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Martyn Denscombe

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Item non-response rates: a comparison of online and paper questionnaires

Martyn Denscombe*

Department of Public Policy, De Montfort University, Leicester, UK

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Item non-response rates are a significant factor affecting the quality of questionnaire data. This article looks at the impact that the mode of administration might have on item non-response rates. Using closely matched groups of respondents (n = 466) it compares item non-response rates for near-identical versions of online and paper questionnaires. The research also analyses the difference between fixed-choice and open-ended questions in terms of their respective item non-response rates. Findings from the research indicate that the administration of questionnaires online, while it might have relatively little impact on the item non-response rates for fixed-choice questions, would seem to reduce item non-response rates where the questions are open-ended and require respondents to provide unstructured text-based answers.

Keywords: item non-response rates; online questionnaires; mode effect; open-ended questions; fixed-choice questions

With any self-administered questionnaire the quality of the data is jeopardised when respondents fail to fill-in specific items as they work their way through the list of questions. Such *item non-responses* reduce the overall volume of data and, more importantly, they leave gaps in the data that can pose a range of practical, methodological and ethical questions for the researcher. For example, in terms of quality control should all questionnaires containing item non-responses be rejected? In terms of resources, what are the implications of excluding any incomplete questionnaires? In terms of inclusivity, is there an ethical duty on the researcher to include questionnaires even when some items have not been answered? If the researcher chooses to include incomplete questionnaires, what proportion of item non-responses is acceptable within any particular questionnaire? Should certain items be treated as essential, with questionnaires being rejected if the respondent has not answered these particular questions? With online questionnaires, should researchers use the 'forced answer' option when designing the questionnaire in order to oblige the respondent to complete each item before moving on to the next, and will this encourage respondents to drop out or to provide spurious answers simply so that they can progress?

Such questions have an added significance at a time when the use of online questionnaires is replacing the use of paper questionnaires in many aspects of social research. There is little doubt that online questionnaires can have practical advantages in terms of cost saving, reduced turnaround times, more efficient data inputting and

*Email: md@dmu.ac.uk

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wider geographical coverage, but the question arises as to whether any shift to a new mode of administration might come at a price – a reduction in the quality of the data. Responding to this, there is a growing body of research on the quality of data produced by online questionnaires. Such research has tended to focus primarily on response rates; comparing response rates from online questionnaires and paper-based mailed surveys, looking at how response rates might impact on the representativeness of online samples, and investigating techniques for encouraging people to return their questionnaires (e.g. Couper 2000; Couper, Kapteyn, Schonlau, & Winter, 2007; Couper, Tourangeau, Conrad, & Crawford, 2004; Deutskens, de Ruyter, & Wetzels, 2006; Dillman, 2007; Fox, Murray & Warm, 2003; Heerwegh & Loosveldt, 2002; Heerwegh, Vanhove, Matthijs, & Loosveldt, 2005; Kaplovitz, Hadlock, & Levine, 2004; Lee, 2006; Lozar Manfreda, Bosnjak, Berzelak, Haas, & Vehovar, 2008; Lozar Manfreda, Bosnjak, Haas, & Vehovar, 2005; Lozar Manfreda, Vehovar, & Batagelj, 2001; Marcus, Bosnjak, Lindner, Pilischenko, & Schutz, 2007; Porter & Whitcomb, 2003; Ritter, Lorig, Laurent, & Matthews, 2004; Ross, Mansson, Daneback, Cooper, & Tikkanen, 2005). Some consideration has also been given to the substantive content of the answers given by respondents using contrasting modes of questionnaire administration (Denscombe, 2006; McCabe, 2004; McCabe, Boyd, Couper, Crawford, & D'Arcy, 2002; Vehovar & Lozar Manfreda, 2002). Relatively little attention, however, has been given to the matter of item non-responses and the way that online questionnaires might affect respondents' willingness to complete individual items within a questionnaire. The research that does exist tends to suggest that online questionnaires produce lower item non-response rates than their paper-based counterparts (Boyer, Olson, Calatone, & Jackson, 2002; Denscombe, 2006; Haraldsen, Dale, Dalheim, & Hrydahl, 2002; Kwak & Radler, 2002; Schaefer & Dillman, 1998; Tourangeau, Rips, & Rasinski, 2000) – but there is no unanimity on the point. Some evidence suggests that item non-response rates are actually higher in the case of online questionnaires (Lozar Manfreda et al., 2005) or that people answering online questionnaires are more likely to drop-out before they reach the end of the task than those answering paper questionnaires (Brecko & Carstens, 2006). And there are indications that any mode effect associated with the use of online/paper questionnaires might depend on the nature of the question type (Smyth, Dillman, Christian, & Stern, 2006), whether the data are qualitative or quantitative (Etter, 2002; Lozar Manfreda & Vehovar, 2002; Stangl, 2004) and whether the questions are fixed-choice or open-ended (Reja, Manfreda, Hlebec, & Vehovar, 2003).

Bearing these points in mind, the research reported in this article focuses on two things. First, it looks at the impact that the mode of questionnaire administration might have on item non-response rates. It does this through a comparison of findings from two different modes: the 'paper' mode (hard-copy format and distributed/collected by hand) and the 'online' mode (on-screen and distributed/collected via the Internet). Second, it explores item non-response rates in relation to the format of questions, in particular looking for any association between item non-response rates and three alternative types of answers: fixed-choice factual, fixed-choice opinion and open-ended text.

Methods

Data came from a survey of young people aged 15–16 years. The research, which took place in 2005, formed the latest phase of the *Perceptions of Social Issues* (PSI) project

concerned with the health-related behaviour of young people. The project focused on the use of tobacco and alcohol and the way this is associated with young people's self-identity and perceptions of risk. In this latest phase of the PSI project data collection included the use of online questionnaires in parallel with near-identical paper-based 'Optical Mark Recognition' (OMR) questionnaires. The purpose of this was to allow an assessment of any mode effect associated with the use of online questionnaires, and it is this aspect of the research that is reported in this article.

The survey involved two schools in Leicestershire, England. In each school, the survey covered all year 10 students (aged 15–16 years). The administration of the questionnaires was designed to minimise, if not eliminate, the possibility that any observed difference in responses might be caused by sample bias or by the context within which respondents completed the questionnaires. The allocation of students was done on the basis of existing class groups. The class groups were of mixed ability, were mixed sex and were of equal size. Allocation on the basis of existing class groups meant that the students themselves were not able to elect for one kind of questionnaire in preference to the other. There was a random selection of class groups to the 'online' or 'paper' mode and, although the proportion included in the online mode was limited by the number of available computer labs in each school, a reasonable balance was obtained in terms of the number of responses obtained from either mode (see Tables 1 and 2). In total there were 466 responses. Of these, approximately 40% were from the online mode ($n = 190$) and 60% were from the paper mode ($n = 276$).

At each school, the number of participants was quite similar (see Table 1); the differences were not statistically significant ($p = 0.218$). The students completing the online and paper versions of the questionnaire at each school also shared a very similar profile in terms of key demographic features such as age, sex, ethnicity and academic ability. In terms of gender, there was no statistically significant difference relating to the respondents at each school or the type of questionnaire completed (see Table 2). In school A, there were slightly more male than female respondents (male = 54.2%, female = 45.8%), whereas in school B the opposite was true (male = 46.1%, female = 53.9%). The number of non-White students in the survey was very low, and therefore no meaningful test of statistical significance could be applied relating to ethnicity. In school A, 95% of students classified themselves as White; in school B the figure was 96.5%.

Table 1. Type of questionnaire by school.

	School A	School B	Total
Paper	129 (62.6%)	147 (56.5%)	276
Online	77 (37.4%)	113 (43.5%)	190
Total	206 (100%)	260 (100%)	

Table 2. Type of questionnaire by gender.

	Male	Female	Total
Paper	137 (59.8%)	139 (59.9%)	276
Online	92 (40.2%)	93 (40.1%)	185[a]
Total	229 (100%)	232 (100%)	

[a]Five item non-responses.

The online and paper questionnaires were administered concurrently. The research was conducted during normal school hours with ample time provided for completing the questionnaire. Students were asked to complete the questionnaires as individuals and not to collaborate with one another. A member of teaching staff was present at all times but, recognising that this might potentially influence the nature of responses, the students were assured that all information would be kept confidential and not made available to the school in any way that would identify individuals as the source of specific comments. Teaching staff did not have access to the password for the online questionnaire, and all paper questionnaires were placed in sealed envelopes which were collected immediately after the session.

Students and their parents were given written notification about the research project, and were assured that they were under no obligation to complete the questionnaires, that any information they provided would be treated in the strictest confidence and that their responses were to be anonymous. Information was also supplied about who was conducting the research, the purposes for which the findings would be used, and a website address at which the general findings from the research would be made publicly available. Students and their parents were appraised of their right to withdraw from the research should they wish to do so. In the event, none of the students declined to participate and no pupils were withdrawn by parents.

The two versions of the questionnaire were designed to be as near-identical as possible. The content, the wording and the sequence of questions were identical. Visually, they adopted the same layout as far as possible. Like the paper version, the online questionnaire was monochrome – black text on white background. And although, as Beebe, Mika, Harrison, Anderson, and Fulkerson (1997, p. 162) point out, 'it may be impossible to construct an on-line questionnaire that is identical to paper-and-pencil questionnaires in terms of structural characteristics', careful tailoring of the options and facilities available within the online version made it possible to minimise the differences. The online questionnaire did not make use of pull-down menus or flash buttons and was deliberately designed using just the basic HTML radio buttons, check boxes and text boxes. The online version of the questionnaire did not make use of any pop-ups or help screens or any type of automated keyboard response that was not available with the paper version. Respondents using the online version of the questionnaire could scroll through to the previous and next questions, replicating the ability of those using the paper version to preview and revisit all parts of the questionnaire. The design of the questionnaire deliberately avoided the use of branching or skip patterns in the sequence of questions (eliminating the technical advantages potentially available in the case of online questionnaires). Importantly, too, the online version of the questionnaire did not make use of the 'forced answer' option. Online respondents were as free as their paper questionnaire counterparts to skip over questions and leave specific items in the questionnaire incomplete. Only on this basis was it possible to make a reasonable comparison between the two modes in terms of item non-responses.

Non-responses were defined as occasions when there appeared to be no attempt to provide any information at all in relation to a question. Where there was any kind of information provided, this was treated as a response to the question. Item non-response rates were calculated for the 34 items contained in the questionnaire. These comprised three different types of questions (see Table 3). Nine of the questions sought 'factual' data and offered fixed-choice options for the response. These nine questions covered things like how often the respondents used a computer at home,

Table 3. Item non-response rates.

Question	% non-response		Chi-square	p	Fisher's Exact *p*
	Paper (*n* = 276)	Online (*n* = 190)			
Fixed-choice 'factual': mean =	**2.6**	**1.8**			
Q1*	0.0	2.6	7.342	0.007	0.011
Q4	1.1	1.6	0.214	0.643	0.692
Q5*	7.2	1.6	7.704	0.006	0.005
Q6	0.4	1.1	0.838	0.360	0.570
Q9	1.4	2.1	0.287	0.592	0.721
Q10a	2.9	1.1	1.826	0.177	0.211
Q10b*	8.0	1.6	9.056	0.003	0.003
Q19*	0.0	2.6	7.342	0.007	0.011
Q21	2.2	1.6	0.210	0.647	0.744
Fixed-choice 'opinion': mean =	**2.7**	**1.5**			
Q2a	2.9	2.6	0.030	0.863	1.000
Q2b	2.2	1.1	0.839	0.360	0.481
Q2e	2.5	1.6	0.491	0.483	0.747
Q2f	2.5	2.1	0.091	0.763	1.000
Q2h	2.5	1.1	1.308	0.253	0.321
Q2i	3.3	1.6	1.269	0.260	0.375
Q2m	2.5	1.6	0.491	0.483	0.747
Q7a	4.0	1.6	2.237	0.135	0.172
Q8a	5.1	3.2	1.004	0.316	0.361
Q12a	2.2	0.5	2.065	0.151	0.249
Q12b	1.8	0.5	1.463	0.227	0.408
Q12c	1.4	0.5	0.903	0.342	0.653
Q12d	1.8	0.5	1.463	0.227	0.408
Q12e	2.9	0.5	3.344	0.067	0.090
Q12f**	3.3	0.5	4.007	0.045	0.053
Q12g	1.8	0.5	1.463	0.227	0.408
Q12h	1.8	4.2	2.388	0.122	0.154
Q12i	2.2	2.6	0.102	0.749	0.764
Q12j	1.8	1.1	0.438	0.508	0.706
Q12k	2.9	1.6	0.850	0.356	0.537
Q30a*	6.2	1.6	5.748	0.017	0.019
Open-ended: mean =	**15.1**	**6.8**			
Q7b*	21.3	8.5	6.086	0.014	0.013
Q8b*	19.9	6.6	8.010	0.005	0.005
Q30b*	14.1	7.4	5.105	0.024	0.026
Q33	5.1	4.7	0.27	0.869	1.000

*Statistically significant at $p < 0.05$ level.
**Statistically significant at $p < 0.06$ level.

how many cigarettes they smoked a week and how much spending money they had a week. Twenty-one of the questions sought 'opinion' data. These covered issues connected with body image and attitudes to risk with, for example, questions about how the young people perceived themselves, what they felt about smoking, what importance they attached to a healthy diet and how they perceived specific health risks. Four of the items consisted of open-ended questions which asked respondents to write what they thought about topics such as the risks they like or the risks they try to avoid, and their thoughts on publicity campaigns for healthy diets. The responses to these open-ended questions were entered into text boxes whose dimensions were the same on both online and paper versions. This is important because, as Dillman (2007, p. 493) notes, 'the size of open-ended spaces sets expectations for how much information respondents provide to open-ended questions'. The initial expectation for both online and paper versions, therefore, was designed to be the same. Online respondents could expand the size of the box if necessary; those answering the paper version of the questionnaire could continue their answer outside the box if they required.

Findings

There are four main findings from the research. First, there was some evidence suggesting that *item non-response rates might be slightly lower for the online version of the questionnaire*. As Table 3 indicates, this was the case with 27 out of the 34 items and the mean non-response rate was lower for online questionnaires with all three types of questions. In the case of fixed-choice factual questions it was on average 0.8% lower (paper = 2.6%, online = 1.8%), with fixed-choice opinion questions the mean was 1.2% lower (paper = 2.7%, online = 1.5%) and with open-ended questions it was 8.3% lower (paper = 15.1%, online = 6.8%). It should be borne in mind, however, that only on seven occasions could the difference be considered statistically significant, and it should also be recognised that there were some items where the paper questionnaires actually produced a lower item non-response rate than the online version ($n = 7$). On two such occasions, the difference was statistically significant. So, although there was some *prima facia* evidence for a mode effect, it should not be considered to be conclusive on the point.

The second finding is that *fixed-choice questions tended to produce a lower item non-response rate than open-ended questions*. As Table 3 shows, the mean non-response rates were markedly different, with the fixed-choice questions ranging between 1.5% to 2.7% in terms of non-responses compared with 6.8–15.1% for the online questionnaires. Two items (Q1 and Q19), both fixed-choice/factual types of questions, were completed by all respondents using the paper version of the questionnaire. At the other end of the spectrum, the highest item non-response rate was for one of the open-ended questions (Q8b) on the paper version of the questionnaire. Looking at the *range* of item non-response rates (Table 4), it appears that the tendency for fixed-choice questions to produce lower item non-response rates was true for both online and paper versions of the questionnaire.

The third finding is that the *difference in item non-response rates between modes was larger in the case of open-ended items than it was for fixed-choice items*. The point underlying this is that the mode effect did not affect each type of question to the same extent. In general, it was more evident with open-ended questions than it was with the fixed-choice questions. As Table 3 shows, the mode effect was least in

Table 4. Range of item non-response rates.

		Questionnaire mode	
Type of question	Type of data	Paper (%)	Online (%)
Fixed-choice, factual	Numeric	0.0–8.0	1.1–2.6
Fixed-choice, opinion	Numeric	1.4–6.2	0.5–4.2
Open-ended, opinion	Text	5.1–19.9	4.7–8.5

evidence in relation to the nine questions that were *fixed-choice* and *factual* where the difference in means was 0.8% (paper = 2.6%, online = 1.8%). Item non-response rates were lower for the online version of the questionnaire in just four instances, and the difference was statistically significant in two cases (Q5 and Q10b) but not in the others (Q10a and Q21). With the other five *fixed-choice* and *factual* questions, it was actually the paper version of the questionnaire that produced lower item non-response rates. In two cases the amount of difference achieved statistical significance (Q1 and Q19); in three cases it did not (Q4, Q6 and Q9).

A mode effect was slightly more in evidence in relation to the 21 questions that were *fixed-choice* and *opinion*. Item non-response rates were lower for the online version of the questionnaire in 19 out of 21 cases and the difference in means was 1.2% (paper = 2.7%, online = 1.5%). Even here, though, the pattern was not as strong as it might at first appear. Only in 2 cases out of the 19 was the difference statistically significant (Q30a at the $p < 0.05$ level and Q12f at the $p < 0.06$ level), and there were two contradictory instances where the paper version of the questionnaire produced a lower item non-response rate – although in neither case was the difference statistically significant (Q12h and Q12i).

The disparity between modes was more evident in relation to the four questions where respondents were asked to provide answers in their own words in text boxes. For these *open-ended* questions, the difference between the means was 8.3% (paper = 15.1%, online = 6.8%) and there was a substantially lower item non-response rate for the online version of the questionnaire for all of the four items. The difference was statistically significant at the $p < 0.05$ level for three of the four items (Q7b, Q8b and Q30b). Following from this, the fourth finding is that *the item non-response rate for open-ended questions was notably lower for the online version of the questionnaire*.

Discussion

The research design went some way towards achieving a comparison based on near-identical groups responding to near-identical questionnaires delivered in two different modes. It met all eight 'necessary features' for the valid comparison of mode effects identified by Holbrook, Green, and Krosnick (2003) with the possible caveat that the context for the delivery of the questionnaires differed slightly – the paper questionnaires being administered in normal classrooms and the online questionnaires being administered in computer labs. The research took advantage of the possibility afforded by school-based surveys to administer questionnaires to cohorts of respondents (e.g. classes or year groups). Although this raises some issues relating to privacy (Beebe, Harrison, Park, McRae, & Evans, 2006) and to the voluntary nature of responses (Denscombe & Aubrook, 1992), it provides distinct advantages

in terms of the controls it offers. Findings from the survey confirmed that the use of class groups as the basis for the allocation of respondents worked well with those answering online questionnaires and those answering paper questionnaires being closely matched in terms of key personal attributes such as ability, sex, age and familiarity with computers.

Taken as a whole, the findings could be interpreted as corroborating other recent research which has concluded that the online mode of administration produces lower item non-response rates than its paper-based counterpart (e.g. Boyer et al., 2002; Etter, 2002; Haraldsen et al., 2002; Kwak & Radler, 2002; Tourangeau et al., 2000). However, there are three caveats to this conclusion. First, statistically speaking evidence for the trend is not conclusive; on most occasions the mode effect did not achieve conventional levels of statistical significance. Second, the evidence did not indicate that online questionnaires achieved a lower item non-response rate on all occasions. There were instances where things worked in the opposite direction, with the paper version of the questionnaire getting a lower item non-response rate. Third, the mode effect appeared to differ according to the type of answer being sought by the questionnaire. The mode effect was more pronounced in relation to open-ended items than it was to fixed-choice items. So, rather than suggesting simply that online questionnaires produce lower item non-response rates, a more accurate conclusion would be that, compared with paper-based questionnaires – the administration of questionnaires online tends to produce lower item non-response rates where the questions are open-ended and require respondents to provide unstructured text-based answers online, but it has relatively little impact on the item non-response rates for fixed-choice question.

This finding invites some speculation about the reasons for the lower item non-completion rates for open-ended questions delivered online. One factor that might have been associated with item non-response rates was gender. In findings from the PSI project reported elsewhere (Denscombe, 2007) it was shown that gender was a significant factor in terms of the length of answers provided to open-ended questions. Girls tended to provide longer answers than boys. In terms of item non-completions, however, there was nothing in the PSI data to suggest that gender was a crucial variable. There were no statistically significant differences (using chi-square) with any of the categories of question – fixed-choice (factual), fixed-choice (opinion) or open-ended questions. Nor did gender feature prominently in the variables tested through multiple regression analysis. Multiple regression analysis, in fact, indicated that two other variables were much more likely to be associated with item non-response rates, specifically

- familiarity with personal computers, and
- educational aspirations.

Both of these factors can be linked to the notion of *respondent burden*. The more effort a respondent needs to put into answering a question the less likely he/she is to complete the item (unless there are compensating rewards). Familiarity with the computers and the Internet has been found to increase the response rate for online questionnaires (Ranchhod & Zhou, 2001) and the logic is that those who are routine computer users will find online questionnaires less of a burden to answer than those who use computers and the Internet less frequently. And when it comes to completing open-ended questions, those young people whose familiarity with the Internet incorporates the use of social networking sites and blogs might be expected to feel all the

more comfortable with the physical (keyboard skills) and emotional aspects of expressing ideas and feelings online in a text-based format.

Educational aspirations, likewise, can be seen as a factor that has a bearing on the respondent burden. The students in the PSI survey were asked to state the age at which they anticipated leaving full-time education (16+, 18+, 21+), and multiple regression analysis pointed to a link between this variable and item non-completions. The item non-response rate was consistently lower for those expressing the intention to leave full-time education at 21+ compared with 18+, and likewise at 18+ compared with 16+. And the difference was more pronounced in relation to open-ended questions with those intending to leave education later being less likely to 'non-respond' to questions. There was a statistically significant relationship between educational intentions and item non-response rates for all four of the open-ended questions, whereas this was true for 11 of the 21 fixed-choice opinion questions and just two of the nine fixed-choice factual questions. A possible explanation for this pattern of item non-completions could be that that those who were more educationally 'ambitious' might be more able and willing to articulate text-based answers and generally more comfortable with the demands of open-ended questions. Their literacy skills might be better than those intending to leave education earlier with the consequence that they experience less of a burden in composing a response to an open-ended question.

Conclusion

Findings from this study provide some reassurance for social researchers in relation to the use of online surveys in the sense that they do not identify any troubling disparity in item non-completion rates between online and paper modes of administration. Social researchers, in effect, do not need to face the prospect of sacrificing the quality of data (in the form higher item non-completion rates) if they chose to administer their questionnaires online.

The findings from this study also provide some positive encouragement for the use of online questionnaires in social research. Partly, this is because they provide grounds for optimism that online questionnaires might possibly produce lower item non-response rates than their paper counterparts. Mainly, however, it is because there would seem to be particular benefits to be gained from online questionnaires when it comes to the use of open-ended questions. Perhaps because entering text is less burdensome, *the administration of questionnaires online would appear to produce lower item non-response rates where the questions are open-ended*. This is encouraging in terms of the use of online surveys for capturing text-based data. It means that not only can qualitative researchers take advantage of online survey software and CAQDAS, making it easier to download and analyse text data from online surveys, but there is also evidence of some greater willingness of respondents to complete open-ended questions online and to express their thoughts and feelings through an online technology.

Notes on contributor

Martyn Denscombe is Professor of Social Research at De Montfort University, England. He is the author of '*The Good Research Guide*' and '*Ground Rules for Good Research*' (both published by Open University Press) and his latest research involves an investigation of risk perception and health-related behaviour of young people.

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