are identified in particular among young and elderly people (Larson 1990), and the less well educated (e.g. McPherson et al. 2006; Klinenberg 2016; Tanskanen

and Anttila 2016). In addition, the increase of single households may lead to increasing time spent alone, since there is no partner with whom to share the spare time. Living alone has increased, especially among elderly people and the male workforce. In 2016, 42.6% of Finnish households were single households. Living alone is most common among groups under the age of 30 and over the age of 60 (Kähäri et al. 2017). In previous studies the increase of single households was found to be the main reason why solitary eating in Belgium increased between 1966 and 1999 (Mestdag and Glorieux 2009).

While the number of unmarried people has increased, the marriage rates and the number of children per household have decreased. Yet there is a growing number of older people who don't have spouses or children (Miettinen et al. 2015). For elderly people, having a low income and living alone are also risk factors for experiencing loneliness (Savikko et al. 2005). In addition, it has been suggested that men are at greater risk of social isolation (Stringhini et al. 2012). Men are usually more oriented toward activities outside the family than women, and are less adept at making friends; men are also found to be less able to sustain ties with family members, including children (Klinenberg 2012).

While work is a central source of social relations, missing a job is associated with a loss of social relationships (Jahoda 1982). Larson (1990) has shown that adults who have higher-status jobs spend less time alone than adults in semi-skilled jobs, who spend more time alone at home, at work and in the public domain than people in more skilled jobs. This may partly be due to their higher education, since individuals with higher education tend to consume culture such as theatre more often and participate more frequently in voluntary activities (Pääkkönen 2006; Wilson 2000; Van de Werfhorst and Kraaykamp 2001). Thus having a higher occupational status seems to ensure a wider social network and more active leisure.

New technologies are considered to be the main factor in the change of social relations and in creating new networks (Castells 1996; Parigi and Henson 2014). Previously, television has been accused of being antisocial and isolating (e.g. Putnam 2000). The critical view emphasizes that watching television is, however, an activity that is intimately connected with the social life of households (Brown and Barkhuus 2011) and remains a highly relevant leisure pursuit (Hamill 2011). More lately the issue of the effects of Internet use on interpersonal connectivity has generated a great deal of debate among researchers. Earlier empirical studies have shown conflicting results. Some studies have suggested that detrimental use of the Internet, especially in terms of face-to-face social interaction (Sanders et al. 2000; Stern 2008; Sigman 2009), leads to social isolation, or to poorer social skills (Maczewski 2002). It has been suggested that the Internet reduces participation, especially in those activities that are important for obtaining social capital. Other studies indicate that computer-mediated communications complement other modes of communication (Hampton 2016). Indeed, new technology has evidently extended possibilities for social connections. The 'depth' of these connections is a more controversial issue. Turkle's (2017, 280) expression 'alone together' indicates that technology has enhanced connectivity, but we rarely gain others' full attention through these connections.

There are plenty of studies on technology and social isolation within different social groups. The biggest digital divides are identified among young and elderly people in the use of, and access to, new technologies and social networks. For young people, social media has emerged as an important means of communication that adds new types of social communication and affects young people's lives by changing the physical proximity to both family and peers (Thulin and Vilhelmson 2007).

Along with technological change, we may also find architectural trends that change physical proximity—and time spent in face-to-face contact. Williams (2006) suggests

that within homes, families can be ever more internally separated from each other if these homes are ever larger and media entertainment stations can be found increasingly in the private spaces of individual family members rather than in common spaces. Thus, enlargement of the physical space in homes is one potential source of increased time spent alone.

2 Data and Methods

There are many approaches to looking at time use. In this study our focus is on time spent alone. This is an objective measure that does not grasp perceived qualities of time. In this study it serves as an indicator of social isolation, and specifically we use it to measure changes in face-to-face interaction.

In line with previous time use research we define time as 'alone' when the respondent reported being alone during an activity (Roeters et al. 2014; Craig and Brown 2015). Time use surveys are underutilized in studying changes in social connections; for example, Fisher (2015) has noted that there is a lack of research on time spent alone utilizing time use surveys. In addition, we have the opportunity to examine time use surveys from several decades to observe the long-term trends in time spent alone.

Descriptive analyses (see Fig. 1) start by examining the prevalence and characteristics of social isolation and changes over time. We ask how, and to what extent, social connections have changed in Finland. We assume that new information technologies in particular change the way in which people are connected with each other. The breadth and intensity of the use of technology can be defined in time use surveys.
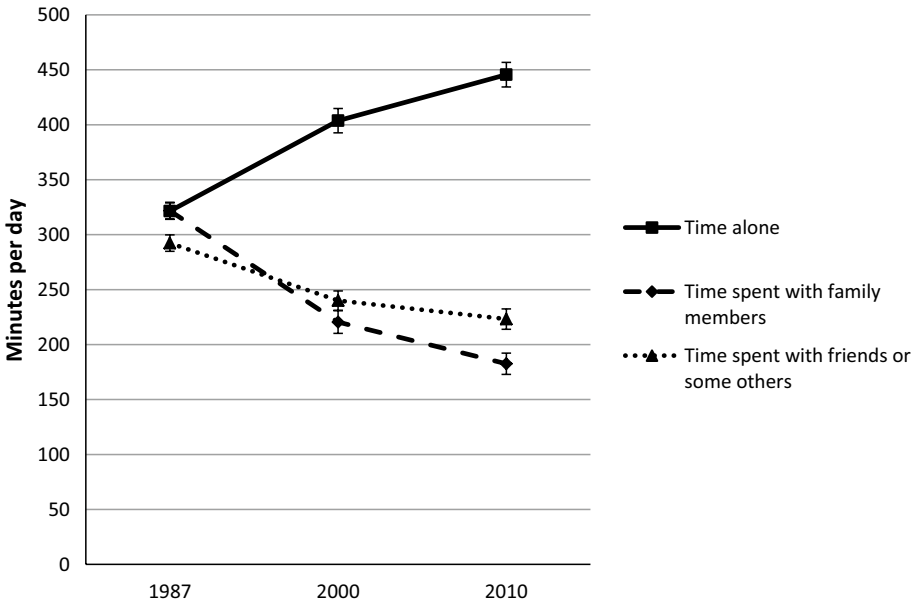

Fig. 1 Changes in time spent alone, time spent with family members and time spent with friends. Mean values and their 95% confidence intervals

2.1 The Finnish Time Use Survey

The Finnish Time Use Survey (FTUS) has been conducted by Statistics Finland approximately every 10 years since 1979. It is an interview survey in which respondents keep a detailed diary for 2 days of their time use. Every 10 min they describe in their own words what they were doing and with whom. The last survey round was in 2009–2010, when it yielded a response rate of 41% (this was the lowest response rate in the time use survey history). The time use survey has been carried out in accordance with the Eurostat (ESS) guidelines since 1999. By that time the statistical unit had changed to households instead of individuals and the HETUS categorization of activities became applicable. Nevertheless, previous years can also be restored to match with the HETUS categorization. All Time Use Surveys are representative samples of the Finnish population aged 10 or older (see Table 1).

For our purposes we combined Time Use Surveys from the years 1987–1988 (n = 1887), 1999–2000 (n = 2673) and 2009–2010 (n = 1887). We had to limit our analysis from September to November because in 1987 there was no 'with-whom' information available for other months. As the FTUS data collection procedure changed between of 1987–1988 and 1999–2000, we made some modifications to 1987–1988 data to ensure the survey waves are comparable. The data collection changed from two consecutive days to one weekday and one weekend day coupled with change in the 24-h time frame from 0 am–12 pm to 4 am–4 am. To have a comparable daily time frame with later survey waves, we left out from 1987 to 1988 data the first 4 h from each person's first diary day. This procedure changed the beginning time of each diary day from 0 to 4 am. Secondly, we "borrowed" the missing 4 h from the second diary day, as the two diary days were consecutive. Thus, for the 1987 data we use only the first diary day merged with 4 h (0–4 am) from the second diary day. Following the same procedure as in 1999–2000 and 2009–2010, the diary weight is calibrated in relation to the day of the week of first diary day i.e. the day contributing

Table 1 Descriptive statistics for each wave

		1987 freq (%)	1999 freq (%)	2010 freq (%)
Gender	Male	915 (48.2)	1221 (46.3)	882 (47.2)
	Female	984 (51.8)	1419 (53.8)	988 (52.8)
Age	10–20	300 (15.9)	372 (14.1)	275 (14.7)
	21–34	521 (27.6)	569 (21.6)	411 (22.0)
	35–49	534 (28.3)	710 (26.9)	379 (20.3)
	50–64	359 (19.0)	552 (20.9)	494 (26.4)
	65–	173 (9.2)	437 (16.6)	310 (16.6)
Educational level	Primary	951 (50.1)	1052 (39.8)	697 (37.3)
	Secondary	774 (40.7)	903 (34.2)	702 (37.5)
	Higher	175 (9.2)	686 (26.0)	471 (25.2)
Work situation	Employed	1122 (59.1)	1370 (51.9)	979 (52.4)
	Unemployed	52 (2.7)	163 (6.2)	136 (7.3)
	Student	316 (16.6)	453 (17.2)	296 (15.8)
	Disabled	95 (5.0)	91 (3.4)	69 (3.7)
	Retired	248 (13.1)	477 (18.1)	338 (18.1)
	Other	66 (3.5)	85 (3.2)	51 (2.7)

4 am to 12 pm h of the 24 h diary. We use diary weights in all analyses to ensure that each day of the week and month have equal representation in dataset for all three waves. Weighting also accounts for the fact that weekend days are overrepresented in the latter two waves of FTUS. Thus, our analyses incorporate one 24 h diary (4–4 am) from 1987 to 88 and two 24 h diaries (4–4 am) for the two latter data waves.

2.2 Measures

2.2.1 Dependent Variable: Time Spent Alone

Respondents marked a tick box next to each activity (except sleeping) indicating whether they were doing it 'alone' or with someone they knew. The answer options were: 'with spouse', 'with mother or father', 'with children from the household aged up to 10 years', 'with other household members' and 'with someone else who you know'. Respondents were further informed that being with someone implies just being present with someone in the same room, but not necessarily active interaction. However, if the respondent was alone in his/her own room, it was to be coded as time spent alone even if there were other people in other rooms in the house.

2.2.2 Control Variables

In the analysis we used several control variables to detect whether the time spent alone was concentrated on certain places, times, groups or activities. In terms of places, we considered home, summer cottage, workplace and trips to somewhere (on foot, by car, by bicycle, by public transport, some other trip). As 'time' variables, in turn, we examined differences between weekends and weekdays as well as differences in the time of the day. In the latter the analysis was limited to the daytime (between 7 am and 23 pm) since we did not have 'with-whom' data from the sleeping hours. Furthermore, we compared different groups in terms of gender (male/female), age groups (10–20, 21–34, 35–49, 50–64, 65–), education (primary, secondary and higher-educational level), family type (couple with children, couple without children, single, single parent) and work situation (employed, unemployed, disabled, retired) as well as different types of living areas (urban, semi-urban and rural). Activities, in turn, were divided into five general groups: paid work, studying, homework, personal needs and leisure time, which further consisted of several subcategories of activities.

Later, when we examined the leisure time in more detail, we further controlled certain activities related to technological change. These included information regarding the existence of a television (yes/no), a computer (yes/no) and a mobile phone (yes/no), frequency of computer use (0 = no computer, 1 = never, 2 = less than once a week, 3 = once or twice a week, 4 = more than 3 days a week, 5 = every day) and the density of televisions (number of televisions divided by the number of rooms in the household).

2.3 Method of Analysis

The analysis is carried out by using descriptive and explanatory analysis methods. In the descriptive part we analyse the 'with-whom' data by detecting how time spent alone has changed since 1987 compared to time spent with family members and friends. Thereafter

we use cross-tabulations to investigate whether the increase in time spent alone has concentrated on certain places, times of the day, groups or activities.

After the descriptive part we continue our analysis by analysing the changes in the time spent alone by using general estimating (GEE) modelling. The GEE is an extension of the generalized linear models and enables us to take account of the clustering of observations within households in the 2000 and 2010 data sets (two diary days for each person and possibly multiple persons from the same household) and thus to generate robust standard errors. In the analysis we assumed that time spent alone follows normal distribution and the correlation structure was set to unstructured. In contrast to subject-specific random-coefficient or multilevel models (MLMs), the GEE is a population-average model. In a population-average model the explanatory variables indicate the expected change in the population for a unit change in one of the explanatory variables. The effect of the clustering of the data is treated as a type of 'noise' that can be removed by accounting for the correlation between observations in the model. If the sample size is reasonably large, GEE estimators are robust against misspecification of the random part of the model, including violations of the normality assumption (Hox 2010).

3 Results

Since 1987, time spent alone has increased at the same time as time spent with family and friends has decreased In 2010, people were alone an average of 7.5 h a day, which is 124 min more than it was in 1987 (See Fig. 1). Especially time spent alone has increased on weekdays (125 min since 1987), but also on weekends (91 min). On weekdays solitary time increased especially between 1987 and 2000, whereas in weekends most of the increase situated between 2000 and 2010 (see Table 2).

Most of time spent alone people spent in their own home, as that covers 60% of the total time spent alone in 2010. This is more than it used to be in 1987 (47%), but the growth is due to the increased time spent at home. Thus, when we compared time spent alone in relation to the amount of time spent in that certain place, we found that this solitary time increased steadily at home (1987: 15% → 2010: 26%), at work (1987: 16% → 2010: 27%) and in summer cottages (1987: 17% → 2010: 27%). Only travel time spent alone (1987: 37% → 2010: 53%) increased a bit faster than the time spent alone in other places. Thus the time spent alone at home did not increase more than the alone time in other places and therefore the increase in time spent alone cannot be connected to a certain place.

The increase in time spent alone cannot be explained either by changes in the rhythms of time use. Regardless of the year, people spent more time alone from Mondays to Fridays and less at weekends. Also, the timing of time spent alone was stable over the years. The only thing that changed was the amount of time spent alone (see Fig. 2). Regardless of the year, the biggest proportion of respondents were alone in the morning before going to school or work (before 9am), after school or work (between 3 pm and 5 pm) and again in the evening (after 9 pm).

The increase in the time spent alone time further occurs in nearly all population groups, including males and females, people of different ages, those with lower to higher educational levels, people in urban areas and the countryside, people in different family types and those in work or out of work.

Both genders—males and females—spend more time alone nowadays than they used to in 1987. Compared to females, the increase in time spent alone on weekdays

Table 2 GEE results of solitary time separately for weekends and weekdays. Time spent alone in different years without (Model 1) and with (Model 2) control variables

	Weekends		Weekdays	
	Model 1 coef (SE) p	Model 2 coef (SE) p	Model 1 coef (SE) p	Model 2 coef (SE) p
Intercept	292.8 (15.2)***	− 3.3 (23.2)	332.8 (8.4)***	− 17.0 (20.9)
Year (ref. = 1987)				
Year 2000	40.2 (18.8)*	13.5 (15.5)	79.2 (13.9)***	44.6 (11.5)***
Year 2010	91.0 (19.6)***	54.9 (16.6)**	125.1 (14.5)**	83.3 (12.7)***
Gender (ref. = female)				
Male		− 6.5 (9.3)		25.7 (9.5) **
Age (ref. = 10–20 years)				
21–34		144.9 (20.1)***		211.1 (17.2)***
35–49		289.9 (23.0)***		274.2 (19.4)***
50–64		356.2 (36.4)***		317.5 (20.6)***
65–		349.5 (25.3)***		357.0 (28.5)***
Family situation (ref. = couple with children)				
Couple without children	25.8 (14.7)		42.2 (13.9)**	
Single		248.7 (18.5)***		234.3 (16.8)***
Single parent	92.5 (50.8)		120.6 (34.7)**	
Work situation (ref. = emloyed)				
Unemployed	9.4 (27.8)		57.4 (26.1)*	
Disabled	71.7 (41.2)		17.2 (29.4)	
Retired		− 4.9 (29.4)		14.0 (22.9)
Education (ref. = primary or secondary level)				
Higher educational level	6.6 (13.3)		15.6 (13.3)	
Area type (ref. = urban and semi-urban areas)				
Rural area	9.6 (15.8)		6.6 (12.5)	
Goodness of fit (QICC)	110,093,094.7	81,508,221.5	267,621,419.2	208,459,042.0
Pseudo R^2	1.4	27.0	2.3	23.9
N	2660	2660	3353	3353

p*** > 0.001; ** > 0.01. * > 0.05. Pseudo R^2 is calculated by comparing changes in the goodness of fit measures (QICC) between the model and the null model

has been even faster for men. Thus, the differences between the genders have grown over the years and as a result, men report more time alone nowadays on weekdays than women. On weekends, however, differences between genders have remained the same (see Table 2).

Time spent alone increases with age (Fig. 3). The oldest people report most time spent alone as could be expected (e.g. Larson 1990). Thus, the aging of the Finnish population may be one reason why the time spent alone is increasing at the national level.

Another reason for increased time spent alone is the spread of single households and the decrease in the number of nuclear families. In all family types—couples with children, couples without children and single households—the trend in regard to time spent alone has grown, but on weekdays there are also notable group differences. Single households,
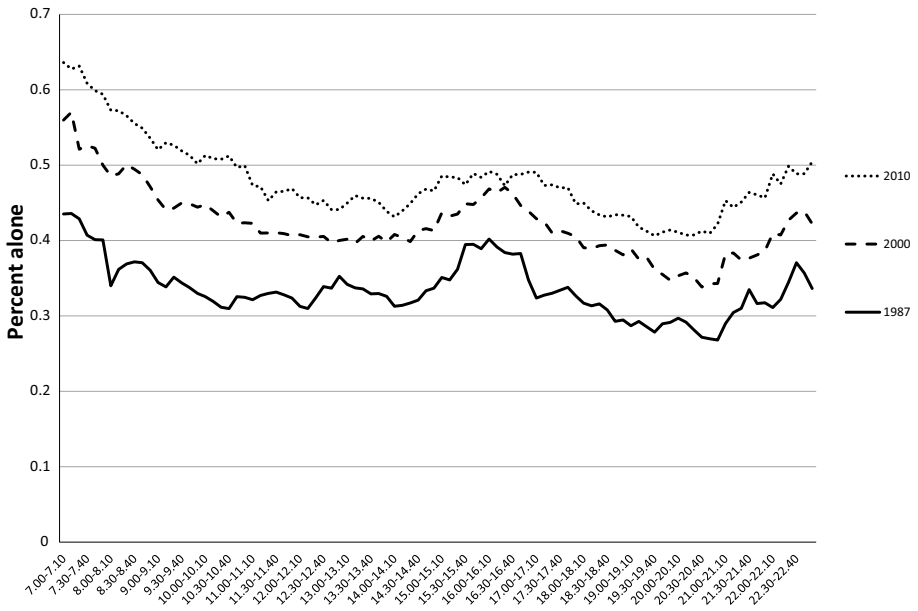
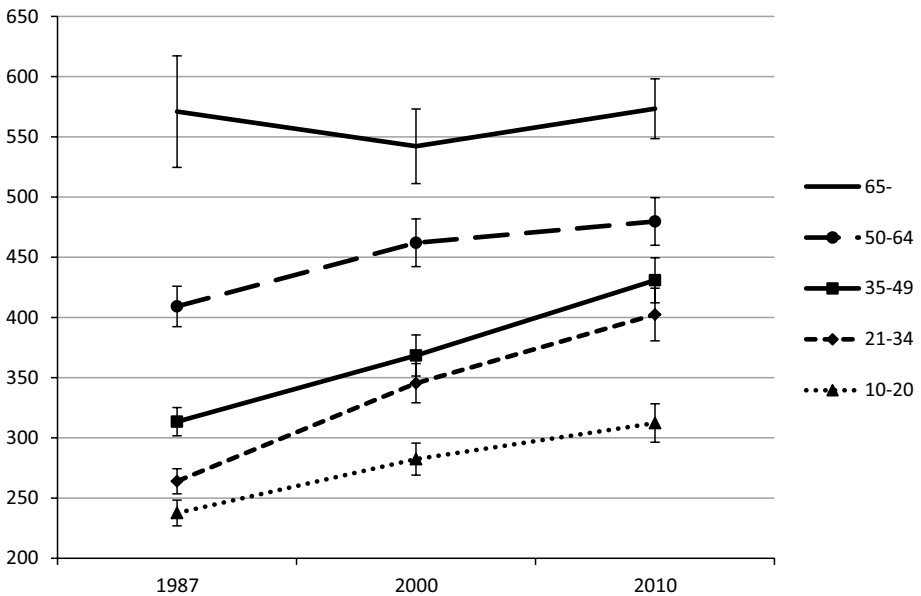**Fig. 2** Tempogram of daily variation in time spent alone, 1987–2010

Fig. 3 Time spent alone (minutes per day) in different age groups, 1987–2010. Mean values and their 95% confidence intervals

couples with children and members of single families spend more time alone on week-days than members of nuclear families. On weekends, in turn, only single households spent more time alone than members of nuclear families (see Table 2). Thus time spent alone is at the highest level among single households. The increase in the number of single house-holds in Finland (Kähäri et al. 2017) may thus explain the increased time spent alone at the national level.

Work situation, in turn, is not that important for time spent alone as could be expected. In all work status groups—in the groups of employed, unemployed, disabled and retired people—the time spent alone has increased, but on weekdays the average levels differ among groups. Employed people report less time spent alone than unemployed people as expected, but there are no differences between employed people and disabled or employed and retired people. Neither there are no group differences on weekends.

Education or residential factors do not play an important role either in explaining increases in the time spent alone (see Table 2). The minutes spent alone have increased steadily among people of all educational levels as well as among those in urban and rural living areas. In terms of group differences, in turn, it seems that people with a lower educa-tion level and those living in rural areas would report more time alone than people with a higher educational level or those living in urban and semi-urban areas. These differences, however, disappear after controlling for other factors. Thus, a higher educational level or living in an urban area as such does not guarantee high levels of face-to-face social interaction.

Based on the previous observations it hardly comes as a surprise that the increase in time spent alone cannot be totally explained by the control variables (see Table 2). As we noted at the beginning, time spent alone has increased by 125 min since 1987 on weekdays and 91 min on weekends. Of these, approximately 40 min can be explained by the con-trol variables. Thus, aging and the increase of single households explain only some of the increased time spent alone at the national level.

3.1 Time Spent Alone in Different Activities

Increased time spent alone touches nearly all demographic groups in Finnish society. To form a more detailed picture of the phenomenon, we continue the analysis and examine what people are doing while they are alone. As can be seen from Fig. 4, time spent alone has increased in nearly all time use categories since 1987 – in work, in unpaid homework, personal needs and leisure. Only in the category 'studying' has the increase in time spent alone not been statistically significant.

The time spent alone has, however, increased specifically in leisure time. In 1987, peo-ple used to be alone in their leisure time on average 80 min a day, but since then time spent alone has doubled (see Fig. 4). More detailed analysis showed that even if we take into account differences between workdays and weekends, between males and females, in edu-cation, in family status and work situations, as well as differences in urban and rural living areas, time spent alone has increased by about an hour.

As social interaction seems to be changing, especially during leisure time, we deepen the analysis by splitting leisure time into more detailed categories. In time use surveys lei-sure time is coded into 10 categories: participatory activities, sports and outdoor activi-ties, culture, reading, listening to the radio, watching television, hobbies, using a computer, other leisure time and travels in leisure time. In most of the leisure subcategories, time spent alone has barely changed or the change has been only a few minutes (see Table 3). In
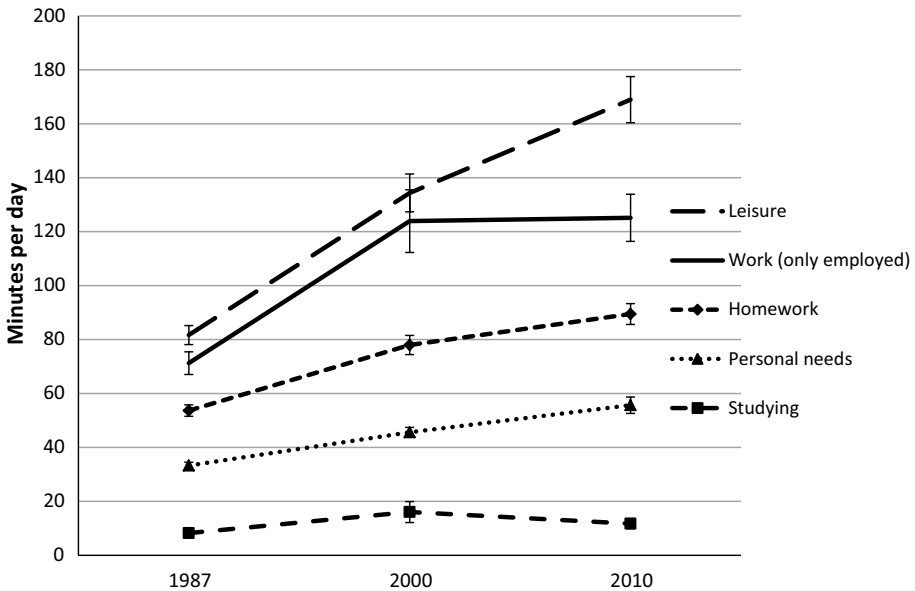
Fig. 4 Time spent alone in each main activity per year (based on GEE model without control variables, mean values and their 95% confidence intervals)

Table 3 Changes in different leisure activities spent alone (minutes alone per day)

	Weekdays				Weekends			
	1987	2000	2010	Change	1987	2000	2010	Change
Watching television	19.26	50.02	53.94	34.68	25.37	56.84	58.82	33.45
Computer	0.28	4.77	25.52	25.24	0.16	5.17	28.07	27.91
Sports and outdoor activities	6.93	13.55	16.55	9.62	7.24	16.5	0.45	-6.79
Reading	21.72	29.02	29.25	7.53	25.75	27.96	30.50	4.75
Travels in leisure time	6.13	8.83	9.18	3.05	9.16	7.55	10.44	1.28
Culture	0.72	1.11	0.94	0.22	0.21	0.45	1.24	1.03
Participatory activities	0.57	1.42	0.70	0.13	0.49	0.98	1.72	1.23
Hobbies	0.74	0.76	1.06	0.32	0.67	0.90	1.35	0.68
Other leisure time activities	9.56	10.33	8.00	−1.56	9.54	13.43	8.83	−0.71
Listening to radio	5.01	2.88	3.54	−1.47	7.26	5.59	4.20	−3.06

the case of watching television and using computers, however, the change has been more remarkable. In 2010, people spent an average 35 min more watching television alone and 25 min more using a computer by themselves than they used to do in 1987. Thus, changing social forms in using technologies may be one reason for the increase in leisure time spent alone.

3.2 Leisure Time and Technological Change

Previously television has been accused of being antisocial and isolating (e.g. Putnam 2000). The opposite perspective emphasizes that television still brings family members together, providing a low-cost and low-effort way of sharing an experience with members of the family or household (Brown and Barkhuus 2011). Our trend analysis indicates that currently, television may act more as an antisocial than a bonding element. If we look at the last 30 years we see that nearly every Finnish household has had a television (see Table 4). Thus, the number of households that own a television has not increased, but the change has rather happened in the density of televisions per households. In 1987, there was an average of one TV for three rooms, but since 2000 there has been one TV in every other room. As the number of television screens per household has increased, the television may have lost its ability to gather family members in front of the same screen.

Technological change has been even more remarkable in the case of computers and mobile phones (see Table 4). In 1987, only 15 per cent of Finnish households had a computer, while in 2010 81 per cent owned a computer. The existence of mobile phones, in turn, was not asked about in 1987, but since 2000 they have become very popular. In 2000, about 82 per cent of households owned a mobile phone, whereas in 2010 nearly every one (99%) had one.

Since the existence of mobile phones was not asked about in 1987, we first constructed a model in which we explained solitary leisure time by year, control variables (day of the week, gender, age, education, family and work situation and type of living area) and different variables describing technological change. These included the density of televisions (ratio of number of televisions to number of rooms), whether there was a computer in the household (yes/no) and the frequency of computer use. As can be seen from Table 5, technological change explains about 10 min of the year differences in the time spent alone. The density of televisions in households increases leisure time spent alone as family members watch television from their own TV screens instead of gathering in one place. The existence of one computer, in turn, slightly decreases time spent alone, which indicates that computers are used together (or in the same space) with others. Since 2010, the density of computers in households has evidently increased and a similar disconnecting tendency in face-to-face interaction as we found in television watching may occur today. Nevertheless, this is true only for minor use since frequent computer use increases time spent alone. Thus it is possible that earlier computers acted as socializing devices as people gathered together to spend time with them.

As the amount of computer use increases it starts to reduce face-to-face interaction. We further tested whether this phenomenon is particularly true for male or young people, but we did not find any interactions between the use of a computer (computer in household and the frequency of computer use) and gender or age. In addition to interactions, we also tested whether the existence of mobile phones in the household could

Table 4 Percentage of households that had a TV, computer or mobile phone in 1987, 2000 and 2010

	1987 (%)	2000 (%)	2010 (%)
TV	95	96	95
Computer	15	52	81
Mobile phone		82	99

FTUS, household interviews

Table 5 Results of GEE models on leisure time spent alone

	Model 1 β (SE) p	Model 2 β (SE) p	Model 3 β (SE) p
Intercept	81.5 (3.5)***	− 45.6 (13.8)**	− 49.1 (14.8)**
Year (ref. = 1987)			
Year 2000	52.8 (7.8)***	37.9 (6.0)***	31.3 (7.1)***
Year 2010	87.4 (9.3)***	64.4 (7.0)***	51.2 (9.4)***
Day of the week (ref. = weekdays)			
Weekend		12.9 (4.7)**	11.8 (5.1)*
Gender (ref. = female)			
Male		18.3 (4.4)***	18.1 (4.5)***
Age (ref. = 10–20 years)			
21–34 years		51.3 (12.6)***	45.3 (13.9)**
35–49		61.6 (11.9)***	58.0 (12.6)***
50–64		88.9 (10.3)***	86.3 (10.4)***
65–		99.7 (16.1)***	96.7 (16.6)***
Education (ref. = primary or secondary level)			
Higher educational level		11.0 (7.5)	11.0 (7.5)
Family situation (ref. = couple with children)			
Couple without children		2.0 (8.5)	− 2.1 (8.8)
Single		115.6 (12.0)***	110.1 (12.4)***
Single parent		34.2 (13.7)**	30.8 (13.8)*
Work situation (ref. = emloyed)			
Unemployed		95.9 (16.5)***	95.3 (16.3)***
Disabled		85.1 (17.6)***	84.0 (17.3)***
Retired		65.8 (12.5)***	65.4 (12.7)***
Area type (ref. = urban and semi-urban areas)			
Rural area		− 25.1 (6.6)***	− 22.3 (6.6)**
Televisions per room			35.2 (11.6)**
Computer in household (ref. = no)			− 24.2 (9.9)*
Frequency of computer use			7.1 (2.3)**
Goodness of fit (QICC)	151,987,242.4	117,425,987.3	116,614,014.3
Pseudo R^2 based on changes in QICC	4.1	25.9	26.4
N	7036	7036	7036

p***> 0.001; **> 0.01. *> 0.05. Pseudo R^2 is calculated by comparing changes in the goodness of fit measures (QICC) between the model and the null model

explain some of the increases in solitary time between 2000 and 2010. It turned out to be statistically insignificant, which is why we do not present these results.

In addition, there might be differences in how time spend alone has changed depending on weekday. To address this issue we conducted additional analyse separately for weekdays and weekends reported in supplementary material. According to stratified model, results remain essentially the same for weekdays and weekends.

4 Discussion

Many international studies have examined the change in social interaction and its less sociable nature in recent decades. This phenomenon has been identified largely in Western societies, and has been associated with societal changes such as demographic changes (aging), cultural changes (individualization) and changes in the use of new technologies. And indeed, several researchers have raised their concern over how the new information technologies reduce our time with face-to-face interaction. Also, economic development has generated wealth and modern welfare states provide social security, both of which have enabled people to live alone.

Our approach focuses on structural factors of social isolation and uses an objective indicator measuring time spent with face-to-face interaction. The detailed information from 'with-whom' coding in time use surveys and a nationally representative data set from three decades are clear strengths of the study. Time use surveys are underutilized in studying changes in social connections. Our study significantly contributes to the scarce literature on trends in time spent alone. Although time use surveys have included columns for participants to report time spent alone for decades (Fisher 2015), to our knowledge, the literature is restricted to only few descriptive studies (Turcotte 2007; Clark 2002).

The strength of time use diary data in assessing objective face-to-face social interaction is evident. Compared to retrospective survey questions on the time devoted to social interaction, time use diary data provides detailed information about time spent together with someone or alone and, in addition, connects this time to specific activities (Kingston and Nock 1987; Michelson 2005; Glorieux et al. 2011). At the same time, we emphasize that time spent alone cannot be judged as a purely good or bad phenomenon. People may seek solitude as it enables them to be free of social commitments and thus to just relax. Solitude, as one deliberately seeking to spend time alone, can be a constructive stimulus, e.g. for psychological well-being and creativity.

This study identified a number of factors associated with a decrease in face-to-face interaction. Our results showed that structural factors, such as aging and an increase of single households, are strongly associated with increased time spent alone. We expected that rapid urbanization would also effect social context of time use. However, the living area did not have an effect in time spent alone after controlling for other factors. The increase in time spent alone has been faster for men than for women. There are also important gender differences between weekdays and weekends. Men report more time alone on weekdays than women. On weekends, however, differences between genders do not exist and the situation has been stable over the study period.

With regard to weekly variation in time spent alone, our results showed that differences between weekdays and weekends have stayed rather steady. Time spent alone has increased on both weekdays and weekends, but on average, weekends still provide more shared time. Public debate on changing societal rhythms and the thesis of 24/7 society implicitly predicts that the special nature of weekdays is disappearing and that the special nature of weekdays and weekends is increasingly less determined by collectively shared rhythms of work, consumption or leisure time. An earlier Finnish time use study (Anttila and Oinas 2018) showed, however, that despite the deregulation of working hours and opening hours, the time structure of weekends has not begun to resemble weekdays to any significant degree. Weekend time is still spent resting, free of work, and socialising.

With regard to social connections, new technologies may be considered disruptive, because they reduce the time potential for face-to-face activities (Stern 2008). Our analysis

showed that time spent alone increased in particular during leisure activities. The most remarkable increase was found in activities that can be classified as passive leisure. Television and computers seem to be technologies that are associated with the decreasing tendency for face-to-face interaction. The findings are in line with previous studies showing a connection between digital media use and time spent alone (Thulin and Vilhelmson 2019).

At the same time, we acknowledge, that activities in social media are possibly associated with several beneficial social networks, including discussion networks that are more likely to contain and connect people from different backgrounds (Vriens and van Ingen 2018). In addition, new social media is efficient in regard to network maintenance in quantitative terms, as it decreases the average amount of time devoted per connection and therefore potentially increases the number of friends and acquaintances.

4.1 Further Research

During the study period the technologies found in homes have changed, and along with new technology new activities have occurred. The density of televisions in households was in association with leisure time spent alone as family members watch television from their own TV screens. Thus, our results suggest that the increase in time spent alone not only reflects a growing proportion of the Finnish people living alone but also that more people who live in family homes are spending time apart from each other in front of separate screens when at home. This 'alone together' is interesting finding, which calls for future research. We observe the increasingly common phenomenon of groups of people in the same space, but paying more attention to content on digital devices than to the people with whom they are in close proximity. Being alone with other people is a very relevant concept. We propose further research with more sophisticated research design to address this issue. For example, time use surveys with household sample allow for construction of shared time episodes, which estimate how many household members were at home, but perhaps reporting being alone.

It is evident that family routines and cultural traditions differ between countries. For example, an earlier comparative study on children's time use (Gracia et al. 2019) shows that Finnish children do have a markedly different organization of their daily lives than British children, and especially compared to Spanish children, because of cultural differences in their daily structure of time. The study showed that after controlling for multiple demographic and socioeconomic factors, Finnish children spent 127 min per day with parents compared with 235 min in the United Kingdom and 280 daily minutes in Spain. By contrast, Finnish children spent a large proportion of their time alone (235 daily minutes), representing more than 1 h per day, compared to Spain and the UK. We propose that researchers take advantage of rich harmonized time-diary data from different countries to study between-country differences in the social context of time use.

4.2 Limitations

The objective nature of our indicator is a limitation in our study. The data here cannot address the subjective qualities or meanings that a person attaches to time spent alone. For instance, not all people who spend time alone are isolated or feel lonely which heightens the need to have a better understanding of peoples' views on time alone. More in-depth information about the qualities in time spent alone cannot be accessed with diary data and qualitative approaches are needed. Other possible limitations relate to

comparability across surveys from three decades. However, we found linear increase in the time spent alone, which occurred in nearly all population groups. In the more detailed analysis on daily timing of time spent alone, the results remained stable over the years. We also conducted further analysis separately for weekdays and weekends and the results indicated only minor differences. Another possible limitation is the restriction of the analyses to September–November as in 1987–1988 data there was no 'with-whom' information available for other months. For years 1999–2000 and 2009–2010, we find that time spend alone varied significantly depending on time of year. However, the autumn season (September to November) did not differ significantly from the rest of the year. Thus, the seasonal restriction should not bias our analyses i.e. underestimate or overestimate the amount of time spend alone.

4.3 Recommendations

This study attempts to contribute one more piece to the puzzle of how social connections are changing in the information age. Our contribution to public discussion is to provide important views on societal processes that create both hindrances to, and opportunities for, face-to-face social interaction, which is critical for the well-being of individuals and communities.

The knowledge on societal processes producing social isolation can give useful input to policy programmes and interventions that can improve social connectedness and social capital. The topic is important in many respects. For example, social interaction is central to human well-being and is critically involved in the maintenance of health. Social isolation has been compared to obesity and smoking in terms of potential association with negative health effects (Holt-Lunstad et al. 2015). Roeters et al. (2014) found that for both women and men, spending a high proportion of leisure time alone is associated with negative mental health consequences. Young adults and older people are identified as risk groups for social isolation. Children's time spent alone can strengthen their individual autonomy or self-reflection, but, on the other hand, when children spend excessive amount time alone, the risks of suffering from well-being problems increase. Our results showed that in the youngest age group (10–20 years old) the amount of time spent alone increased by 75 min over the study period. In the oldest age group people spent almost 10 h per day without face-to-face interaction. This amount of alone time may raise health concerns. Researchers have found that older people with fewer human contacts are more likely to die—even if their perceived loneliness is controlled—than are people with richer social connections (Steptoe et al. 2013). Thus, identifying the risk groups of social isolation can help target those factors that are the most crucial to preventing welfare inequalities and promoting equal prospects for well-being.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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