

Time use data: What can instantaneous enjoyment tell us about life satisfaction?



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## About the authors

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## About the What Works Centre for Wellbeing

We are an independent collaborating centre, and the aim of our work is to improve wellbeing and reduce misery in the UK. We believe that this is the ultimate goal of effective policy and community action. By accelerating research and democratising access to wellbeing evidence, we develop and share robust evidence for governments, businesses, communities, and people to improve wellbeing across the UK.

## About this report

Time use data offers insight into the daily activities and patterns of individuals and the different reported levels of enjoyment, providing a way to directly measure the contributions of these experiences to subjective wellbeing. Using the CTUR UK Time Use Survey 6-Wave Sequence across the COVID-19 Pandemic dataset, we show that the higher the daily mean activity enjoyment, the higher the reporting of overall life satisfaction, with some differences observed in terms of sex and age.

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## Introduction

### What are time diaries?

Time-diary data can be used to understand how people spend their time (Chau et al., 2019). The time-diary methodology is recognised as one of the most accurate and detailed research methods for time use data collection, allowing researchers to explore the complex relationships between different outcomes and activity types, enjoyment levels, location, and co-presence (Gershuny, 2011; Hunt and McKay, 2015). Self-report time diaries have been validated against simultaneous body-camera and accelerometer records (Gershuny et al., 2020).

To complete time diaries, participants provide a sequential account of their daily activities. This corresponds with the way our memory stores events, resulting in higher validity of the data obtained (Juster et al., 2003; Kan and Pudney, 2008; Robinson and Godbey, 1999). Time diaries are usually collected over a 24 hour period, equivalent to 1440 minutes, usually in 10 or 15 minute slots. This provides a highly accurate account of the activities participants are engaging in by limiting their ability to manipulate the durations they report. Unlike survey questionnaires, participants are not able to select middle-range responses, where choosing an answer is essentially an approximation (Chatzitheochari et al., 2018; Krosnick 1999). As such, in both adult and younger populations time diaries are less likely to include response errors or include socially desirable answers, (Dollman et al., 2009).

### Click and Drag Diary Instrument (CaDDI)

Advances in the field saw a rise in using technology to assist in time-diary data collection, moving away from the 'golden standard' paper and pencil time diary to web and app formats. Digitisation enables a more user-friendly interfaces, as well as soft and hard checks employed for maximum efficiency. This ultimately leads to higher response rates (Bauman et al., 2019).

The online Click and Drag Diary Instrument (CaDDI) was developed in 2016 (Wave 1) by the ESRC Centre for Time Use Research at the Social Research Institute, UCL (Sullivan et al., 2022). Time use diary data were collected using a population-representative (quota sample) from Dynata's large international market research panel across 9 countries.

### Covid-19

The CaDDI was used with the UK panel across the COVID-19 pandemic in five waves (Waves 2-6), capturing a range of different lockdown restrictions: May-June 2020, August 2020, November 2020, January 2021, and in August-September 2021. For each wave, there are up to three time use diaries per respondent per wave, recording their primary and secondary activities,

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location, co-presence, device use, and enjoyment level, using 10-minute episodes throughout the diary day. Participants were also asked to complete a survey questionnaire, including sociodemographic, health and time use related questions.

An additional set of survey questions were added from Wave 2 onward, including the 'ONS4' wellbeing questions capturing life satisfaction, worthwhileness, happiness, and anxiety. The ONS4 were first introduced in April 2011 by the Office for National Statistics and have been tested for children and adults. The questions are part of the Annual Population Survey (APS) and the APS Personal Wellbeing dataset (ONS, 2018).

In total, 6896 diaries were collected across the six waves, allowing analysis of behavioural change from a baseline in 2016, through three national lockdowns, and two intervening periods of the relaxation of social restrictions.

## Data availability

All waves of the CTUR UK Time Use Survey 6-Wave Sequence across the COVID-19 Pandemic are free and available to download from the UK Data Service, available to academic and non-academic users, upon acceptance of the terms and conditions. Users should delete any data files upon the expiration of the usage licence. Data are already in an anonymised form; however, no attempt should be made for single individuals to be identified in statistical analyses.

## Measuring wellbeing

### Instantaneous activity enjoyment

Feelings of pleasure and displeasure built over time contribute to our overall wellbeing and act as reflections of immediate experiences and conditions (Kahneman, 1999). Ultimately, hypothesising that enjoying activities of daily life leads to higher reported levels of subjective wellbeing.

John Robinson introduced the field of enjoyment in time diaries in the 1985 US national time use study, where respondents could rate their enjoyment for each activity (see Gershuny, 2011).. 'Instant utility' is defined by Kahneman (1999) as the instantaneous enjoyment of an activity, best understood as the disposition to continue or interrupt a current experience. Kahneman (2004) continues to identify this as 'objective happiness', collecting instant utility over a period of time, supporting that 'objective happiness' can be derived in a straightforward way from time diary records.

In CaDDI, respondents were given a scale of 1-7, where 1 is 'least enjoyable activity' and 7 is 'most enjoyable activity', to select for every activity reported during the day. A 'daily mean activity enjoyment' score was then calculated for

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each participant, for each day, by taking the average of all enjoyment scores reported in the day.

### Overall life satisfaction

Overall life satisfaction is a well-known and tested measure for personal wellbeing. This report uses the question 'Overall, how satisfied are you with your life nowadays?', on a scale of 0-10, where 0 is 'not at all' and 10 is 'completely'. This question is part of the ONS4 subjective wellbeing questions (ONS, 2018).

Survey questionnaires are considered the cheapest and most widely used data collection tool to measure wellbeing, and depending on the question, they can measure different dimensions of it. Given their low cost, survey questionnaires can be administered to large samples, allowing for generalizable findings, if the sample is representative of the target population. However, they are prone to several limitations, like measurement error (Bryman, 2015).

Survey questionnaires can be used in combination with time-diaries:

1. **To compare;** to account for measurement error in surveys (comparing those reporting high levels of life satisfaction, but low levels of enjoyment during their daily activities).
2. **As complementary;** for different types of analyses (looking at life satisfaction while looking at the precise amount of time worked in a typical day) and account for intra-individual variation (accounting for individuals who exercise a few times a week but did not exercise on the day the diary was completed).

In this report, we will be using the CTUR UK Time Use Survey 6-Wave Sequence across the COVID-19 Pandemic dataset, to look at the effect of daily mean activity enjoyment on overall life satisfaction by sex and age, during the COVID-19 pandemic in the UK (Sullivan et al., 2022).

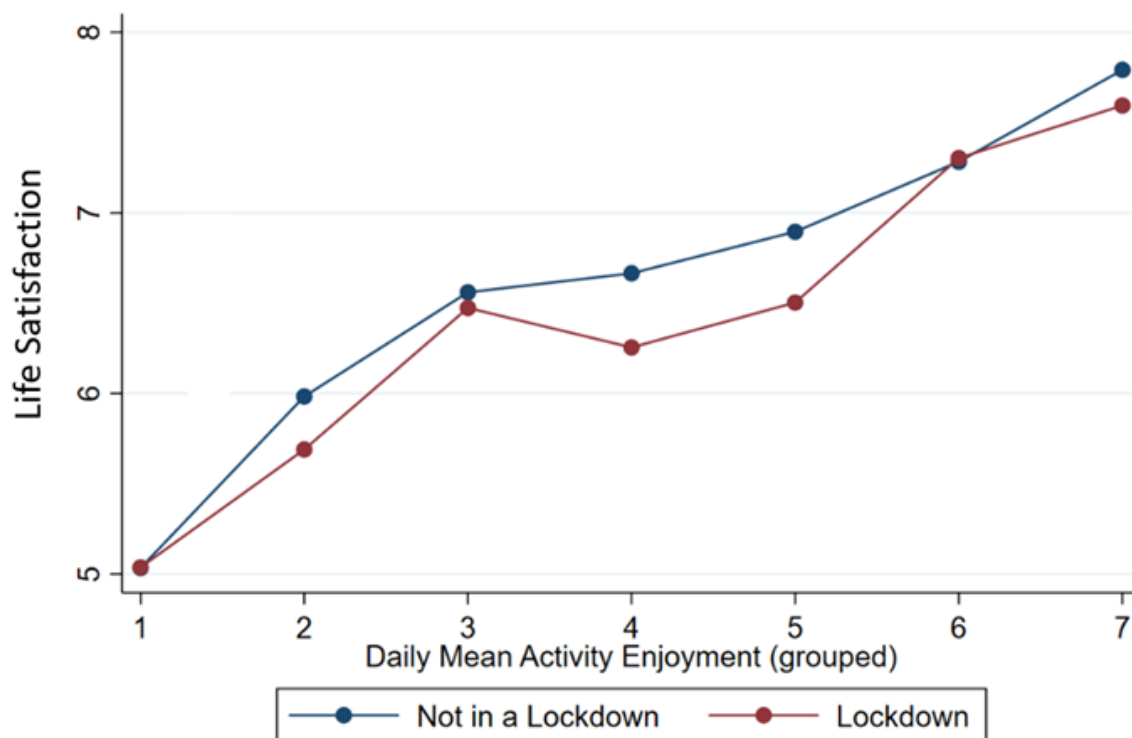
## Data analysis

### Modelling life satisfaction

We used linear regression models to predict overall life satisfaction, during lockdown and easing of restrictions (Waves 2-6), to look at the effect of daily mean activity enjoyment, controlling for: sex, age, and income. Ordered logit models were used as a robustness check, yielding similar results. Descriptive statistics and correlation coefficients can be found in the Appendix.

Figure 1 shows that, all else being equal, as daily mean activity enjoyment increases, reported level of overall life satisfaction also increases. This is similar for lockdown and during easing of restrictions.

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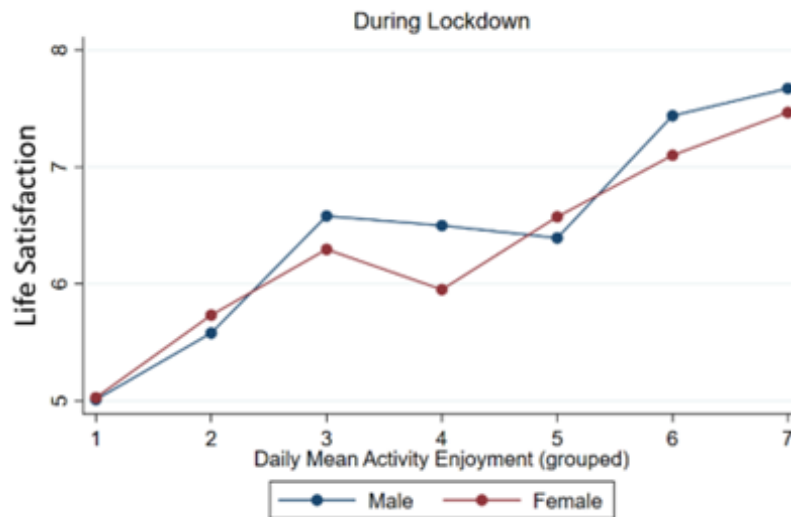


**Fig. 1: Predicting life satisfaction, by daily enjoyment and lockdowns/easing of restrictions.** Waves 2-6, N= 5276. Data were weighted using the recommended weights. Robust SE were used to account for multiple observations per person. Interactions: Daily mean enjoyment grouped, sex and age grouped.

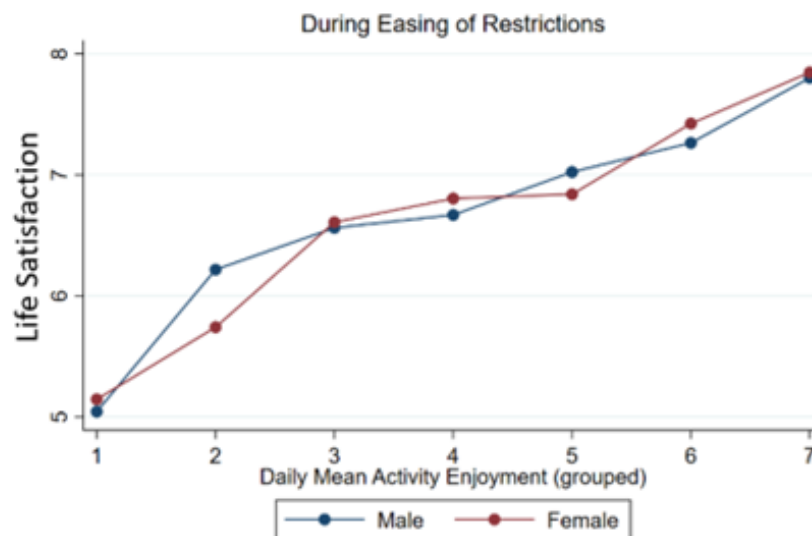
Figures 2 and 3 decompose the data by sex, and show a similar upward trend: as daily mean activity enjoyment increases, reported level of overall life satisfaction also increases. For both conditions (lockdown and non-lockdown) the lines interact, indicating daily mean activity enjoyment differs by sex.

During a lockdown, males report higher levels of overall life satisfaction based on daily activity enjoyment. These observed differences might be a result of the increase in women's unpaid domestic and care workload during school closures and when restrictions were put in place (Zamberlan et al., 2021). The effect appears to be more prominent when the daily mean enjoyment is the mid-value 4, possibly meaning that males and females report their overall life satisfaction differently when they experience average levels of daily enjoyment. During easing of restrictions, the effect is similar for both males and females.

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**Fig. 2: Predicting life satisfaction, by daily enjoyment and sex, during lockdowns .** Waves 2-6, N= 3103. Data were weighted using the recommended weights. Robust SE were used to account for multiple observations per person. Interactions: Daily mean enjoyment grouped, sex and age grouped.

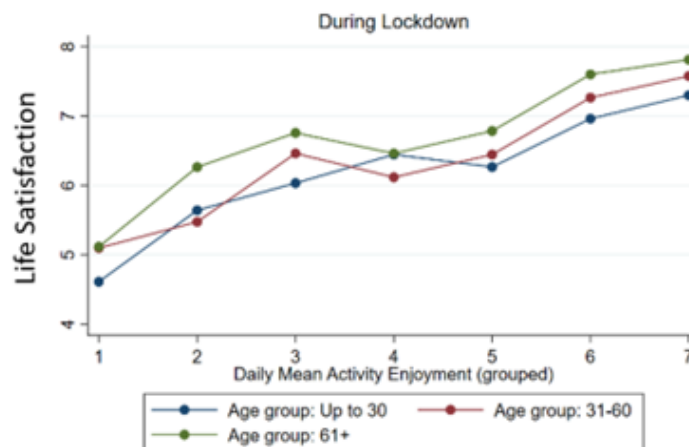


**Fig. 3: Predicting life satisfaction, by daily enjoyment and sex, during lockdowns easing of restrictions.** Waves 2-6, N= 2173. Data were weighted using the recommended weights. Robust SE were used to account for multiple observations per person. Interactions: Daily mean enjoyment grouped, sex and age grouped.

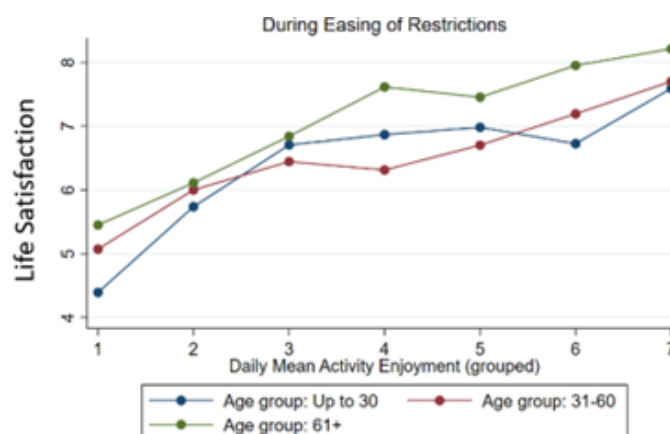


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When we decompose the data by age, figures 4 and 5, there is an evident upward trend for all age groups: as daily mean activity enjoyment increases, the reported level of overall life satisfaction also increases. For individuals aged 61+, the higher the daily enjoyment, the higher the overall life satisfaction levels reported during easing of restrictions and lockdowns, when compared to the 18-30 and 31-60 age groups. During easing of restrictions, the effect of age appears to be more prominent when the daily mean enjoyment is at the mid-values 3-5, possibly meaning that people at different age groups report differently their overall life satisfaction when they experience average levels of daily enjoyment.



**Fig. 4: Predicting life satisfaction, by daily enjoyment and age, during lockdowns.** Waves 2-6, N= 3103. Data were weighted using the recommended weights. Robust SE were used to account for multiple observations per person. Interactions: Daily mean enjoyment grouped, sex and age grouped.



**Fig. 5: Predicting life satisfaction, by daily enjoyment and age, during easing of restrictions.** Waves 2-6, N= 2173. Data were weighted using the recommended weights. Robust SE were used to account for multiple observations per person. Interactions: Daily mean enjoyment grouped, sex and age grouped.

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## Conclusion

Time diaries are validated measures used in time use research to explore the complex relationships between different outcomes and activity types, enjoyment levels, location, and co-presence. Time diaries can be used alongside survey questionnaires as complementary, or to compare. Using the CTUR UK Time Use Survey 6-Wave Sequence across the COVID-19 Pandemic dataset, this report looked at the effect of daily mean activity enjoyment on overall life satisfaction by lockdown restrictions, sex, and age, during the COVID-19 pandemic in the UK. This report showed that the higher the daily mean activity enjoyment, the higher the reporting of overall life satisfaction, with higher values predicted for individuals aged 61+. Some differences were also observed in terms of sex and age in the way individuals report daily enjoyment and their overall life satisfaction during easing of restrictions and lockdowns.

The main limitation of this report is the use of cross-sectional data. Panel data would have allowed for causal inferences, given their ability to control for time-invariant, unobserved, confounders, and therefore the ability to model the direction of this causal relationship: Do individuals engaging in more enjoyable activities report higher levels of overall life satisfaction, or do individuals reporting high levels of overall life satisfaction enjoy in general more their daily activities?

## Policy implications

Time diaries offer an insight into our daily lives by capturing a direct measure of affective state while engaging in a particular activity. They also record sequences of daily activities, allowing us to study patterns and better explore concepts like tiredness and leisure throughout the day.

The insights from time use data can be used to inform new policies designed to enhance lifestyle-related welfare in the population, such as: the effectiveness of flexible working arrangements; service design and delivery, including digital; childcare provision; and long-term mental and physical health.

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## Appendix

**Table I. Mean (SE) of daily mean enjoyment and overall life satisfaction**

	Daily mean enjoyment (1-7)	Overall life satisfaction (0-10)
Baseline Feb, Oct, Dec. '16	5.33 (0.04)	-*
Lockdowns May-June 2020/November 2020/ January 2021 (Waves 2**,4&5)	5.29 (0.02)	6.47 (0.04)
During Easing of Restrictions August 2020/August-September 2021 (Waves 3&6)	5.41 (0.03)	6.81 (0.05)

Notes:

Daily mean enjoyment (Likert scale 1-7, negative to positive); Overall life satisfaction (Likert scale 0-10, negative to positive)

\* Question was not introduced in the survey yet

\*\*Question introduced part-way through the survey

**Table II. Kendall's Correlation ( $\tau$ ), daily mean enjoyment and overall life satisfaction**

	Daily mean enjoyment and Overall life satisfaction
Lockdowns May-June 2020/November 2020/ January 2021 (Waves 2*,4&5)	0.30***
During Easing of Restrictions August 2020/August-September 2021 (Waves 3&6)	0.32***

Notes:

Daily mean enjoyment (Likert scale 1-7, negative to positive); Overall life satisfaction (Likert scale 0-10, negative to positive)

\*Question introduced part-way through the survey

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001