Personality, Health and Lifestyle in a Questionnaire Family Study: A Comparison Between Highly Cooperative and Less Cooperative Families

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The effect of nonresponse on health and lifestyle measures has received extensive study, showing at most relatively modest effects. Nonresponse bias with respect to personality has been less thoroughly investigated. The present study uses data from responding individuals as a proxy for the missing data of their nonresponding family members to examine the presence of nonresponse bias for personality traits and disorders as well as health and lifestyle traits. We looked at the Big Five personality traits, borderline personality disorder (BPD) features, attention-deficit/hyperactivity disorder, Anger, and several measures of health (Body Mass Index, migraine) and lifestyle (smoking, alcohol use). In general, outcomes tend to be slightly more favorable for individuals from highly cooperative families compared to individuals from less cooperative families. The only significant difference was found for BPD features ($p = .001$). However, the absolute difference in mean scores is very small, less than 1 point for a scale ranging from 0 to 72. In conclusion, survey data on personality, health and lifestyle are relatively unbiased with respect to nonresponse.

If nonresponse influences data collected in survey research, this may seriously limit the validity of the findings. As such, nonresponse has received much attention and several methods have been used to estimate nonresponse bias in population studies. In some studies, respondents and nonrespondents were compared with respect to information that was already available, using data from official population statistics registers or health insurance databases (Bergstrand et al., 1983; Etter & Perneger, 1997; Reijneveld & Stronks, 1999; van den Berg et al., 2006). In other studies, nonrespondents were contacted by telephone or reply card to obtain information on the characteristics of interest. This information was used to estimate nonresponse bias (Hill et al., 1997; Korkeila et al., 2001; Vink et al., 2004). Longitudinal studies also provide information on differences between nonrespondents and respondents. In some cases, nonrespondents in a follow-up study can be characterized using information obtained at the beginning of the study (Eerola et al., 2005; Heath et al., 2001; Van Loon et al., 2003). Vink and colleagues (2004) proposed an additional method to study nonresponse bias in family samples. When a trait has a familial component, a possible nonresponse bias can be estimated by using data from respondents as a proxy for the missing data of their nonresponding family members. Data from highly cooperative families (i.e., many invited family members participate) are compared to data provided by the participating members of less cooperative families (i.e., few invited family members participate). A difference between these two groups indicates a possible nonresponse bias.

These various study designs tend to show that nonrespondents smoke more often and drink more alcohol (Barchielli & Balzi, 2002; Heath et al., 2001; Hill et al., 1997; Kotaniemi et al., 2001; Macera et al., 1990; Van Loon et al., 2003). Also, nonrespondents tend to be less educated, more often divorced or widowed, have lower annual incomes, and a lower socioeconomic status (Barchielli & Balzi, 2002; Goyder et al., 2002; Korkeila et al., 2001). In most studies, no differences between respondents and nonrespondents were found for

body mass index (BMI), major depression and social anxiety (Eerola et al., 2005; Korkeila et al., 2001). Vink et al. (2004), however, found an effect for anxious depression. In conclusion, nonresponse has been found to influence a variety of traits, but in general the effects were small.

Nonresponse bias with respect to personality has been less extensively investigated than lifestyle variables such as smoking behavior and alcohol use. The few studies that examined the effect of nonresponse on personality focused on the Big Five personality traits. Dollinger and Leong (1993) investigated differences in personality between individuals who volunteered to be followed up in longitudinal research and individuals who did not. They found volunteers to be more agreeable, more open to experiences and a little more extraverted. Rogelberg et al. (2003) showed that respondents were more agreeable and more conscientious than nonrespondents. These results suggest that nonresponse may be associated with personality as well as with lifestyle and other demographic factors. It is not unlikely that individuals with high scores on personality traits such as impulsivity, affective instability, relationship problems and identity problems, which are the core features of borderline personality disorder (BPD; American Psychiatric Association, 2000), are less

likely to complete a survey. If this is true, nonrespondents will exhibit more BPD features, resulting in an underrepresentation of individuals with BPD features in the study sample.

It is particularly important to quantify the effect of response bias in much needed population based studies of personality and mental health. Most studies on personality and other mental health variables utilize clinical samples, but although clinical samples are very important, for example in characterizing the syndromes of a disorder and evaluating treatment programs, there are also some limitations. Clinical samples are always biased to some degree and not representative of the disorder as it appears in the community. In clinical settings, the most severe cases (the individuals seeking treatment) are more likely to be selected in a study sample. Thus while clinical studies tend to sample the most severe cases, nonresponse bias might cause affected individuals to be underrepresented in population studies.

In the present article we describe data from a Dutch family study on personality, health, and lifestyle and compare data on family members from highly cooperative and less cooperative families (Vink et al., 2004) to investigate to what extent nonresponse bias affects questionnaire data on personality.
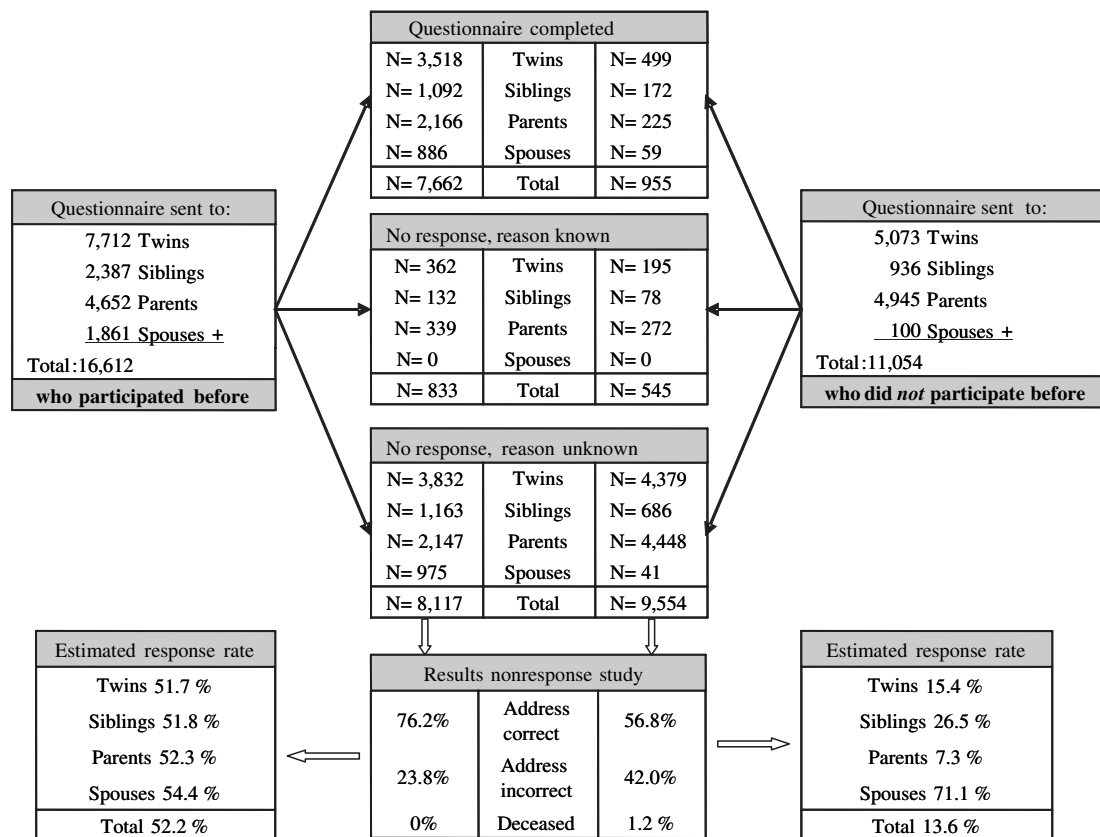

Figure 1

Overview of the number of participants in the study. The left side of the figure depicts the number of invited individuals who participated before and the right side depicts the number of invited individuals who did not participate before.

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Methods

Participants

This study is part of an ongoing study on personality, health and lifestyle in twin families registered with the Netherlands Twin Register (NTR; Boomsma et al., 2006). Surveys on personality, health and lifestyle were sent to the twin families every 2 to 3 years. For the present study data from the 2004 to 2005 survey were used. Twins and their siblings, parents and spouses were contacted by mail and invited to complete a survey which was enclosed with the letter. Questionnaires were sent to 27,666 individuals from 7036 families. The average number of family members in the families that were invited to complete a questionnaire was 3.9 (SD = 1.6).

Figure 1 shows an overview of the number of participants and the response rates in the study. The figure is subdivided into two groups; individuals who participated before (left side) and individuals who did not participate before (right side). Of those 16,612 individuals who participated at least once before in a study of the NTR, 7662 individuals (46.1%) returned the questionnaire. Of those who were sent the questionnaires, 11,054 had never before participated in NTR research, because they never returned a questionnaire or because they registered only recently and therefore were invited to complete a questionnaire for the first time. In this group 955 (8.6%) individuals completed the questionnaire. A group of 1378 individuals informed us after they received the invitation that they were not willing to participate for various reasons (e.g., death of co-twin, illness, lack of time, lack of interest). For the remaining nonrespondents reasons for not participating are unknown. Part of the invited individuals did not actively register but were recruited in 1991 by contacting city councils in the Netherlands for the addresses of twins. It is therefore plausible that some of these individuals received the invitation but were unwilling to participate. Others, however, might not have received the invitation because they moved to a different address without informing the NTR. We therefore contacted a subgroup of each of the two groups of nonrespondents for which the reason for nonresponse was unknown (those who participated at least once before [n = 8117] and those who never participated [n = 9554, see Figure 1]) by telephone and asked whether they received the questionnaire and what their reason was for not participating. Addresses were incorrect in 23.8% and 42.0% of the two groups, respectively. In other words, a substantial group of targeted participants never received the questionnaire. After adjusting for these estimated rates of incorrect addresses by subtracting the number of incorrect addresses from the number of sent questionnaires, the estimated 'true' response rates for the two groups were 52.2% and 13.6%, respectively.

Measures

Personality Related Traits

Borderline personality disorder features. BPD features were measured using the Personality Assessment Inventory-Borderline Features scale (PAI-BOR; Morey, 1991). The PAI-BOR consists of 24 items that are rated on a 4-point scale (0 to 3; *false, slightly true, mainly true, very true*). The items were scored according to Morey's test manual (Morey, 1991), which states that at least 80% of the items must have been completed to calculate a sum score and that missing and ambiguous answers should be substituted by a zero score. The English PAI-BOR was translated into Dutch and then translated back into English by a native English speaking translator. This translation was reviewed and approved by the test author and publishing company (Psychological Assessment Resources). Because the data showed a somewhat right-skewed distribution, a square root data transformation was performed.

ADHD. The Conners' Adult ADHD Rating Scales (CAARS; Conners et al., 1999) was used to assess attention-deficit/hyperactivity disorder (ADHD). In this study, the subscales Inattentive and Hyperactive/Impulsive were used.

Big Five personality traits. The personality dimensions Neuroticism, Extraversion, Openness, Altruism and Conscientiousness were assessed using the NEO Five-Factor Inventory (NEO-FFI), which is the shortened version of the Revised NEO Personality Inventory (NEO-PI-R) developed by Costa and McCrae (1992).

Anger. Anger was measured using the Dutch adaptation of Spielberger's State-Trait Anger Scale (STAS; Spielberger et al., 1983; van der Ploeg et al., 1982). The trait version of the anger scale was administered, which measures how frequently an individual experiences state anger over time and in response to a variety of situations.

Health and Lifestyle

Body Mass Index. BMI was calculated from self-reported height and weight using the formula: weight in kg/(height in m²).

Smoking. From the questions 'Have you ever smoked?' (no/a few times to try/yes), and 'How often do you smoke at present?' (I have quit smoking since .../once a week or less/several times a week but not daily/daily), lifetime and current smoking status were determined. Lifetime smoking status was coded as 'smoked' (yes) versus 'never smoked' (no/a few times to try). Current smoking status was coded as 'non-smoker' (never smoked/a few times to try/quit smoking) versus 'smoker' (once a week or less/several times a week but not daily/daily).

Alcohol use. Regular alcohol use was determined by asking participants how often they used alcohol (I don't drink alcohol/once a year or less/a few times a

Table 1

Means (*SD*) and Prevalences of Personality, Health and Lifetime Variables for Males and Females from Less Cooperative Families and Highly Cooperative Families

	Males		Females		Significance of cooperativeness*	
	L *n* = 1659	H *n* = 1675	L *n* = 2840	H *n* = 2443	$F_{(df1, df2)}$	*p*
PAI-BOD (BPD)	14.65 (±7.62)	13.89 (±7.29)	16.60 (±8.22)	15.96 (±8.03)	10.82 $_{(1, 3264)}$	.001
CAARS-Inattentive	6.07 (±3.51)	6.11 (±3.38)	6.09 (±3.39)	5.82 (±3.32)	2.86 $_{(1, 3231)}$	.091
CAARS-Hyperactive/impulsive	7.17 (±3.24)	7.01 (±3.22)	7.30 (±3.24)	7.02 (±3.11)	7.99 $_{(1, 3231)}$	.005
NEO-Neuroticism	27.97 (±6.77)	27.34 (±6.61)	31.01 (±7.37)	30.86 (±7.25)	3.46 $_{(1, 3245)}$	.063
NEO-Extraversion	41.12 (±5.89)	41.08 (±6.01)	41.40 (±5.98)	41.18 (±5.89)	0.24 $_{(1, 3245)}$	.624
NEO-Openness	36.53 (±5.88)	36.40 (±5.85)	37.14 (±5.62)	36.96 (±5.52)	0.70 $_{(1, 3245)}$	.404
NEO-Altruism	42.82 (±4.68)	42.89 (±4.72)	45.53 (±4.57)	45.61 (±4.45)	0.53 $_{(1, 3245)}$	.466
NEO-Conscientiousness	44.79 (±5.28)	44.97 (±5.24)	44.91 (±5.11)	45.30 (±5.03)	6.11 $_{(1, 3245)}$	.014
STAS-Anger	15.00 (±3.83)	14.83 (±3.79)	15.32 (±3.83)	15.13 (±3.74)	3.31 $_{(1, 3266)}$	.069
Body Mass Index	25.00 (±3.20)	24.90 (±3.22)	24.08 (±4.01)	23.95 (±3.92)	3.16 $_{(1, 3253)}$	.075
					$\chi^2_{(1)}$	*p*
% lifetime smoking	58.3	54.8	47.0	45.0	6.92	.009
% current smoking	25.7	22.3	20.0	18.9	3.24	.072
% regular alcohol use	61.9	64.6	37.2	38.4	0.84	.360
% potential alcohol problem	14.3	12.9	6.3	7.8	0.21	.646
% migraine	4.5	3.8	13.6	14.2	0.04	.846
% good to excellent health	84.8	87.6	84.8	84.8	3.35	.067

Note: L = individuals from less cooperative families, H = individuals from highly cooperative families. Means and standard deviations are presented for continuous variables and prevalences for categorical variables. Range of scales: PAI-BPD 0-72, CAARS 0-27, NEO 12-60, STAS 10-40.*Comparisons are significant if $p < .004$ (Bonferroni correction) and corrected for age and sex.

year/about once a month/a few times a month/once a week/several times a week/daily). 'Several times a week' or more was treated as 'regular alcohol use'. Also included in the survey were four items which together constitute the CAGE, a questionnaire designed to screen for possible alcohol problems (Ewing, 1984). Participants positive for two or more CAGE-items were classified as potentially having alcohol problems.

Migraine. Participants who screened positive for the question 'Do you ever experience headache attacks, for instance migraine?' answered a series of follow-up questions concerning the characteristics of their headaches (frequency, duration, pulsating quality, pain intensity, aggravation by physical activity, and accompanying nausea and photo- or phonophobia). Based on this detailed symptom information a migraine diagnosis consistent with the International Headache Society criteria for migraine could be obtained (Headache Classification Committee of the International Headache Society, 2004).

Perceived health. Participants were asked to rate their general health on a 5-point scale (*poor, fair, reasonable, good, excellent*). This variable was dichotomised to 'good' (*good, excellent*) and 'not good' (*poor, fair, reasonable*).

Data Analyses

Families in which at least one person completed the questionnaire were selected and categorized as highly cooperative families and less cooperative families, based on the percentage of invited family members that completed the questionnaire. When less than 80% of the invited family members completed the questionnaire, the family was considered a 'less cooperative family' and when 80 % or more of the family members completed the questionnaire the family was considered a 'highly cooperative family'. The dataset contained 4499 participants from less cooperative families in which the mean percentage of participating individuals per family was 53% and 4118 participants from highly cooperative families in which the mean percentage of participating individuals per family was 94%. Multiple regression (continuous measures) and logistic regression analyses (categorical measures) were carried out in STATA 9.2 (StataCorp, College Station, Texas, USA) to determine the association between family cooperativeness and our selection of personality, health, and lifestyle variables, taking age and sex into account. Dummy coding was used for sex (0 = male, 1 = female) and family cooperativeness (0 = less cooperative, 1 = highly cooperative). Age was included in the analyses as a covariate. STATA's 'robust cluster' option was used to account for the nonindependence of family members. All other statistical analyses were performed in SPSS 13.0 for windows.

Since the traits of interest are not independent of each other PRELIS 2.45s (Joreskog & Sorbom, 1993) was used to compute a correlation matrix of Pearson,

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polychoric and polyserial correlations for the 16 variables. We then estimated the equivalent number of measured independent traits using the matSpD interface (http://genepi.qimr.edu.au/general/daleN/matSpD; Nyholt, 2004; Li & Ji, 2005). This analysis showed that the original 16 variables correspond to approximately 13 independent traits. To correct for multiple testing and to determine the significance of the results Bonferroni correction was applied by dividing the significance level by the number of independent traits. A p value of $.05/13 = .004$ was considered significant.

Results

Mean values and prevalence of the various health, lifestyle and personality variables for individuals from highly and less cooperative families are shown in Table 1, as well as the results of the regression analyses. Individuals from highly cooperative families generally seem to have slightly more favorable outcomes than individuals from less cooperative families, but with the exception of BPD features, differences are not significant. Although BPD features are significantly more present in less cooperative families, the difference in BPD features between less cooperative and highly cooperative families is very small (0.76 point for males and 0.64 point for females), especially when considering the broad range of possible scores (0–72).

Discussion

In the present study, the response bias for several personality traits was investigated in a Dutch family sample. To examine whether nonresponse was trait-specific we also determined the response bias for several health and lifestyle measures. As expected, the participating members of less cooperative families showed somewhat higher scores on the PAI-BOR scale, suggesting nonresponse will be higher among subjects with more BPD features. However, the difference between people from less cooperative and highly cooperative families was relatively small, with a mean difference of less than 1 point (on a scale ranging from 0 to 72). This indicates that although the difference is statistically significant, its practical importance should not be overestimated. For some of the other measures, such as lifetime and current smoking, a similar trend was observed, with subjects from highly cooperative families having slightly more favorable outcomes, consistent with previous reports on smoking behavior. However, differences were very small; after correcting for multiple testing, none of these effects remained significant.

To examine whether our cut-off criterion of 80% family participation influenced our results we also examined 60%, 70% and 90% cut-off criteria. This did not significantly change the results.

Clearly, data from the relatives of nonrespondents are only an approximation of the true values in the group of nonrespondents; the outcomes of nonrespondents may be less favorable than the outcomes of their participating relatives. However, considering the minor differences between participants from highly cooperative and less cooperative families, the true effect is not expected to be substantial. In conclusion, these results confirm previous findings that questionnaire data on personality, health and lifestyle are relatively unbiased with respect to nonresponse.

Acknowledgments

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