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When "I Don't Know" Means a Lot – Moderators and Mediators of Age-Related Changes in Uninformative Answers

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Our paper focused on identifying moderators (i.a. question difficulty) and mediators (i.a. health condition) allowing for better understanding of the relationship between ageing and respondents' tendency to select uninformative answers ("do not know", "have no opinion" etc.). Our results, based on data obtained in three waves of PGSS study (2002, 2005, 2010), support previous research linking preference for uninformative answers with age-related cognitive decline.

Keywords: survey research, ageing, do-not-know answers.

Kiedy „nie mam zdania" znaczy wiele – moderatory i mediatory związanych z wiekiem zmian w skłonności do udzielania odpowiedzi beztreściowych

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Artykuł koncentruje się na identyfikacji moderatorów (m.in. złożoności pytań) i mediatorów (m.in. stanu zdrowia), które pozwalają lepiej zrozumieć związek pomiędzy starzeniem się a skłonnością respondentów do udzielania odpowiedzi beztreściowych („nie wiem", „nie mam zdania" itd.). Nasze wyniki opierające się na danych uzyskanych w trzech falach badania PGSS (2002, 2005, 2010) są zgodne z wcześniejszymi doniesieniami łączącymi tendencję do udzielania odpowiedzi beztreściowych z ograniczeniami poznawczymi związanymi z wiekiem.

Słowa kluczowe: badania sondażowe, starzenie się, odpowiedzi beztreściowe.

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Despite the fact that age-related decline might be observed in most domains of our cognitive functioning, its influence on the response behavior of elderly participants in survey studies is not a popular research topic. The need for better understanding of this issue becomes increasingly obvious as most developed countries in the world are facing massive changes in their demographic structure. According to the Eurostat projections (2016) growing population of the European Union is expected to peak by around 2040. Due to the fertility rates declining below the replacement level and changes in life expectancy (Mamolo & Scherbov, 2009) this growth will be accompanied by a rapid increase in the share of the elderly. The proportion of the population aged 65 years and over is projected to rise from 17% in 2010 to 30% in 2060, with the share of those aged 80 years and over rising from 5% to 12%. Similar changes might be observed in Poland, where the share of the 65 years old and over population is projected to rise to 35% over the same period by 2050 (Eurostat Press Office, 2016). This trend, often called "gray tsunami", will have enormous impact on societies and their economies.

Unprecedented scale of demographic change poses many challenges that have to be addressed not only by policy makers, but also scientific community. Social sciences might be perceived as one of the key forces responsible for successful dealing with the "gray new world". Within the last two decades we have observed a rapid increase of interest in problems such as cognitive aging, life-span development, or memory trainings and rehabilitation. Interestingly, the growing popularity of studies focused on the elderly is not evenly distributed across the various specialized branches of the social sciences. The methodology of survey studies in elderly populations seems to be one of the neglected areas.

The scarcity of research programs and publications dealing with that issue is surprising concerning the scale and fully predictable nature of the upcoming changes and growing general knowledge about the challenges in methodology of survey studies (Podsakoff, MacKenzie & Podsakoff, 2012 provide a comprihensive review). Elderly participants, many of them facing serious cognitive limitations and other health problems (Mungas et. al, 2010), will constitute a large part of any representative sample within the next few decades. Adapting survey methodology, creating valid and reliable research tools adjusted to the needs and limitations of the older respondents should become a priority. Without high quality data we will not be able to keep pace with the changing society. Accurate measurement is the *sine qua non* condition of precise description of any population of interest and, therefore, a vital part of understanding, monitoring, and – hopefully – improving the quality of life in ageing societies.

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1. Current Knowledge About the Response Style of Elderly Participants

Considering the importance of better understanding of the age-related changes in the response style, the scarcity of broader theoretical frameworks addressing that issue is perplexing. Existing papers are usually limited in their scope with the important exception of a monograph by Schwarz, Park, Knauper and Sudman (1999) and a comprehensive review paper published a few years later by the same authors (Schwarz, Knäuper & Rosen, 2005). The latter publication describes the functioning of survey participants from a process-oriented perspective underlining that "answering a question posed in a research setting requires that respondents perform several (possibly demanding) tasks" (p. 233). Schwarz and his collaborators identify five mechanisms which might be responsible for the emergence of age-related changes in response strategies. As this classification summarizes most of the existing findings and some future research avenues, we will briefly describe it below.

1.1. Reduction of the question order effects

There is a long tradition of studying the influence of question order on survey results. Regardless of whether the content of previous questions leads to contrast or assimilation, the emergence of order effects relies upon persistent activation of memory content, evoked by previously presented items. For older respondents previously used information is less accessible and, in consequence, dependencies between adjacent questions are weakened; we may therefore expect that age-related decline in memory will attenuate question order effects.

1.2. Question order and rating scale use

Some findings indicate that in the oldest group of respondents (above 80 years of age) the ability to discriminate between response categories might be diminished. In that case, the reliability and predictive power of ratings might be significantly compromised, as more error variance will be introduced at the stage at which participants are choosing the answer option best describing their feelings or opinions.

1.3. Response order effects

Similarly to the question order effects, long lists of response alternatives might impose high load on older participants processing resources, leading either to a poor quality of judgment and problems with selecting the optimal answer or a tendency to choose options most accessible in memory – i.e. ones presented closer to the end of the list. This should be particularly true in case of oral presentation of survey questions – when alternatives are read to the respondents only once, with no external memory support provided. This hypothesis has already been verified and has abundant sup-

port by collected data (including studies focusing on the moderating effects related to the oral vs. visual mode of question presentation).

1.4. Subjective theories of stability and change

This effect is related to the tendency to perceive past events preceding major life changes as markedly different from current situation. Descriptions provided by older participants after important events (i.e. retirement or loss of a spouse) might be significantly altered. Retrospective reports of elderly participants might be distorted and differences between past and present experience inflated due to the memory bias evoked by narrations constructed after life-changing events. This mechanism is described by Schwarz and his collaborators as a hypothesis worth verifying (according to our best knowledge its status has not changed within the last decade).

1.5. Influence of available response alternatives

One of the most important achievements of more general studies focused on behavior of survey participants is a set of discoveries revealing critical importance of question wording and choice of measurement scale (e.g. Knäuper, Stich, Yugo & Tate, 2008) as factors modifying the results. These effects are more noticeable in older participants, probably due to age-related decline in memory functioning leading to higher likelihood of using situational cues (i.e. response options) as a valid source of information. More recent studies showed, however, that this effect is moderated by the question content – for items related to issues closely monitored by elderly respondents, such as physical symptoms, the results might be actually inversed with older participants being less affected than younger by the response scale.

Most of the effects described by Schwartz and collaborators (and described above) are linked by a common thread. With the exception of theory of change, all the postulated effects are directly related to various consequences of cognitive decline observed in the elderly. This approach seems to be an effective heuristic in hypotheses generation, however – at the very same time – it is clearly a simplistic approach.

2. Studies Focused on Cognitive Resources

Cognitive ageing is a complex, multi-faceted phenomenon that cannot be reduced to a single dimension. Still, most of the studies on the age-related changes in response style are employing a very simple, univariate approach with age being the only independent variable of interest.

One of the rare exceptions to that rule is an unpublished work of Jerzyński (2008), which contains a set of advanced analyses focused on verification of more complex hypotheses. In his Ph.D. dissertation Jerzyński identified several moderators shaping the age-response style relationship at many different levels, including subject variables (i.e. length of education

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and job complexity used as a proxy for cognitive resources) and formal characteristics of survey questions (more complex items revealing more pronounced aging effects).

The importance of moderators was tested in the context of two already known and robust effects observed in elderly respondents: recency effect (defined as preference for the last of the presented answers) and significant increase in the number of uninformative answers (i.e. "do not know" / "have no opinion" / "difficult to say" for simplicity, later related to as DK answers). The latter effect has highly disruptive consequences for the quality of survey results because an increase in DK answers leads to many problems – heightened risk of bias, non-representativeness, reduction in the reliability of aggregate measures, just to name a few.

Jerzyński's empirical analysis is based on a large data set obtained from Polish editions of General Social Survey in 1992–2005 waves. From the point of view of the overall high quality of the methodological standards of GSS, the results acquired by Jerzyński might be interpreted as enlightening and worrying at the same time. His successful verification of the postulated hypotheses provides compelling evidence showing that not only the content of the responses, but also the very occurrence of DK answers in our results is affected by ageing and significantly moderated by many factors including cognitive demands imposed by questions and participants' level of education.

In our project we followed two different lines of analysis broadening our understanding of the complex relationships between uninformative answers, cognitive ageing, level of education, and other participants' characteristics. Firstly, using more recent PGSS datasets we replicated some of the results reported by Jerzyński (2008) including the analysis of the effects of ageing on the proportion of DK answers and moderators of this effect. Secondly, we expanded the models proposed by Jerzyński by including additional mediators (subjective assessment of health condition and level of life satisfaction) and an additional dependent variable – assessment of the respondents' ability to understand survey questions provided by interviewers.

The first set of hypotheses aimed at a direct replication of Jerzyński's findings. We expected that with older age (and limited processing abilities) participants would more often rely on choosing DK answers. At the same time we hypothesized that this relationship would be moderated by participants' level of education (treated as a proxy measure of respondents' cognitive resources). We expect aging effects to be less pronounced in better educated respondents as a group having greater cognitive reserve, more intellectually active lifestyle, and delayed ageing-related cognitive decline (**Hypothesis 1.**). At the same time, as more complex items impose higher cognitive load on respondents, moderating effects of education should be stronger if complex questions are compared with simple ones (**Hypothesis 2.**).

The next group of hypotheses was focused on identifying mediators of the age-related changes in the preference for DK answers. As PGSS dataset

does not contain any direct measures of the quality of participants' cognitive functioning, in our analysis we selected a variable which is known to be strongly correlated with trajectory of cognitive ageing: general health condition (Alvin & Hofer, 2011). This decision might be justified on the basis of two arguments. Firstly, serious cognitive limitations are likely to be taken into account as part of participants' ratings of their health condition. For example, we might expect that memory loss or other cognitive problems reducing life quality would be reflected in lower self-ratings. Secondly, many common health problems observed in elderly populations (hypertension, diabetes etc., Raz et al., 2005; Reitz et al, 2007) are known to affect working memory and other key aspects of cognitive functioning.

To further support the claims about the role of health ratings, in the last set of analyses we assessed their mediatory role in the context of a competing mediator – general life satisfaction. We expected that respondents declaring lower satisfaction would be less cooperative and motivated to participate in the survey interview, leading to an increase in the number of DK answers. This effect, however, should be more general than mediation related to cognitive decline, and not modified that strongly by questions complexity. These predictions are more precisely specified in the following hypotheses.

Hypothesis 3. As cognitive ageing is the key factor contributing to the emergence of DK answers, we expect self-ratings of the health condition (treated as a proxy of cognitive resources) to mediate the relationship between age and preference for DK answers.

Hypothesis 4. The mediating effects of cognitive ageing should be more pronounced in more cognitively demanding conditions (i.e. while answering more complex questions).

Hypothesis 5. We assume that the link between ageing and DK answers is primary cognitive, so mediation effects of health ratings should be still present after controlling for the mediating effects of life satisfaction. In the last step of our analysis we wanted to validate further the conclusions concerning the relationship between problems in answering survey questions and cognitive limitations by using an alternative dependent variable. If our line of reasoning is valid, a large proportion of DK answers should co-occur with increased probability that the interviewer will assesses the respondent as having difficulties in understanding survey questions. Based on these premises we conducted a systematic comparison of regression models where two different dependent variables were used: large proportion of DK answers vs. problems with understanding survey questions (assessed by the interviewer).

Hypothesis 6. Due to the shared causal mechanism (age-related cognitive limitations), we expect similar variables to moderate and mediate the effects of age on both: DK answers and problems with understanding survey questions assessed by the interviewer.

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3. Results

All the analyses were performed in SPSS (ver. 23) supplemented with macros written by A. Hayes (2013) that allowed for testing more complex moderation and mediation models.

3.1. Data

The analyses were conducted on data obtained in three waves of PGSS study (2002, 2005, 2010). We excluded data collected using an experimental version of the survey (half of 2002 sample and whole 2008 wave). All the datasets are available on the website of the Polish Social Data Archive: http://www.ads.org.pl/opis-szczeg.php?id=91.

3.2. Uninformative answers

We based our analysis on items fulfilling two criteria: (1) questions shared in all selected waves of PGSS, (2) questions in which "do not know" or "have no opinion" response options were available. The proportion of DK answers was computed after excluding all the missing data. We used same decision criteria as Jerzyński to identify less and more cognitively demanding questions, defining the first group as all questions with only two response options. The complete list of selected questions can be requested from the authors of the article via e-mail.

Since the distribution of the DK answers was strongly skewed to the right and contained extreme scores, both indices (for binary and complex questions) were dichotomized (the threshold set at 10% level), so binary logistic regression was used in all the models explaining preference for DK answers. It also allowed us to make these models comparable with results obtained for the other outcome variables (see below).

3.3. Problems with understanding survey questions

Problems with understanding survey questions were assessed by the interviewers using an ordinal 3-point scale. Because of the low percentage of participants being classified into "poor comprehension" group ("słabe zrozumienie", 3.7% of the respondents), we decided to collapse this answer with "sufficient comprehension" ("dostateczne zrozumienie", 20.1%) transforming this variable into a binary indicator. That allowed us to directly compare regression coefficients obtained for both dependent variables.

3.4. Description of key predictors

The predictors used to build the regression models were:

1) Participant's age (in years)
2) Level of education (measured on 0 – "no formal education" to 9 – "completed M.A." scale)
3) Participant's assessment of health condition (variable q87e, 6-point "very dissatisfied"– "very satisfied" scale)

4) Participant's general life satisfaction (variable q95, 4-point "unhappy" – "very happy" scale).

All the predictors were standardized prior to the analysis. Measures of health ratings and life satisfaction were reversed so that higher scores represented more satisfaction / happiness.

3.5. Education as a Moderator of the Age-Related Effects

In the first three models we examined the level of education as a moderator of the relation between age and three dependent variables: proportion of "don't know" answers in binary and complex questions exceeding 10% threshold or being classified into the group having problems with understanding survey questions. This first and all the following models are illustrated using conceptual diagrams (Fig. 1 and foll.) depicting the relationships between the predictors. Model illustrations are supplemented with template numbers allowing for easy replication of all the presented analyses using PROCESS macros (Hayes, 2013).

Regression coefficients as well as basic model descriptives are reported in Table 1. In all three models age and level of education were significantly related to the dependent variables. The signs of coefficients indicate that

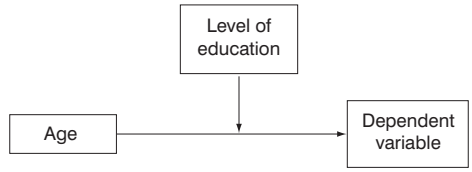

Fig. 1. Conceptual diagram of the models of age effects moderated by level of education (Hayes' template no. 1)

Dependent variable	**Binary questions DK answers > 10%**			**Complex questions DK answers > 10%**			**Problems with understanding survey questions**		
N	3792			3792			3786		
Nargelkerke R^2	5.48%			12.68%			28.15%		
	B	**SE**	**p**	**B**	**SE**	**p**	**B**	**SE**	**p**
Constant	–0.60	0.04	<.001	–1.75	0.05	<.001	–1.59	0.05	<.001
Age	0.21	0.04	<.001	0.27	0.05	<.001	0.36	0.06	<.001
Level of education	–0.28	0.04	<.001	–0.45	0.05	<.001	–1.10	0.06	<.001
Age x Level of education	**–0.11**	**0.04**	**.003**	**–0.34**	**0.05**	**<.001**	**–0.19**	**0.06**	**.002**

Tab. 1. Statistics for the regression models including age as a main predictor and level of education as a moderator

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younger and better educated participants have less problems with answering questions. More importantly, in all three models the interaction of these variables was significant, confirming the predictions of Hypothesis 1. Moderating effects of the level of education were more pronounced for complex questions and when compared with binary questions, these results confirm the second hypothesis. Similarity between the results observed for DK answers and problems with question understanding provides partial support for Hypothesis 6.

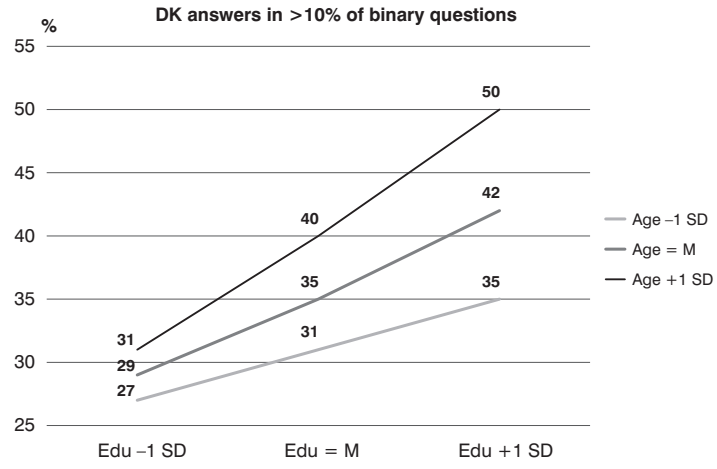

Fig. 2. Predicted probabilities of exceeding 10% of uninformative answers in binary questions for different levels of age and education

To better understand the moderating effects of the level of education in each of the models, we probed the conditional effects of age for lower (–1 SD below the mean), average (mean), and higher (+1 SD above the mean) level of education. Predicted means are depicted in Figures 3. to 5. In all three cases conditional effects of age were highly significant for average and low (–1SD) values of the moderator (all $p < .001$), and marginally significant ($p = .079$, binary questions) or non-existent ($p > .1$, other two dependent variables) for higher levels of education.

3.6. Ageing Effects Mediated by Self-Rated Health Condition and Moderated by Education

To verify the next set of hypotheses, we conducted a series of moderated mediation analyses to check if age indirectly influenced outcome variables through its effect on health problems self-rating. Additionally, the moderating effects of the level of education were taken into account as important for direct and indirect effects of ageing. A conceptual diagram of the model is depicted in Figure 5. Similarly to the previous example, this model was

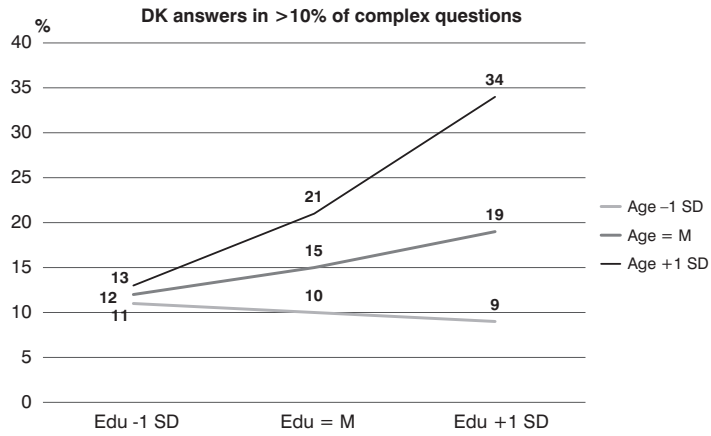

Fig. 3. Predicted probabilities of exceeding 10% of uninformative answers in complex questions for different levels of age and education

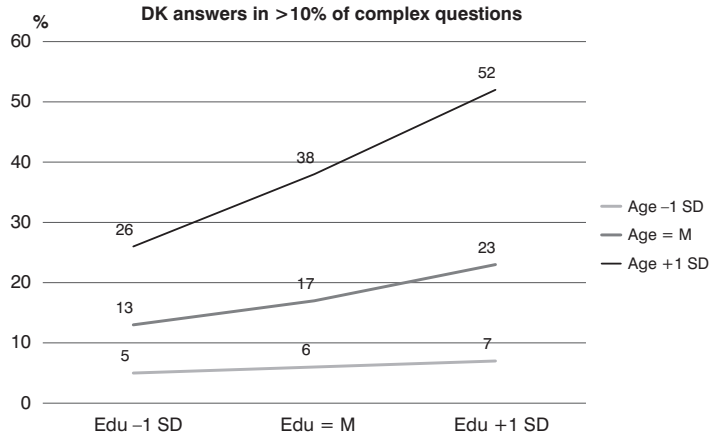

Fig. 4. Predicted probabilities of being assessed as a respondent having problems with understanding survey questions for different levels of age and education

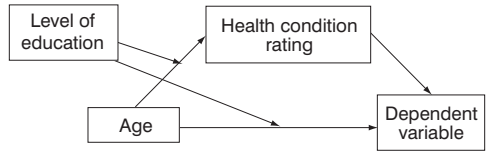

Fig. 5. Conceptual diagram of the moderated mediation of age effects through health condition ratings moderated by level of education (Hayes' template no. 8)

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estimated for all three dependent variables. Coefficients and descriptives for both are reported in Table 2.

Not surprisingly, older participants, while compared with younger respondents, declared poorer health condition (see: top part of Table 2.). Concerning the predictions of Hypotheses 3. and 4. tested by these models, the effects linking health ratings with the dependent variables were

Mediator model (health condition ratings) – linear regression									
N	3775								
R^2	20.53%								
	B	**SE**	**p**						
Constant	0.01	0.02	.368						
Age	–0.39	0.02	<.001						
Level of education	0.12	0.02	<.001						
Age x Level of education	0.05	0.02	.001						
Outcome model – binary logistic regression									
Dependent variable	**Binary questions DK answers > 10%**			**Complex questions DK answers > 10%**			**Problems with understanding survey questions**		
N	3775			3775			3769		
Nargelkerke R2	5.49%			12.82%			29.24%		
	B	**SE**	**P**	**B**	**SE**	**p**	**B**	**SE**	**p**
Constant	–0.60	0.04	<.001	–1.77	0.05	<.001	–1.60	0.05	<.001
Age	0.20	0.04	<.001	0.23	0.06	<.001	0.25	0.06	<.001
Health condition rating	–0.03	0.04	.401	–0.11	0.05	.016	–0.27	0.05	<.001
Level of education	–0.27	0.04	<.001	–0.43	0.06	<.001	–1.07	0.06	<.001
Age x Level of education	–0.11	0.04	.004	–0.34	0.05	<.001	–0.18	0.06	.003
Mediation effect									
	Effect	**LL CI**	**UL CI**	**Effect**	**LL CI**	**UL CI**	**Effect**	**LL CI**	**UL CI**
Mediation effect:	**–0.002**	**–0.006**	**0.002**	**–0.006**	**–0.014**	**–0.001**	**–0.013**	**–0.023**	**–0.005**

LL CI – lower limit of 95% confidence interval. UL CI – upper limit of 95% confidence interval. Bias corrected confidence intervals for mediation effects were estimated using 5000 bootstrap samples.

Tab. 2. Coefficients and descriptives for regression models predicting values of the mediator (health condition rating) and outcome variable

of key importance. The obtained results reveal a clear picture in that regard: health condition was significantly related to the number of DK answers; however, this effect was limited to the complex questions (as predicted by Hypothesis 4). Again, the third model, predicting problems with question understanding, was essentially identical to the results observed for complex questions. These conclusions were further supported by significance of mediation effects estimated for all three models.

3.7. Health Problems and Mood as Mediators

The final series of analyses aimed at verification of Hypothesis 5. – describing relative contribution of health ratings and life satisfaction as mediators. Again all three dependent variables were successively included in the analyses. A conceptual diagram of this model is illustrated by Figure 6. Table 3. summarizes the results.

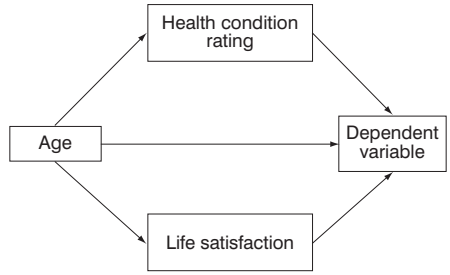

Fig. 6. Conceptual diagram of the models including mediatory effects of health condition ratings and life satisfaction (Hayes' template no 4)

Older participants declared worse health condition and lower life satisfaction. Although the size of the latter effect was much smaller, both effects were highly significant (see: top part of Table 3.). While the effects of health condition on predicted outcomes were similar to the results obtained in the previous analyses (significant influence was not present in binary questions), lower life satisfaction was related to increased probability of selecting DK answers across all outcomes. This configuration of results was also reflected in significance of the mediation effects involving both predictors (see: bottom part of Table 3.). Life satisfaction was a significant mediator of all the effects. Mediating effects of health ratings were limited to more cognitively demanding questions, but remained significant even after taking into account the influence of life satisfaction, as predicted by Hypothesis 5. Coefficients obtained by modelling problems with understanding questions as an outcome were coherent with the results observed for complex questions, including significant mediation of the age – outcome relationship through health condition ratings.

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Mediator models – linear regression									
	Health condition ratings			**Life satisfaction**					
R2	18.57%			3.53%					
	B	**SE**	**p**	**B**	**SE**	**p**			
Constant	0.00	0.01	0.848	0.00	0.02	0.974			
Age	**–0.43**	**0.01**	**<.001**	**–0.19**	**0.02**	**<.001**			
Outcome model – binary logistic regression									
Dependent variable	**Binary questions DK answers > 10%**			**Complex questions DK answers > 10%**			**Problems with understanding survey questions**		
N	3712			3712			3706		
Nargelkerke R2	3.79%			8.35%			16.14%		
	B	**SE**	**p**	**B**	**SE**	**p**	**B**	**SE**	**p**
Constant	–0.59	0.03	<.001	–1.69	0.05	<.001	–1.35	0.04	<.001
Age	0.26	0.04	<.001	0.47	0.05	<.001	0.54	0.05	<.001
Health condition rating	**–0.01**	**0.04**	**.848**	**–0.10**	**0.05**	**.039**	**–0.26**	**0.05**	**<.001**
Life satisfaction	–0.18	0.04	<.001	–0.22	0.05	<.001	–0.30	0.04	<.001
Mediation effects									
	Effect	**LL CI**	**UL CI**	**Effect**	**LL CI**	**UL CI**	**Effect**	**LL CI**	**UL CI**
Mediation: Health condition	0.003	–0.030	0.038	0.044	0.003	0.087	0.114	0.077	0.155
Mediation: Life satisfaction	**0.035**	**0.021**	**0.052**	**0.041**	**0.023**	**0.061**	**0.056**	**0.038**	**0.076**

LL CI – lower limit of 95% confidence interval. UL CI – upper limit of 95% confidence interval.

Bias corrected confidence intervals for mediation effects were estimated using 5000 samples bootstrap.

Tab. 3. Coefficients and descriptives for regression models estimating mediatory effects of health condition ratings and life satisfaction

4. Results Summary

The obtained results confirmed the predictions outlined in the introduction. The tendency to select DK answers observed among elderly respondents was significantly moderated by participants' level of education. Moderation effects were more pronounced in complex questions. Mediation models suggest that these effects might be partly explained by participants' life satisfaction level and intensity of health problems. The latter factor

played a significant role only in the case of more cognitively demanding questions. It lends some support to our claim that preference for DK answers is driven by cognitive factors, as health problems are strongly correlated with accelerated cognitive decline.

The most important limitations of the described analyses are related to the use of indirect, single-item measures of the key moderating and mediating variables. Even though the overall picture is congruent with postulated mechanisms, there are many alternative explanations to the presented results. For example, both life satisfaction and health condition might significantly influence participants' levels of motivation, leading to low involvement in the response-formation process. Although this explanation might be to some extent refuted by the last set of analysis, further studies should aim at obtaining more direct, valid, and reliable measures of participants' cognitive abilities.

In our report we focused solely on attempts to understand the emergence of DK answers, intentionally omitting an even more important issue: what is their influence on the quality of survey data obtained from elderly participants. As for the results discussed in our report, we might expect that a large number of DK answers might not only reduce reliability of measurement, but also introduce significant bias. This complex and fascinating problem has been completely overlooked in scientific literature and certainly deserves more of our attention in the future.

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