The Impact of Response Biases on the Variation in Life Satisfaction

Johannes Klement (johannes.klement@gmx.de)
Wuppertal Institute  https://orcid.org/0000-0003-1073-6938

Research Article

Keywords: Interviewer Bias, Central Tendency Bias, Life Satisfaction, Survey Methods, SOEP

Posted Date: September 25th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-1906292/v4

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
The Impact of Response Biases on the Variation in Life Satisfaction

Johannes Klement

Abstract

Despite the abundance of empirical research on life satisfaction, disparities remain regarding its variation. Using data from the German Socio-Economic Panel (SOEP), this study analyses to what extent biases in the design and implementation of life satisfaction surveys influenced the variation in life satisfaction. The study employs various methodological approaches, including distributional analysis, descriptive statistics, Markov transition probabilities and logistic regression. Consequently, this study demonstrates the significant positive and non-adaptive changes in life satisfaction that can arise when an interviewer is present during a survey. Moreover, the method of measuring life satisfaction on an eleven-point integer scale has a substantial impact. The midpoints of the scale are frequently used by individuals to assess their lives, which results in a balance between positive and negative evaluations. These findings have broader implications for the overall level of variation. It appears unlikely that an average life satisfaction score of more than 8 can be maintained over the long term on a scale of 0 to 10. It should be noted that the scale also impacts adaptive processes. Additionally, the patterns of dissatisfaction and satisfaction variation differ. For a more nuanced understanding of the causes, future research may benefit from analyzing periods of satisfaction and dissatisfaction with life separately.

Keywords Interviewer Bias; Central Tendency Bias; Life Satisfaction; Survey Methods; SOEP
1 Introduction

In the context of empirical research within the fields of positive psychology and happiness economics, subjective life satisfaction represents a prominent indicator of happiness. This is primarily attributed to its simplistic nature. By using the life satisfaction question, “How satisfied are you with your life, all things considered?”, a person’s entire life may be self-assessed through a single query. The widespread use of this concept is attributed to its inclusion in comprehensive surveys of individuals’ life circumstances across various nations, such as the British Household Panel Survey (BHPS), the Household, Income and Labour Dynamics in Australia Survey (HILDA), the German Socio Economic Panel (SOEP), and the Panel Study of Income Dynamics (PSID, USA). These surveys provide comprehensive insights into people’s lives, leading to extensive research on determining the factors that influence life satisfaction. These factors include personal circumstances and traits that impact changes in life satisfaction. Examples of such factors include an individual’s financial resources (Frijters, Shields, and Haisken-De New, 2004), family dynamics, work-life balance, leisure, and personality traits (Headey, 2008; Headey, Muffels, and Wagner, 2010). Despite our extensive knowledge of happiness correlates, our ability to describe variations in life satisfaction remains imprecise. We are often much less accurate than the wealth of data would suggest. In light of this, Headey and Muffels (2016, p. 30) state that “it is likely that we have only scratched the surface and that there are many other variables over which individuals have some degree of control which affect life satisfaction.”

Since no survey can be large enough to capture all the correlates of happiness that occur in life, the lack of observations may well be one reason. However, I suspect—and I explore this in this paper—that the nature of the survey, i.e. the way in which people were interviewed, is crucial for the variation in response behaviour and thus for the variation in life satisfaction. For example, respondents’ life satisfaction can be strongly influenced by what they focus on during and before the interview (Kahneman, 2014): the current weather, but also the time of year, positive or negative events during the interview or the outcome of sporting events can have a strong influence on the variation in life satisfaction (Schwarz, 1987; Schwarz and Clore, 1983). Kahneman (2014, p. 496) aptly summarises this in one sentence: “Nothing in life is as important as you think it is, while you are thinking about it.”

However, biases in survey behaviour can be caused not only by illusions of focus, but also by people wanting to look better in surveys. Or the nature of the question may consciously or unconsciously influence response behaviour. Although this area is well researched in terms of surveys, there is little evidence of how life satisfaction is biased by these aspects. As I will briefly explain below, it can be assumed that they have an influence on the variation in life satisfaction.
1.1 On a potential central tendency bias in the survey of life satisfaction

Fig. 1.1 shows the distribution of life satisfaction in Germany at two points in time, once in 1957 and once in 2013. In the case of the 1957 distribution, 5 is the most frequent answer, while in 2013 it is 8. In both cases, life satisfaction was measured on an 11-point scale defined between the extremes 0 (very dissatisfied with life) and 10 (very satisfied with life). Such a scale has three midpoints (OECD, 2013): 8 is the midpoint of the positive part of the scale, 2 is the midpoint of the negative part, while 5 is the neutral point between the two halves of the scale. Since the midpoint of the scale was the most frequently mentioned in both surveys, I will examine below whether this is simply a coincidence or whether there is a central tendency in the life satisfaction survey. This in turn could influence the variation in life satisfaction.

1.2 On a potential interviewer bias in the survey of life satisfaction

People’s response behaviour in surveys must also be seen in a social context. It may be that people make their choice or opinion more in line with what is socially desirable (leading to a social desirability bias (Krumpal, 2013)). In the case of the life satisfaction survey, for example, it could be that people do not want to present a negative image of themselves to others and therefore present a more positive image of their life than it actually is. To give an example, it is known that people report higher life satisfaction especially at the beginning of a series of annual surveys in the SOEP (Frijters, Shields, and Haisken-De New, 2004; Headey, Muffels, and Wagner, 2013), where the personal relationship with the interviewer could also play a role (Kühne, 2018). In other research on life satisfaction—analysing other survey data than the SOEP—the also suggest that social desirability explains part of the quality of life satisfaction (Brajša-Žganec, Ivanović, and Lipovčan, 2011; Caputo, 2017). In the case of the SOEP, the individual satisfaction with life in the sample is collected in six
different interview settings in which the interviewers are involved in different ways. There are types of surveys in which no interviewer is present and those in which the interviewer conducts the entire survey. In other cases, the interviewer is only partially or only supportively present. Based on the results of the research on social desirability bias, it can be assumed that different types of surveys or the change between them can have an influence on the reported life satisfaction and thus also on its variation.

1.3 Aim of this article

The aim of this paper is to gain a deeper insight into how reported life satisfaction is biased by the interview setting. The following questions are fundamental to the analysis:

- Which methods can be used to capture response biases in reported life satisfaction caused by the presence of an interviewer or the life satisfaction scale?

- What and how strong is the effect of these biases?

- Which consequences does this have for the variation in life satisfaction over time?

2 Materials and Methods

2.1 Panel data

The SOEP provides the data basis for the analyses. It is a longitudinal panel data set started in 1984 sampling households living in Federal Republic of Germany and re-interviewing them annually. Additional households are added regularly to replace those that have dropped out or to respond to changes in the demographic structure of Germany in order to keep the dataset representative. Under the name Leben in Deutschland [Living in Germany], individuals and households are interviewed on the basis of various questionnaires covering aspects of the lives of the (Goebel et al., 2019) participants. In particular, the Personal Questionnaire covers individual issues such as personal characteristics and opinions, financial and social status. The Household Questionnaire covers issues related to family life. All data used in the following are based on these two questionnaires. The SOEP version used in this article is covers the annual waves from 1984 to 2013, including 62,579 different participants over this period, resulting in 498,061 observed person years.

2.2 Life satisfaction in the SOEP

In a long series of questions (https://www.diw.de/en/diw_02.c.222729.en/questionnaires.html) on aspects of individual life, the final question in the SOEP is about individual life satisfaction. It is asked by means of an integral 11-step ladder running from 0 (very dissatisfied) to 10 (very satisfied) (cf. Cantril, 1966). The according question in the SOEP-questionnaire is: In conclusion, we would like to ask you
about your satisfaction with your life in general. Please answer on a scale from 0 to 10, where 0 means completely dissatisfied and 10 means completely satisfied. How satisfied are you with your life, all things considered?

0 1 2 3 4 5 6 7 8 9 10
completely dissatisfied completely satisfied.

Despite the ordinal character of the scale, life satisfaction is usually treated as an interval variable, as both the assumption of ordinal or interval character of the scale lead to equivalent results of life satisfaction measurement (Andrews and Withey, 1976).

2.3 Methods used

In my forthcoming analysis of response biases, I perceive the recurrent questioning of individuals regarding their life satisfaction as the observation of a randomised experiment, in which life satisfaction is represented by a whole number between 0 and 10. Given that in the survey of life satisfaction, apart from major life events (Diener, 2006; Lucas et al., 2004), only current events are determinant of the variation in life satisfaction (Suh, Diener, and Fujita, 1996), it is assumed that life satisfaction, in general, can be regarded as a first-order autoregressive process. This is also indicated by the analysis of Bottan and Perez Truglia (2011). For further details on these interrelations, refer to Klement (2021). A first order autoregressive process has the Markov property.

2.3.1 Stochastic properties of life satisfaction

2.1 Definition (Life Satisfaction as a Stochastic Process)
The possible outcomes of a life satisfaction survey on a 11-step scale are defined as the realisation of a random variable at time \( t \) as \( Y_t \), whereas \( y_t \) denotes the realisation of \( Y_t \) within a sample space \( \Omega, y_t \in \Omega = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\} \).
The results of the annual repetition of life satisfaction \( Y_t, \{Y_t, t = 0, 1, 2, \ldots\} \) is thus a time discrete stochastic process with \( Y_t \in S = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\} \) where \( S \) is a discrete state space.

2.2 Definition (Markov Property)
\( Y_t \) has the Markov property if \( Y_{t+1} \) is conditionally independent of past realisations \( Y_0, \ldots, Y_{t-1} \), given \( Y_t \):
\[
P(Y_{t+1} = b | Y_t = a, Y_{t-1} = a_{t-1}, \ldots, Y_0 = a_0) = P(Y_{t+1} = b | Y_t = a)
\]
for all \( t \geq 0 \) and for all \( b, a, a_{t-1}, \ldots, a_0 \in S \).
The probability of a state is determined only by its previous state. \( Y_{t+1} \) is thus conditional independent of past realizations \( Y_0, \ldots, Y_{t-1} \) given \( Y_t \).

2.3 Definition (Stochastic Matrix)
The \( n \)-step transition probabilities are expressed in a \( |S| \times |S| \) transition matrix \( P \):
\[ P(n) = \sum_{a \in S} P(Y_{t+n} = b | Y_t = a) = \begin{bmatrix}
  p^{(n)}_{0,0} & p^{(n)}_{0,1} & \cdots & p^{(n)}_{0,10} \\
  p^{(n)}_{0,0} & p^{(n)}_{0,1} & \cdots & p^{(n)}_{1,10} \\
  \vdots & \vdots & \ddots & \vdots \\
  p^{(n)}_{0,10} & p^{(n)}_{1,10} & \cdots & p^{(n)}_{10,10}
\end{bmatrix}, \]

where \( p^{(n)}_{a,b} := P(Y_{t+n} = b | Y_t = a) \) is the probability of changing from state \( a \) to \( b \) in a time step \( n \). The row sum of the matrix is 1, since every transition from a state \( a \) ends in a state \( b \):
\[
\sum_{b=0}^{10} p^{(n)}_{a,b} = 1.
\]

2.4 Definition (Time homogeneity)
A discrete Markov chain is called time-homogeneous if the transition probabilities are independent of time: \( P(Y_t = b | Y_0 = a) = P(Y_{t+n} = b | Y_n = a) \) for all \( n, t \geq 0 \) and for all \( a, b \in S \). A Markov chain is said to be non-stationary or non-homogeneous if the condition fails.

2.3.2 Fixed effects and random effects ordered logistic regression
In what follows, I estimate the influence of an interviewer bias on life satisfaction using a fixed effects estimator and a random effects estimator. Intuitively, the difference is as follows: The fixed-effects estimator takes into account the variation over time for each individual participant in SOEP (within estimator). The random-effects estimator also takes into account the variation over time between different individual participants within SOEP. The regression equation is a logistic function that approximates a non-linear relationship between the ordinal outcome and a linear combination of the predictors.

In STATA a random-effects ordered logistic regression is performed using the \texttt{xtologit} command. For the fixed-effect ordered logistic regression the STATA \texttt{feologit} command written by Baetschmann, Staub, and Winkelmann (2011) is used. I use both estimation procedures because neither of the two basic assumptions can be ruled out a posteriori due to the quality of the data set. Moreover, both estimation procedures lead to qualitatively and quantitatively similar regressors.

2.3.3 Binomial distribution
2.5 Definition (Binomial Distribution)
The binomial distribution describes the number of attempts \( n \) in a series of independent yes/no trials with probability \( p \in [0,1] \), which are necessary for \( k \) events to occur. The probability \( P(X = k) \) that \( k \) events occur in \( n \) tries is:
\[
P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}.
\]

The mean \( \mu \) of the binomial distribution is
\[
\mu = np.
\]
2.4 Data used

2.4.1 Data on interview settings

The following analysis of the interviewer bias is based primarily on an analysis of the individual interview types. Since the most common type of interview today, the computer-assisted personal interview (CAPI), was only first used in the SOEP in 1998, I use the SOEP waves from 1998–2013 for the analyses. Table 1 provides an overview of the frequency of the individual types of interviews in the SOEP between 1998 and 2013. The interview types ‘by telephone’ and ‘proxy’ are excluded in the following since they are rare.

<table>
<thead>
<tr>
<th>Type of interview</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>By telephone</td>
<td>44</td>
</tr>
<tr>
<td>Proxy</td>
<td>89</td>
</tr>
<tr>
<td>Paper-based interview, assisted by an interviewer</td>
<td>10,510</td>
</tr>
<tr>
<td>Partly oral, partly written</td>
<td>11,350</td>
</tr>
<tr>
<td>Paper-based interview without assistance by an interviewer</td>
<td>42,453</td>
</tr>
<tr>
<td>Paper-based interview by mail</td>
<td>80,205</td>
</tr>
<tr>
<td>Oral interview</td>
<td>81,653</td>
</tr>
<tr>
<td>Computer-assisted personal interview (CAPI)</td>
<td>127,194</td>
</tr>
</tbody>
</table>

2.4.2 Regression variables

As part of the study on interviewer bias, the impact of computer-assisted personal interviews on life satisfaction is estimated. The model used for estimation employs eight independent variables, known to significantly influence the variation in life satisfaction. These variables are happiness correlates. Please refer to (see Argyle, 1999; Headey, Muffels, and Wagner, 2010, 2013; Klement, 2021; Layard, 2006) for further information. For a brief description of the variables, please see Table 2.

2.5 The composition of the life satisfaction scale

The life satisfaction scale is defined between the two extremes of very dissatisfied and very satisfied on an 11-point integer scale from 0 to 10. The centre of the scale, 5, acts as a neutral point, indicating indifference and dividing the scale into two parts (OECD, 2013). Values from 0-4 indicate the dissatisfied part of the scale, while 6-10 indicate the satisfied part. The midpoint of the lower half is again 2, and the midpoint of the upper half is 8.
Table 2: Description of variables used for ordered logistic regression.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPI vs paper-based interview</td>
<td>takes the value 1 in the case of a computer assisted personal interview and 0 in the case of a paper-based interview by mail;</td>
</tr>
<tr>
<td>Dummy for winter interviews</td>
<td>is 1 if the interview was performed in January or February and is 0 otherwise;</td>
</tr>
<tr>
<td>Age and Age squared</td>
<td>control for age related effects;</td>
</tr>
<tr>
<td>Unemployed</td>
<td>registers unemployment. 1 if the interviewed is registered as unemployed and job seeking, 0 if not;</td>
</tr>
<tr>
<td>Married</td>
<td>takes the value of 1 if the person is married, 0 if divorced, single or widowed;</td>
</tr>
<tr>
<td>Log of real household income</td>
<td>is the logarithm of the annual real income (2011=100) of the household a person lives in;</td>
</tr>
<tr>
<td>Exercising at least once a week</td>
<td>is 1 if the interviewed exercises at least once a week, 0 if less;</td>
</tr>
<tr>
<td>Voluntary work at least once a week</td>
<td>is 1 if the interviewed volunteers at least once a week, 0 if less;</td>
</tr>
<tr>
<td>Performing at least two hobbies</td>
<td>Takes the value of 1 if the number of hobbies of an interviewed is above 2 (the average number of hobbies) and 0 if the number of hobbies is 1 or 0.</td>
</tr>
</tbody>
</table>

3 Results

3.1 Regarding the central tendency bias

3.1.1 Survey behaviour of very satisfied and very unsatisfied people

If there is a central tendency in the life satisfaction survey, respondents should prefer to rate their life satisfaction at the mid-points of the scale. A first indication would be whether the distribution of life satisfaction has local or global maxima at these points. As demonstrated in Fig. 1.1 the distributions display global maxima at points 8 and 5, respectively. For a more in-depth understanding of the SOEP, refer to Fig. 3.1 The SOEP displays the distribution of life satisfaction for the most dissatisfied 10 percent on the left and the distribution for the most satisfied 10 percent on the right. The left distribution contains local maxima at points 5 and 8 while the right distribution shows local maxima at points 2, 5, and 8, with 5 and 8 both being global maximums. Additionally, a negative correlation exists between the mean and variance. The most satisfied 10 percent of individuals tend to report life satisfaction between 7 and 9. For the 10 percent of individuals with the lowest satisfaction, their level of life satisfaction is distributed more evenly throughout the range.
3.1.2 Survey behaviour when repeatedly questioned annually

In the case of a central tendency, we would still expect points 2, 5 and 8 to be preferentially chosen over time, i.e. to be repeated more often than other points. To investigate this, the transition probabilities for 1-, 10- and 20-year transitions to the same state are shown in Table 3. These result from the $n$-step transition matrix as the values on the main diagonal. The table reads as follows: A person who reports a life satisfaction score of 8 this year is 49.6 percent likely to do so again next year. There is a 40 percent probability that they will be 8 again in 10 years’ time, and a 37.9 percent probability that they will be 8 again in 20 years’ time.

Table 3: Transition probabilities for 1-, 10, and 20-year transitions into the same life satisfaction state.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P(Y_{t+1} = a</td>
<td>Y_t = a)$</td>
<td>34.5</td>
<td>18.4</td>
<td>19.9</td>
<td>21.5</td>
<td>19.2</td>
<td>37.5</td>
<td>25.8</td>
<td>38</td>
<td>49.6</td>
<td>37.4</td>
</tr>
<tr>
<td>$P(Y_{t+10} = a</td>
<td>Y_t = a)$</td>
<td>12.6</td>
<td>7.1</td>
<td>11</td>
<td>13.8</td>
<td>14</td>
<td>29.3</td>
<td>20.3</td>
<td>31.4</td>
<td>40</td>
<td>22.5</td>
</tr>
<tr>
<td>$P(Y_{t+20} = a</td>
<td>Y_t = a)$</td>
<td>12.5</td>
<td>10</td>
<td>11.4</td>
<td>12.4</td>
<td>10.8</td>
<td>27.3</td>
<td>16.5</td>
<td>28.8</td>
<td>37.9</td>
<td>16.8</td>
</tr>
</tbody>
</table>

A look at the Table 3 shows that 5, 7, 8 in particular exhibit a certain stability over time, insofar as the probability that a person reports the same life satisfaction over several years is significantly increased.

3.1.3 The distribution of life satisfaction vs the binomial distribution

Another method for detecting a central tendency bias is to compare the actual life satisfaction distribution with an expected one. The midpoints of 2, 5, and 8 should occur more frequently than a random distribution would suggest. Various techniques exist to measure the quality of the life satisfaction distribution, with suggested methods including a uniform or beta distribution (Kalmijn, Arends, and Veenhoven, 2011). I employ the binomial distribution in this context since life satisfaction scores are qualitatively comparable to those of a binomial distri-
Life satisfaction, like binomially distributed variables, is defined on a discrete, closed state space with minimized variance as the expectation approaches the limits of the scale. Observing life satisfaction reports is akin to observing the outcome of throwing a ball into a Galton board. Fig. 3.2 illustrates the distribution of life satisfaction in the SOEP dataset represented by dots, alongside a binomial distribution represented by diamonds with the same mean value. The sample had an average life satisfaction score of 7.04. Upon comparison of the distributions, it is evident that values 5, 8 and 10 are mentioned excessively in comparison to the binomial distribution, whilst values 6 and 7 are insufficiently mentioned. This observation confirms the existence of central tendency bias. Individuals who are expected to report a life satisfaction rating of 6 or 7 are more inclined to report ratings of 5 and 8 instead. The frequent mention of a rating of 10 could be attributed to social desirability, which I will elaborate on in the subsequent section.

![Figure 3.2](image.png)

Figure 3.2: Binomial distribution (diamonds) vs the distribution of life satisfaction in the SOEP (dots). Mean = 7.04.

### 3.2 Regarding the interviewer bias

The survey data does not enable us to determine if an individual is genuinely reporting their life satisfaction or inflating it, as we only possess one score for each person. Nevertheless, aside from the actual household income, the SOEP also inquires about the degree of satisfaction obtained from the income earned. Based on these data, potential interviewer bias in income satisfaction can be demonstrated by comparing income levels with satisfaction in different interview scenarios. Moreover, if social desirability or a related bias influences the results, it is plausible that such a bias could also influence self-evaluations of life satisfaction. Table 4 presents the mean levels of contentment with personal income and average household income obtained from the SOEP, arranged according to interview type.
Table 4: Average household income and average satisfaction with household income (1998–2013).

<table>
<thead>
<tr>
<th>Average satisfaction with household income</th>
<th>Paper-based interview by mail</th>
<th>Partly oral, partly written interview</th>
<th>Paper-based interview without assistance by mail</th>
<th>Paper-based interview, assisted by mail</th>
<th>Oral interview partly written interview</th>
<th>CAPI interview partly written interview without assistance by mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average real annual household income (in 2011 €)</td>
<td>5.83</td>
<td>5.88</td>
<td>6.08</td>
<td>6.14</td>
<td>6.25</td>
<td>6.21</td>
</tr>
<tr>
<td></td>
<td>41,437</td>
<td>42,257</td>
<td>49,504</td>
<td>45,926</td>
<td>36,993</td>
<td>39,907</td>
</tr>
</tbody>
</table>

The relationship between average income satisfaction and average household income by interview scenario in Table 4 shows a correlation that could be explained by an interviewer bias. People who are interviewed directly by an interviewer orally report the highest average satisfaction with their income, even though their income is actually the lowest on average. In interviews where the interviewer is absent or plays a subordinate role, an inverse relationship is found. Although interviewed in writing have a higher average household income than those interviewed orally, they are less satisfied with it. There is therefore a negative correlation between satisfaction and actual income, and a positive correlation between satisfaction and the degree of involvement of the interviewer.

3.2.1 Average life satisfaction for each interview scenario

In analogy to Table 4, Table 5 shows the average life satisfaction scores by interview scenario. There seems to be a similar correlation here. The interviewees report the highest life satisfaction in interview scenarios that are carried out orally and in presence of an interviewer. Even if we do not have a comparison with real life satisfaction here, the same distortion seems to be present here as in the previous example.

Table 5: Average life satisfaction by type of interview (1998–2013).

<table>
<thead>
<tr>
<th>Average life satisfaction</th>
<th>Paper-based interview by mail</th>
<th>Partly oral, partly written interview</th>
<th>Paper-based interview without assistance by mail</th>
<th>Paper-based interview, assisted by mail</th>
<th>Oral interview partly written interview</th>
<th>CAPI interview partly written interview without assistance by mail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.79</td>
<td>6.84</td>
<td>6.87</td>
<td>7.00</td>
<td>7.00</td>
<td>7.29</td>
</tr>
</tbody>
</table>

3.2.2 Estimating the effect of the interviewer bias based on logistic regression

The statistic I present in Table 5 suggest that people report more positively about their lives, on average, when they are interviewed in person. In the next step, I will quantify this bias and compare the influence of a computer-assisted personal interview (CAPI) with the scenario of a
paper-based interview where no interviewer is present on the level of reported life satisfaction based on logistic regression. I will use the model presented in Sec. 2 and estimate the model twice: once as an ordered logistic regression with random effects, which takes into account comparisons between individuals, and once as an ordered logistic regression with fixed effects, which takes into account individual variation over time. The variable of interest is \textit{CAPI vs paper-based interview}. It takes the value 1 if the interview is a computer-assisted personal interview and 0 if it is a paper-based interview with no interviewer present. A positive coefficient means that people report higher levels of life satisfaction in a face-to-face interview than in an interview without an interviewer present. The estimation results are shown in Table 6.

Table 6: Results of random-effects and fixed-effects ordered logistic regression. The dependent variable is life satisfaction. The data basis is the SOEP waves 1998-2013.

<table>
<thead>
<tr>
<th></th>
<th>Random-effects ordered</th>
<th>Fixed-effects ordered</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPI vs paper-based interview</td>
<td>0.85*</td>
<td>0.83*</td>
</tr>
<tr>
<td>Dummy for winter interviews</td>
<td>-0.12*</td>
<td>0.01</td>
</tr>
<tr>
<td>Age</td>
<td>-0.07*</td>
<td>-0.03*</td>
</tr>
<tr>
<td>Age Squared</td>
<td>0.0005*</td>
<td>-0.003*</td>
</tr>
<tr>
<td>Unemployed</td>
<td>-1.153*</td>
<td>-0.81*</td>
</tr>
<tr>
<td>Married</td>
<td>0.42*</td>
<td>0.15*</td>
</tr>
<tr>
<td>Log of real household income</td>
<td>0.56*</td>
<td>0.28*</td>
</tr>
<tr>
<td>Exercising at least once a week</td>
<td>0.41*</td>
<td>0.21*</td>
</tr>
<tr>
<td>Voluntary work at least once a week</td>
<td>0.18*</td>
<td>0.01</td>
</tr>
<tr>
<td>Performing at least two hobbies</td>
<td>0.05*</td>
<td>0.1*</td>
</tr>
</tbody>
</table>

Regardless of whether we assume random or fixed effects, the result is clear. The variable \textit{CAPI vs paper-based interview} takes the values 0.85 and 0.85 respectively in the estimated model, the coefficients being significant with p<0.01. The effect is not only significant but also very pronounced and has a stronger impact on life satisfaction than any of the other factors considered. Only job loss has a similarly strong effect, but in negative terms (-1.153 and -0.81).

### 3.2.3 Is the interviewer bias time constant?

The interviewer bias’s time constancy is the final issue I will address. If interviewees did adapt to the interviewer bias, there would be only short-term discrepancies between written and oral interviews because there would be no long-term differences (due to adaptation). Nevertheless, according to Table 7 this is not the case. The interviewer bias remains constant across time. To achieve this goal, I analysed the distribution of life satisfaction during the first interview (P(1)) and ten subsequent written or oral interviews (P(10)) based on the table. To minimize the influence of seasonal factors like weather or unemployment, the analysis only included interviews conducted during the winter.

By and large, the distributions are relatively the same. The difference between the oral and written surveys is that more respondents in the written survey report a life satisfaction score
Table 7: Realisation probabilities of life satisfaction for written and oral interviews performed in January or February.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>interviews</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P(1)</td>
<td>0.27</td>
<td>0.36</td>
<td>1.36</td>
<td>3.19</td>
<td>4.43</td>
<td>13.10</td>
<td>12.98</td>
<td>23.97</td>
<td>29.41</td>
<td>8.27</td>
<td>2.67</td>
</tr>
<tr>
<td>P(10)</td>
<td>0.21</td>
<td>0.55</td>
<td>1.48</td>
<td>3.54</td>
<td>4.56</td>
<td>13.80</td>
<td>13.47</td>
<td>24.47</td>
<td>28.96</td>
<td>7.17</td>
<td>1.78</td>
</tr>
<tr>
<td>Oral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>interviews</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P(1)</td>
<td>0.24</td>
<td>0.26</td>
<td>0.68</td>
<td>1.85</td>
<td>3.02</td>
<td>13.67</td>
<td>12.37</td>
<td>22.39</td>
<td>30.01</td>
<td>10.20</td>
<td>5.31</td>
</tr>
<tr>
<td>P(10)</td>
<td>0.22</td>
<td>0.28</td>
<td>1.01</td>
<td>2.12</td>
<td>3.40</td>
<td>15.15</td>
<td>13.27</td>
<td>22.32</td>
<td>28.86</td>
<td>9.34</td>
<td>4.02</td>
</tr>
</tbody>
</table>

of 2, 3 or 4, while more respondents in the oral survey report a life satisfaction score of 9 or 10. An indication that there are people who present them self much more positive in the presence of others. Be it due to social desirability, narcissistic tendencies, or just to impress other people. However, these differences remain even with 10 years of repeated questioning, as the distributions only converge very weakly.

4 Discussion

4.1 Regarding the central tendency bias

A tendency towards certain states was demonstrated among some respondents in the SOEP. Specifically, states 5 (the middle of the scale) and 8 (the middle of the satisfied portion of the scale) were particularly prevalent. These states, along with state 7, were consistently selected by survey participants (Table 3). These states appear to be stable points in long-term and short-term fluctuations in life satisfaction. This phenomenon is particularly noticeable in the case of state 8: an individual who rates their life as 8 this year has a 50 percent chance of giving the same rating next year, and a 38 percent chance of doing so twenty years from now. For state 5, these probabilities are still 38 percent and 27 percent respectively. Marginal states, such as 0, 1, 9, and 10, are less likely to be repeated. One possible explanation for this survey outcome could be that people tend to place themselves in long-term life satisfaction levels that balance between positive and negative experiences. Positive states that offer potential for improvement and a better future life. The optimal equilibrium or set point appears to be 8, around which individual variation in life satisfaction is minimized.

4.2 Remarks regarding the variation in life satisfaction

In their previously cited article, Headey and Muffels (2016) argue that it is difficult to explain why some individuals consistently report exceedingly high levels of life satisfaction or experience significant gains and maintain them. They suggest that this is a priority for future research. While the study’s findings do not offer any definitive reasons for this behaviour, they do provide insight into the patterns and mechanisms behind such gains. It is possible that the central
tendency bias may have influenced these changes. Although infrequent, significant long-term improvements are typically associated with points 8 and 5. Certain individuals in the SOEP (e.g. person numbers 5120704 or 5719601) experience a bifurcation of their life satisfaction into two distinct periods. During a specific period, individuals are more likely to report a life satisfaction score of 5 or 8. A trajectory in the SOEP, shown in Figure 4.1, illustrates this occurrence. However, it is noteworthy that significant gains or losses in life satisfaction are infrequent and may be attributed to fortuitous circumstances.

Figure 4.1: Example of switching between points 5 and 8 (SOEP participant number 357001).

In Sec. 3.1.2 I gave Markov transition probabilities as evidence for the time constancy of a tendency towards the centre in the survey of life satisfaction. In the following, I have listed the corresponding stochastic matrices in order to briefly discuss the variation in life satisfaction in the SOEP overall.

Table 8: Transition matrix of 1-year transitions in the SOEP.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td><strong>34.50</strong></td>
<td>13.02</td>
<td>13.69</td>
<td>9.53</td>
<td>4.97</td>
<td>13.96</td>
<td>2.68</td>
<td>3.09</td>
<td>2.82</td>
<td>0.54</td>
<td>1.21</td>
<td>0.27</td>
</tr>
<tr>
<td>1</td>
<td>12.45</td>
<td><strong>18.41</strong></td>
<td>21.46</td>
<td>17.09</td>
<td>8.48</td>
<td>10.46</td>
<td>3.84</td>
<td>4.11</td>
<td>2.91</td>
<td>0.66</td>
<td>0.13</td>
<td>0.28</td>
</tr>
<tr>
<td>2</td>
<td>3.92</td>
<td>6.47</td>
<td><strong>19.92</strong></td>
<td>23.18</td>
<td>12.94</td>
<td>18.00</td>
<td>6.12</td>
<td>4.51</td>
<td>3.45</td>
<td>1.92</td>
<td>0.47</td>
<td>0.94</td>
</tr>
<tr>
<td>3</td>
<td>1.12</td>
<td>2.28</td>
<td>9.14</td>
<td><strong>21.54</strong></td>
<td>18.11</td>
<td>24.83</td>
<td>10.02</td>
<td>7.05</td>
<td>4.77</td>
<td>0.78</td>
<td>0.36</td>
<td>0.28</td>
</tr>
<tr>
<td>4</td>
<td>0.53</td>
<td>0.73</td>
<td>3.59</td>
<td>11.88</td>
<td><strong>19.18</strong></td>
<td>29.80</td>
<td>15.15</td>
<td>11.77</td>
<td>6.05</td>
<td>0.92</td>
<td>0.40</td>
<td>0.94</td>
</tr>
<tr>
<td>5</td>
<td>0.30</td>
<td>0.31</td>
<td>1.40</td>
<td>4.47</td>
<td>8.46</td>
<td><strong>37.53</strong></td>
<td>18.59</td>
<td>16.44</td>
<td>10.04</td>
<td>1.51</td>
<td>0.95</td>
<td>0.94</td>
</tr>
<tr>
<td>6</td>
<td>0.09</td>
<td>0.10</td>
<td>0.61</td>
<td>1.92</td>
<td>4.53</td>
<td>19.14</td>
<td><strong>25.83</strong></td>
<td>28.78</td>
<td>15.96</td>
<td>2.13</td>
<td>0.89</td>
<td>1.25</td>
</tr>
<tr>
<td>7</td>
<td>0.04</td>
<td>0.03</td>
<td>0.22</td>
<td>0.85</td>
<td>1.83</td>
<td>8.77</td>
<td>14.95</td>
<td><strong>37.96</strong></td>
<td>30.03</td>
<td>4.22</td>
<td>1.11</td>
<td>0.94</td>
</tr>
<tr>
<td>8</td>
<td>0.03</td>
<td>0.02</td>
<td>0.12</td>
<td>0.36</td>
<td>0.72</td>
<td>4.16</td>
<td>6.33</td>
<td>23.09</td>
<td><strong>49.63</strong></td>
<td>12.78</td>
<td>2.75</td>
<td>0.94</td>
</tr>
<tr>
<td>9</td>
<td>0.02</td>
<td>0.02</td>
<td>0.08</td>
<td>0.18</td>
<td>0.32</td>
<td>1.86</td>
<td>2.75</td>
<td>9.69</td>
<td>38.82</td>
<td><strong>37.41</strong></td>
<td>8.84</td>
<td>1.04</td>
</tr>
<tr>
<td>10</td>
<td>0.06</td>
<td>0.02</td>
<td>0.09</td>
<td>0.30</td>
<td>0.32</td>
<td>2.96</td>
<td>2.10</td>
<td>5.85</td>
<td>21.42</td>
<td>22.44</td>
<td><strong>44.44</strong></td>
<td>1.04</td>
</tr>
<tr>
<td>Total</td>
<td>0.27</td>
<td>0.28</td>
<td>0.94</td>
<td>2.25</td>
<td>3.44</td>
<td>12.18</td>
<td>11.84</td>
<td>23.11</td>
<td>30.82</td>
<td>10.48</td>
<td>4.39</td>
<td>1.00</td>
</tr>
</tbody>
</table>

In these matrices, the significance of points 5 and 8 for variations in life satisfaction is evident. These findings highlight the importance of points 5 and 8 for understanding satisfaction trajectories. Point 5 marks the shift from a dissatisfied to a satisfied state. Point 8 represents the
endpoint of most people’s path to satisfaction. Notably, around 80 percent of the probability mass lies in the satisfied region of the matrices (6 to 10), with the highest probabilities along the diagonal. The above indicates that in general, life satisfaction is stable and individuals typically experience a maximum increase or decrease of one point. However, states of dissatisfaction are found to be highly unstable and individuals are less likely to experience recurring dissatisfaction. Furthermore, transition probabilities suggest that individuals return to a state of satisfaction quickly following a brief period of dissatisfaction. The aforementioned applies to values situated at the highest point of the scale, that is, extremely contented states. Such states seem to repeat in the near future, but gradually converge in probability over the long run. Additionally, the distributions follow a consistent pattern over time, though there exist discernable dissimilarities among the transitional probabilities along the primary diagonal between one-year transitions and those of a decade or two. The probabilities for the latter two transitions are nearly identical. There are evident disparities solely in values 9 and 10, which can be attributed to the effect of age as younger individuals demonstrate a propensity towards extreme values whilst evaluating their age.

The oscillation between satisfaction and dissatisfaction with life appears to be governed by various patterns and origins. For a more nuanced comprehension of the fluctuations in life satisfaction, it may prove valuable to examine and scrutinize contented and discontented life phases discretely.
4.3 Remarks regarding the growth of average life satisfaction in a population

Finally, I turn to the matter of achieving long-term, average population happiness, considering the 11-point life satisfaction survey measures. The *World Happiness Report* (Helliwell et al., 2022) examines the average life satisfaction across most countries worldwide using the 11-point scale, and reports that Finland is the happiest country, achieving an average life satisfaction of 7.8. The analysis results indicate that the 9 and 10 points on the scale lack stability over time, while people report satisfaction levels above 8 only briefly. This is credible as extremely satisfied states rarely endure, with new desires emerging soon after the satisfaction of current ones, leading to a decline in life satisfaction. An individual who reports a life satisfaction score of 8 describes themselves as content, but still open to the possibility of higher levels of satisfaction in the future. Closed scales, like the life satisfaction scale, demonstrate a pattern in which variance decreases as the expected value approaches the ends of the scale. Based on the data, it appears that the variance of life satisfaction is minimized at an average of approximately 8. Therefore, it is highly improbable that the population’s mean life satisfaction will surpass 8 in the long run.

5 Conclusion and summary of findings

The article deals with the question of how large the effect of response bias is on the variation in life satisfaction and which methods are appropriate for describing these effects. In summary, the results of my analyses can be summarised as follows:

*Results regarding response biases:*

- The more involved an interviewer is in the life satisfaction survey, the higher the reported life satisfaction is on average. This effect is particularly pronounced when comparing written and computer-assisted personal interviews. In the latter, life satisfaction is more than 10 percent higher—even taking into account other effects.

- This study reveals a persistent positive interviewer bias. Specifically, it demonstrates that oral respondents over a 10-year period consistently reported higher levels of life satisfaction than their written counterparts regardless of seasonal changes. This discrepancy can be attributed, at least in part, to the fact that oral interviews are more likely to elicit responses of 9 and 10 while written interviews are more likely to produce responses of 3 and 4.

- There is a tendency towards the midway point on the life satisfaction scale, as values of 5 (midpoint) and 8 (midpoint of satisfied range) are reported more frequently than other scores and at a higher rate than predicted statistically. Points 5, 7 and 8 are the most stable life satisfaction scores on the eleven-point scale.
• Extreme values on the scale are typically avoided in surveys, as they are seldom referred to and can be unstable over time. Nevertheless, a subset of respondents consistently rate their lives as a 0 or 10, potentially indicating that they may not take the survey seriously.

Results regarding the variation in life satisfaction:

• 80 percent of the respondents are satisfied with their lives, 10 percent are dissatisfied, another 10 percent are indifferent.

• There is a negative correlation between the expectation and the variance of life satisfaction: The lower the expectation of individual life satisfaction, the higher the variance, and vice versa.

• Dissatisfaction is generally not a stable state, but satisfaction is: the vast majority of people who rate their lives as satisfactory continue to do so next year. Those who rate their lives negatively tend to do so for only 1 to 2 years.

• 8 is the most stable state: the probability that a person who reports a life satisfaction score of 8 will do so again in the next survey is almost 50 percent. 1 is the most unstable state: only 10 percent of all people repeatedly report a life satisfaction of 1.

• The transition probabilities of life satisfaction are time homogenous in the long run.

In summary, response biases resulting from the interview setting or the life satisfaction scale have a significant influence on both the level and the long-term change in life satisfaction. In particular, studies dealing with changes in life satisfaction or with adjustment processes should take these influencing factors into account. Furthermore, the results on the tendency towards the middle can explain why there is a saturation in the growth of life satisfaction, i.e. why people or countries do not become more satisfied on average. Due to the nature of human beings to judge their lives in trade-offs and as a balance between good and bad, the scale does not allow for higher equilibrium points. Especially since people avoid extreme values on scales in life satisfaction surveys, as my research shows.

Data availability
The dataset analysed in this study—the German Socio-Economic Panel (SOEP)—is available from the German Institute for Economic Research under https://www.diw.de/de/diw_01.c.615551.de/forschungsbasierte_infrastruktureinrichtung__sozio-oekonomisches_panel_soep.html

Conflict of interest
The author declares no competing interests.

Funding
No funding was received for the research for this study.
References


Headey, Bruce, Ruud Muffels, and Gert G. Wagner (2010). “Long-running german panel survey shows that personal and economic choices, not just genes, matter for happiness”. In: Proceedings of the National Academy of Sciences of the United States of America 107.42, pp. 17922–17926. DOI: 10.1073/pnas.1008612107


