

Applying Motivation Theory to Achieve Increased Response Rates, Respondent Satisfaction and Data Quality

*Marika Wenemark^{1,2}, Andreas Persson³, Helle Noorlind Brage², Tommy Svensson^{4,5},
and Margareta Kristenson^{1,2}*

Response rates to surveys are declining in most countries. Attempts to persuade or pressure sample persons to increase response might be counter-productive in the longterm because they can negatively affect attitudes towards future surveys. Targeting respondents' own motivation to participate in surveys is an alternative approach to achieving higher response rates. Self-Determination Theory provides a theoretical framework for how intrinsic motivation can be stimulated. We used Self-Determination Theory as inspiration to redesign a self-administered health-related survey. Two versions of the questionnaire and two data collection methods were used in an experimental design. Effects were measured in terms of response rates, respondent satisfaction and data quality. The results suggest that it is possible to improve response rates in a way that also promotes data quality and positive experiences for the respondents.

Key words: Survey design; respondent motivation; Self-Determination Theory; intrinsic motivation; questionnaire.

1. Introduction

Survey data provide valuable information for governments, institutions, establishments and citizens. Hence surveys play an important role in modern society. However, response rates to surveys are declining in many countries (De Leeuw and De Heer 2002). Although the response rates are only weak indicators of the magnitude of nonresponse bias, nonresponse nevertheless can have severe consequences in terms of biased and nonrepresentative information (Dillman et al. 2002; Ekholm et al. 2009). In addition, the response rate is often perceived as an important indicator of the quality of the survey. Therefore high response rates are also important for the image of individual survey organizations and surveys in general (Biemer and Lyberg 2003). Thus, declining response rates are a challenging problem for survey researchers and practitioners.

¹ Division of Community Medicine, Department of Medicine and Health Sciences, Linköping University, Linköping, Sweden. Emails: marika.wenemark@lio.se and margareta.kristenson@liu.se

² Centre for Public Health Sciences, Östergötland County Council, Linköping, Sweden.

³ Statistics Sweden, Örebro, Sweden. Email: andreas.persson@scb.se

The views expressed here are those of the authors and do not necessarily reflect those of Statistics Sweden.

⁴ Division of Sociology, Department of Behavioural Sciences and Learning, Linköping University, Sweden. Email: tommy.svensson@liu.se

⁵ Nordic School of Public Health, Göteborg, Sweden. Email: tommy.svensson@liu.se

Acknowledgments: We would like to thank the staff at the Centre for Public Health Sciences, Östergötland County Council, who made this study possible. We are also grateful to all our respondents who contributed with their time and effort.

Those involved in survey design have tried to counter the declining response rates in different ways. One line of research has investigated how psychological mechanisms can foster compliance with the survey task (Cialdini 1984; Groves and Couper 1998; Biemer and Lyberg 2003). Cialdini (1984) proposed six psychological factors that can facilitate survey participation: norms of reciprocity, social validation, authority, scarcity, liking and consistency in behaviour and attitudes. Several of these factors have been investigated in many studies. For example, studies have shown that sending prepaid incentives, thus activating the norm of reciprocity, increases survey participation in various kinds of mail surveys (Groves et al. 1992; Church 1993; Edwards et al. 2005). Similarly, according to the literature, response rates should increase when the opportunity to participate is presented as scarce (Groves et al. 1992), when the survey organization is perceived as an authority (Groves et al. 1992) and when a norm has been established that most people participate in the survey (Groves and Couper 1998; Biemer and Lyberg 2003).

A related line of research has focused on strategies for more directly and overtly persuading sample persons to participate by, for instance the use of additional reminders (Dijkstra and Smit 2002; Martin and Marker 2007). However, there has been concern that reluctant respondents may provide data of lower quality (Cannell et al. 1981; De Rada 2005; Olson 2006). Curtin et al. (2005) further concluded that efforts to increase response rates have been successful just in preventing further decline and that the effects lasted very briefly; the trend of declining response rates presents a pessimistic view of the future. In addition, recent research suggests that attempts to persuade or pressure people to respond might be counter-productive in the long term because they can negatively affect attitudes towards future surveys (Bergman and Brage 2008). Thus, even though persuasion and compliance strategies can increase the response rates in specific surveys, they do not seem to offer a long-term solution to the problem.

Targeting respondents' own motivation to participate in surveys is an alternative approach to achieving higher response rates. Motivation is a broad area of research in psychology and it includes several different theoretical frameworks. One is Self-Determination Theory (SDT) (Deci and Ryan 1985). To our knowledge, SDT has not been applied to survey research. The question, then, is: can SDT provide a theoretical foundation for the design of surveys with both improved response rates and positive experiences among respondents?

The objective of this study was to evaluate the effects of using SDT as an inspiration in survey design. The overall goal was to evaluate the potential effects of a set of SDT-inspired factors. Effects were measured in terms of response rates, respondent satisfaction and data quality.

2. Theoretical Background

2.1. Self-Determination Theory (STD)

According to SDT, motivation can vary not only in strength but also in orientation (Ryan and Deci 2000a,b). Motivation can vary from amotivation to intrinsic motivation, depending on to what extent the behaviour is self-determined. Amotivated persons see no value in the task they are asked to do, feel forced to do it or do not believe they are

competent enough to do it. A person with controlled extrinsic motivation complies with the request to get an external reward or to avoid negative feedback, such as embarrassment. An autonomous extrinsically motivated person performs a task because of its long-term value to society or to himself/herself, whereas an intrinsically motivated person acts because the task itself is enjoyable and interesting. The distinction between controlled and autonomous motivation is central in SDT. Controlled behaviour is associated with the experience of pressure to feel or act in a certain way, which may lead to anxiety and tension. Autonomous motivation includes autonomous extrinsic and intrinsic motivation. Autonomous behaviours are associated with experiences of volition and self-endorsement of the task and may lead to excitement, interest and enjoyment (Deci and Ryan 2000, 2008). Behaviours that are autonomous and driven by the individual's own interest have been shown to yield stronger commitment and persistence, better output and more positive experiences than those aiming at obtaining a separate reward (Deci and Ryan 2000). Intrinsic motivation is, therefore, regarded as superior to extrinsic motivation. This suggests that survey researchers should aim to enhance autonomous and intrinsic motivation to get respondents who commit to the task and who get positive experiences from their participation. Figure 1 shows a simplified model of Self-Determination Theory applied to survey participation.

Previous research has investigated which environmental factors increase or decrease intrinsic motivation. The ideas are outlined in Cognitive Evaluation Theory (a subtheory of Self-Determination Theory), which stresses three factors that facilitate intrinsic motivation: competence, autonomy and relatedness (Deci and Ryan 1980, 1985). These three factors are seen as innate psychological needs that guide behaviour. The sense of autonomy involves to what extent the individual feels in control of events that affect him/her. That is, whether the individual perceives the activity as self-endorsed or attributes it to external control factors such as coercion and persuasion (Ryan and Deci 2000a).

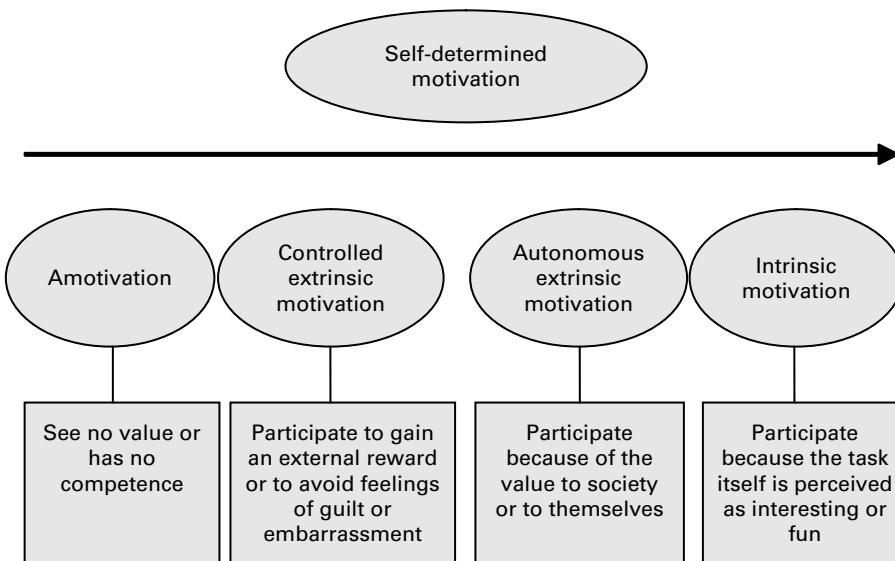


Fig. 1. A simplified model of motivation according to Self-Determination Theory applied to survey participation (Wenemark 2010)

As such, factors that shift the perception from being autonomous to being controlled should decrease intrinsic motivation. In line with this, previous research shows that pressuring language (Reeve and Deci 1996), deadlines (Amabile et al. 1976), directives (Koestner et al. 1984) and competition (Reeve and Deci 1996) reduce intrinsic motivation whereas perceived choice (Zuckerman et al. 1978) increases intrinsic motivation. Thus a sense of autonomy is important when it comes to facilitating intrinsic motivation.

The sense of competence involves whether the individual feels competent to handle or succeed at the task. That is, tasks that are an optimal challenge and that provide positive, rather than negative, feedback are predicted to facilitate intrinsic motivation (Ryan and Deci 2000b). Studies that vary types of feedback on tasks confirm this (Ryan and Deci 2000a), also that the link between feedback and motivation is mediated by perceived competence (Vallerand and Reid 1984) or autonomy (Reeve and Deci 1996).

Intrinsic motivation has been operationally defined in different ways in previous research. In experimental and observational studies it has often been measured by the amount of time an individual spends on a task in the absence of external rewards and by self-reports on interest in and enjoyment of the task (Ryan and Deci 2000b). The Intrinsic Motivation Inventory (IMI) is a scale that has been developed to measure experiences of performing a task. It includes questions about satisfaction with autonomy, perceived competence, relatedness, value/usefulness, effort/importance, interest/enjoyment and pressure/tension (Intrinsic Motivation Inventory (IMI); McAuley et al. 1989).

SDT has been applied and empirically supported in several areas of research, one of them being education (Lin et al. 2003; Niemiec and Ryan 2009). In a classroom setting the students' sense of autonomy is supported by the teacher stimulating choice in the activities while avoiding all forms of coercion (Niemiec and Ryan 2009). Research shows that students' perceived competence will increase through optimally challenging activities which it is possible for them to master as well as feedback that promote success (Niemiec and Ryan 2009). Relatedness is associated with students' feeling that the teacher likes, respects and values them. SDT has also been applied to sports (Gillet et al. 2009; Podlog and Eklund 2009), leisure activities (Watts and Caldwell 2008; Wilson et al. 2008) and medicine (Williams et al. 2006).

2.2. *Motivation in Survey Research*

Researchers have suggested different ways to measure public opinion about surveys (Goyder 1986; Rogelberg et al. 2001; Stocké 2006; Loosveldt and Storms 2008). Hox et al. (1995) distinguish between general attitudes to surveys and attitudes to a specific survey. The leverage-salency theory for survey participation suggests that each sample person has individual weights for different aspects in the survey request and that these weights, together with how salient they are in the request, influence the decision to participate or not (Groves et al. 2000). The purpose of the leverage-salience theory is, like other participation theories, to explain the sample person's decision to participate or not. Several of the factors included in participation theories and measures of attitudes to surveys are similar to aspects of SDT, such as task value and task enjoyment. SDT, however, provides a framework for motivation not only to agree to perform a task (participation) but also to become committed to the task and to performing it well. In this study, SDT is used not only

to increase survey participation but also to make the survey task a more interesting and enjoyable experience which may have a positive effect on future survey participation.

Previous survey research has also emphasized the role of motivation to avoid satisficing (Krosnick 1991) and perceived respondent burden (Hedlin et al. 2008). Smyth et al. (2009) found that data quality in open-ended questions improved when clarifying and motivating instructions were used. Cannell et al. (1981) have shown that enhancing respondent motivation and reducing task difficulty increases data quality in interview surveys. Dillman (2000) suggests that motivation can be stimulated by incentives and by a respondent-friendly approach. Dillman's respondent-friendly approach involves for example making the task easy and establishing trust between the researcher and the respondent. This is consistent with SDT's ambition to increase the individual's perception of competence and SDT's concept of relatedness built on a respectful communication. According to SDT, however, a questionnaire designed to motivate respondents intrinsically should not endorse controlled extrinsic motivation, for example via incentives or reminders. According to SDT, incentives and persuasion stimulate primarily the lowest level of motivation (controlled extrinsic motivation). SDT further suggests that in the case of respondents with an initial higher motivation to participate, such techniques might even undermine intrinsic motivation (Deci 1971; Deci et al. 1999). Thus it seems that theories of survey participation and SDT have many things in common when it comes to factors influencing survey participation, but there are also important differences regarding, for example, external rewards and persuasion.

2.3. SDT Applied to Survey Design

Research suggests that a sense of autonomy, a sense of competence and a sense of relatedness are important with regard to facilitating intrinsic motivation. The question, then, is how these findings translate to the survey context. One way to apply SDT to a survey context could be to promote a sense of autonomy by reducing the number of reminders and by giving people more control over their decision to participate. In regular questionnaires, the designer has limited much of the response process beforehand by restricting the potential answers to a few closed response alternatives. Hence a sense of autonomy might also be enhanced by shifting the control of the response process to the respondent by using open-ended questions to which the respondents can provide their own answers. Perceived competence could, for example, be achieved by making sure that questions are easy to understand and apply to all respondents. In this respect, survey methodology has been enriched by many strategies to improve questionnaires. For example, cognitive interviewing has become standard practice to facilitate the response process and make the survey task easier for the respondent (Willis 2005).

Many of the widely used techniques to achieve improved response rates, such as persuasion and incentives, are according to SDT associated with extrinsic motivation and would only achieve the lowest level of motivation. In practice, strategies to accomplish a respondent-friendly design are often used in combination with compliance and persuasion techniques, which according to SDT might undermine intrinsic motivation. In this study we used SDT as an inspiration to include only factors that would stimulate intrinsic motivation.

3. Research Design

3.1. Study Design

The Centre for Public Health Sciences, Östergötland County Council, regularly conducts population-based self-administered health surveys. The response rates have been decreasing over the years. In this study, we redesigned the questionnaire and the data collection procedure with inspiration from SDT and compared these designs with the standard design. The goal of the redesigned versions was to give higher priority to factors that could increase motivation according to STD and thereby promote a future for these questionnaires even if it meant trade-off in the form for example, of a substantial reduction of the number of questions.

In spring of 2006, 16,440 inhabitants of the county of Östergötland (aged 18–84 years) were included in one of three experimental groups: SDT design (SDT-based questionnaire and data collection, $N = 2,500$); mixed design (standard questionnaire and SDT-based data collection, $N = 500$); standard design ($N = 13,440$) (Table 1). Some estimates were part of the local health reports for municipalities which resulted in a larger sample for the standard design. On the other hand we wanted to minimize the sample size of the mixed design as this design was used only for the methodological evaluation which resulted in unequal sample sizes.

The SDT-based questionnaire was designed to increase *autonomy* by including more open-ended questions in addition to closed questions. Moreover, aiming at facilitating *perceived competence*, we wanted to avoid items and scales with difficult or old-fashioned language since our cognitive tests and other evaluations suggest that they are troublesome for some respondents. The goal was also to stimulate *interest/enjoyment* by avoiding repetitive items. Another intention was to increase the perception of *value/usefulness* by using questions with a clear purpose and avoiding scales with items designed to measure abstract phenomena. The attempt to improve *relatedness* included the use of questions that apply to every respondent (avoiding questions that have embedded assumptions) and adding open-ended questions, and in that way showing an interest in the respondents' own expressions. The aim of the SDT-based data collection was to promote a *sense of autonomy* by stressing voluntariness and by reducing the number of reminders. The design was intended to improve *relatedness* by use of a respectful communication without pressure to participate, improving the sense of *value/usefulness* by providing information about the study in a prenotification letter, and reducing *pressure/tension* by using anonymity and avoiding linkage with registry data.

3.2. Data Collection

3.2.1. Questionnaires

Both questionnaires (SDT-based and standard) included identical questions on the following items: gender, year of birth, size of household, education, occupation, financial situation, trust in health care, social network, alcohol consumption, diet, physical activity, sleep, rest, stress, life satisfaction, sickness absence and use of health care. The standard questionnaire included the full health questionnaire Medical Outcome Study Short

Table 1. Overview of experiment

Sample size ^a	Standard design 13,440	Mixed design 500	SDT design 2,500
	Standard questionnaire	Standard questionnaire	SDT-based questionnaire
Number of pages	21	21	11
Number of questions	85	85	43
Total number of items	190	190	90
Identical items	40	40	40
Questionnaire specific items	130	130	50
Question domains with open-ended questions/ comments	2	2	6
	Standard data collection	SDT-based data collection	SDT-based data collection
Schedule			
Day 1		Prenotification letter	Prenotification letter
Day 7	Questionnaire	Questionnaire	Questionnaire
Day 15	Thank you reminder postcard		
Day 27–28	Reminder with new questionnaire	Reminder with new questionnaire	Reminder with new questionnaire
Day 43–44	Reminder with new questionnaire	Shortened standard questionnaire	Shortened SDT-based questionnaire
Partial anonymity	No	Yes	Yes
Linking with register data	Yes	No	No
Data collection agency	Statistics Sweden	Östergötland County Council	Östergötland County Council
Cover letters	Standard formulation	Nonpersuasive and less formal language	Nonpersuasive and less formal language
Logo on cover letter and responsible for survey	Östergötland County Council	Östergötland County Council	Östergötland County Council

^a After exclusion of noneligible sample units.

Form-36 (Ware and Sherbourne 1992), while the SDT-based questionnaire only included ten of the 36 items (the first item on general health, four items on vitality and five items on mental health). Both questionnaires also included (nonidentical) questions about disease and health problems, responsibility for health and willingness to change lifestyle with regard to diet and physical activity. Difficult judgement items (such as responsibility for health and trust in medical care) and sensitive items (such as alcohol consumption) were included in the same way and to the same extent in both questionnaires. Established scales that were not rejected on the above-mentioned criteria were included in their original format. The questionnaires also had similar layout and format.

The standard questionnaire consisted of about 190 questions on 21 pages. This questionnaire also included questions on work situation, neighbourhood, height, weight, nicotine use, dental health and use of complementary medicine. It also included questions inviting open-ended comments after closed questions (comments about perceived trust in health care/dental care and about what kind of help they would like to change their lifestyle). An example of an open-ended comment to a closed question is *What kind of support/help do you want?* It was a follow-up question to respondents who answered that they needed support to change their lifestyle.

The SDT-based questionnaire consisted of about 90 questions on eleven pages. In addition to the common set, it included questions on country of birth, municipality of residence and availability of health care. It also included two open-ended questions (a question on illnesses and health problems and a question on the health care offered for their health problems) as well as questions inviting open-ended comments after closed questions (about what illnesses the respondent had been seeking health care for during the last twelve months, illnesses that the respondent did not seek care for despite a perceived need, reasons for not seeking care and how the respondent handled the health problems instead of seeking care, changes of diet and what the respondent would like to do to improve his/her health). An example of an open-ended question is *What illnesses or health problems have you had during the last twelve months?*

3.2.2. Data Collection Procedures

The standard data collection included the initial mailing of the questionnaire, a thank you/reminder postcard and two postal reminders with new questionnaires enclosed (Table 1). The questionnaire was marked with an identification number and included linking with registry data on an individual basis.

The SDT data collection included a prenotification letter, the initial mailing of the questionnaire, one postal reminder with a new questionnaire enclosed and, as an alternative to the second reminder, a shortened one-page questionnaire (Table 1). The shortened questionnaire consisted of one page with the most important questions (ten questions for the standard questionnaire used in the mixed design and nine questions for the SDT-based questionnaire used in the SDT design). Results from the shortened questionnaire are not included in any of the tables or figures of this article. Partial anonymity was achieved by means of a separate response card with an identity number. With this procedure, there is a risk of duplicates when respondents answer the questionnaire but fail to send the response card. The reminder questionnaire therefore was

a light beige colour so that it could be easily separated from the original questionnaire when it came to identifying possible duplicates.

Östergötland County Council was responsible for and the financier of the survey in all three designs. For practical reasons the standard data collection was performed by the Questionnaire surveys unit at Statistics Sweden whereas the SDT data collection was performed by the data collection unit at the Centre for Public Health Sciences, Östergötland County Council. Every effort was made to make it clear to the sample persons that Östergötland County Council was responsible for the survey and that Statistics Sweden merely collected the data. All cover letters had the Östergötland County Council logo and were signed by the same persons. The cover letter in the standard version specified that Östergötland County Council had engaged Statistics Sweden to perform the data collection. The cover letter in the standard data collection also included information about the linking with registry data. A footnote specified the information collected from the population registry. The cover letter in the SDT-based data collection was couched in nonpersuasive and less formal language. In the last mailing of the SDT-based data collection (the shortened questionnaire) the letter included the information that there would be no further contacts.

Two separate random samples were drawn from the same population register by the data collection agencies. The sample drawn at Statistics Sweden was stratified by age, gender, and municipality. Sample units in the sample drawn at the Centre for Public Health Sciences were randomized into the two experimental groups: SDT design and mixed design.

3.3. Outcomes

3.3.1. Response Rates

Questionnaires were stamped with the date of receipt. The day-by-day response rates and the final response rates were calculated. Response rates were calculated using RR2 of AAPOR, as applied to mail surveys of specifically named persons (AAPOR 2011). The shortened questionnaires used in the mixed design and SDT design are not included.

3.3.2. Respondent Evaluations

We used three sources of information to measure respondents' satisfaction:

- (a) Four questions inspired by items in the Intrinsic Motivation Inventory (IMI) (Intrinsic Motivation Inventory (IMI); McAuley et al. 1989) were asked on the last page of the questionnaires. They were used as respondent evaluations concerning: perceived competence (the questions were easy/fairly easy/fairly difficult/difficult; the questions had difficult language/fairly difficult language/fairly easy language/easy language); value/usefulness (the questions were important/fairly important/not very important/not important at all); and interest/enjoyment (the questions were interesting/fairly interesting/not very interesting/not interesting at all).
- (b) After the four questions, there was space for comments about the questionnaire. These open-ended comments were used to illustrate respondents' experiences.

- (c) Telephone calls from sample persons and respondents were registered as part of the normal routine of the data collection. All cover letters included a telephone number to the same person at the Centre for Public Health Sciences. In the standard design there was also a telephone number to Statistics Sweden. During the registration of the calls at the Centre for Public Health Sciences, it was documented whether the person was angry or upset. This distinction was not made for phone calls received at Statistics Sweden. Therefore the number of angry and upset phone calls is complete for the SDT data collection but probably underestimated for the standard data collection.

3.3.3. Data Quality

Three measures of data quality were used:

- (a) Comparison with calibrated estimates based on the standard design. The standard data collection used in the standard design was linked with registry data, which made nonresponse adjustments possible (Deville and Särndal 1992). Calibrated estimates use registry data on sex, age, country of origin, municipality, marital status, education and occupation. The criterion for selecting register variables to be used for the calibration was that the variable should be related to both response propensity and important key indicators (general health, dental health, use of health care, smoking, difficulty in managing household expenses, and housing satisfaction) or that the variable defines groups that will be presented separately.
- (b) The proportion of respondents who missed at least one page in the questionnaire.
- (c) Item nonresponse was calculated for all closed questions that were included in both questionnaires. It is shown both for all questions and separately for questions that we regarded as sensitive (questions on economic situation, sick leave, alcohol consumption, any friend to count on and confidence in the County of Östergötland authorities).

3.4. Analysis and Statistical Methods

In this study we are interested in the effect of the SDT-based questionnaire, in the effect of SDT-based data collection and the combined effect of these. The *total effect* is the difference in outcomes between the SDT design and the standard design. The difference between the mixed design and the standard design is referred to as the *data collection effect*, whereas the difference between the SDT design and the mixed design is referred to as the *questionnaire effect*.

A subset of open comments about the questionnaires was used to construct a qualitative hierarchical coding scheme. The coding scheme was used to code all comments regarding the study, questionnaire and questions. Additional codes were introduced during the coding process when necessary. The 1,388 coded items were then grouped into categories and analysed by comparing frequencies in the standard and SDT designs.

Data quality measurements were compared at different response rate levels to detect changes during the data collection period. During a single day the response rate sometimes increases several percentage points. To create comparable breakpoints (for example, at 55% response rate), questionnaires arriving on the same day were randomly ordered within each design group. Special attention was given to responses above the level of the

final response rate in the standard version to evaluate whether data quality decreased when the response rates exceeded that level in the mixed design and the SDT-design.

The results of the standard design were weighted according to age, sex, and municipality to account for the stratified design. The results of the standard and mixed versions were weighted according to age and sex in the general population at the time of the study to make the results from the three samples comparable. Differences between proportions were tested using a two-tailed z -test for two independent samples (Fleiss and Levin 1981).

4. Results

4.1. Response Rates

Does the SDT design increase the response rates? The response rate was higher for the SDT version throughout the data collection period, as shown in Figure 2. Figure 3 shows that the difference between the experimental designs peaked (14 percentage points) after about a week. The data collection effect was largest after the first week – that is, before the thank you/reminder card was sent and before the second reminder (used in the standard data collection) was sent. The questionnaire effect was largest at the beginning of the data collection period and then declined.

As shown in Table 2, the final response rate reached 63.8% in the SDT design group and 54.6% in the standard design group. The total effect on the final response rate was 9.2 percentage points. The effect was statistically significant overall and in all age and gender groups, but was largest in the youngest age group. The data collection effect on the final response rate was 5.7 percentage points and was significant overall, among men and in the 45–64 years age group. The questionnaire effect was 3.5 percentage points and was statistically significant only among women.

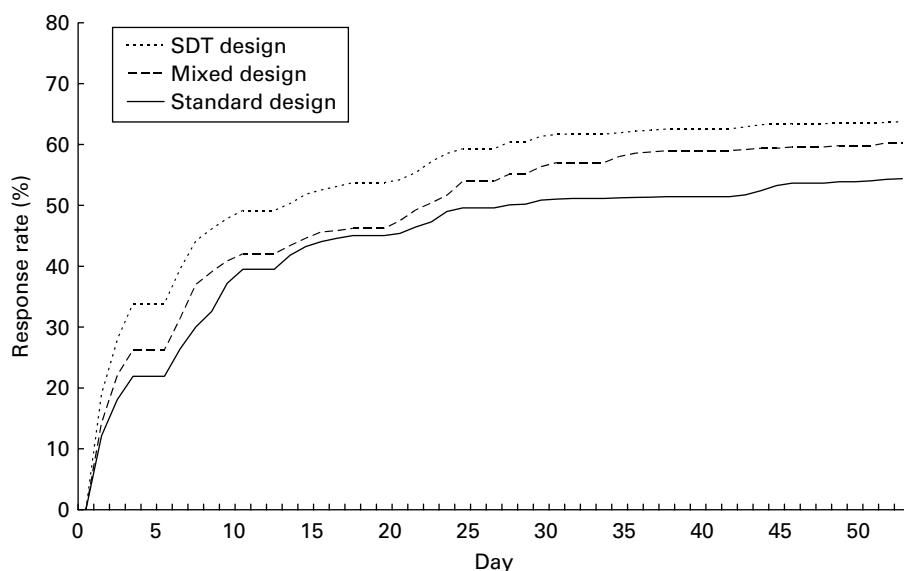


Fig. 2. Day-by-day cumulative response rates for the SDT design, mixed design, and standard design

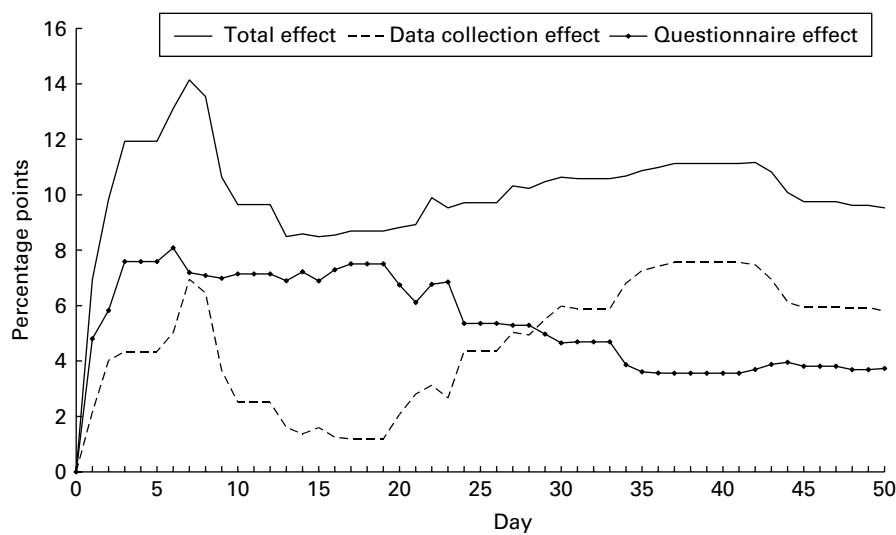


Fig. 3. Day-by-day cumulative difference in response rates between the different experimental designs

Among the nonrespondents in the standard design group who received the second reminder with a new enclosed questionnaire, 6.6% responded. Among the nonrespondents in the SDT group who got the shortened questionnaire, 3.8% chose to respond to the original full-length questionnaire even if this was not enclosed or asked for. The effect of the last contact on the final response rate was 3.2 percentage points in the standard design group and 1.9 percentage points in the SDT design group. Including the shortened

Table 2. Final response rates in the three experimental designs and differences in response rates

	Response rate (%)			Differences between designs (% points)		
	SDT design	Mixed design	Standard design	Data collection effect ^a	Questionnaire effect ^b	Total effect ^c
Number of respondents	1,590	304	7,238			
Overall	63.8	60.2	54.6	5.7**	3.5	9.2***
Women	70.3	62.2	60.3	1.9	8.1**	10.0***
Men	57.3	58.3	48.9	9.4***	-1.0	8.4***
18–29 years	52.2	45.7	40.3	5.3	6.6	11.9***
30–44 years	57.7	52.2	47.5	4.7	5.5	10.3***
45–64 years	68.5	67.1	59.4	7.6**	1.5	9.1***
65–84 years	74.0	72.4	68.5	3.9	1.6	5.5**

Note. Data weighted to adjust for different sample designs. Only responses to the full-length questionnaires are included.

Two-tailed *z*-test for two independent samples ***p* < 0.05; ****p* < 0.01.

^a Difference mixed design – standard design.

^b Difference SDT design – mixed design.

^c Difference SDT design – standard design.

questionnaire, the final response rate was 69.1% for the SDT design and 69.5% for the mixed design.

Thus the SDT design achieved more early responses and the final response rate was 9.2 percentage points higher than that of the standard design.

4.2. Respondent Evaluations

Does the SDT design increase respondent satisfaction? The SDT questionnaire was rated as easier and as more important than the standard questionnaire (Table 3). There were no overall significant differences when it came to rating the questions as interesting. However, men aged 18–29 years rated the questions in the SDT questionnaire as more interesting than the questions in the standard questionnaire (28% vs 17%, $p = 0.009$).

The distribution of different types of open comments is shown for illustrative purposes in Table 4. More respondents reported negative comments on the standard questionnaire. The largest differences were found when it came to comments that the standard questionnaire was too long or took too much time (time burden), and that the questionnaire included irrelevant questions. Comments about the SDT questionnaire more often included suggestions on additional questions and were more positive.

The number of phone calls from persons who refused to participate, who expressed worry about confidentiality or who were angry or upset was 1 per 1,000 for the SDT data collection and 3.6 per 1,000 for the standard data collection. Most of the phone calls regarding the standard data collection were received after the second reminder and 75%

Table 3. Percentage of respondents who rated the questions as being easy, having easy language, being important and being interesting

	Percentage of respondents (%)			Differences between designs (% points)		
	SDT design	Mixed design	Standard design	Data collection effect ^a	Questionnaire effect ^b	Total effect ^c
Number of respondents	1,590	304	7,238			
Questions were easy	42.9	28.7	27.6	1.1	14.2***	15.3***
Questions had easy language	76.8	61.3	62.2	-0.9	15.4***	14.5***
Questions were important	39.1	33.3	33.4	-0.1	5.8*	5.7***
Questions were interesting	25.6	27.8	24.7	3.1	-2.2	0.9

Note. Data weighted to adjust for different sample designs. Only responses to the full-length questionnaires are included.

Two-tailed z -test for two independent samples * $p < 0.1$; *** $p < 0.01$.

^a Difference mixed design – standard design.

^b Difference SDT design – mixed design.

^c Difference SDT design – standard design.

Table 4. Categories of open comments about the questionnaires

	Percentage of respondents (%)		Percentage of comments (%)	
	SDT design <i>n</i> = 1,590	Standard design <i>n</i> = 7,238	SDT design <i>n</i> = 190	Standard design <i>n</i> = 1,198
Negative comments	5.7	11.5	47.9	69.9
<i>Meaningless</i>	0.9	1.1	7.9	6.8
<i>Time burden</i>	0.2	1.5	1.6	9.0
<i>Not relevant to me</i>	0.6	2.7	5.3	16.2
<i>Cognitive burden</i>	3.8	5.4	31.6	32.6
<i>Negative experience</i>	0.2	0.9	1.6	5.3
Positive comments	2.8	2.5	23.7	15.2
Suggestions on additional questions	2.7	1.3	22.1	7.7
Explaining answers	0.8	1.2	6.3	7.1
Total	12.0	16.5	100	100

Note. Only responses to the full-length questionnaires are included.

of the calls from angry or upset persons also came after the second reminder. Angry or upset callers were rare in the case of the SDT-based data collection method.

Overall, the respondents to the SDT design seem to have been more satisfied with the survey than respondents to the standard design.

4.3. Data Quality

Does the SDT design result in better data quality? As shown in Table 5, the calibration changed all estimates in the expected direction except one (consuming alcohol more than three times a week) for the standard design. The magnitude of the changes was less than 2 percentage points for most estimates. The largest differences were for the estimate of people with difficulties with regard to managing housing expenses (+2.6 percentage points) and people living alone (+2.4 percentage points). When the response rate increased from 55% to 64% in the SDT design group, most estimates changed towards the calibrated values. For 14 of the 17 questions the estimate went in the direction of the calibrated value, for two questions the estimates were not changed, and for one question the estimate went in the opposite direction. Thus when the response rate increased from 55% to 64% in the SDT design, most estimates seemed to improve. In the case of eight of the 17 questions the estimate based on the 64% response rate data in the SDT design was still at least 0.3 percentage points lower than the calibrated estimate, and in the case of nine questions equal or larger. Table 6 shows three other aspects of data quality. With increasing response rates, the percentage of respondents who missed at least one page in the questionnaire increased in the standard design group. The item nonresponse on sensitive questions was largest in the standard design. With the SDT design there was no evidence of lower quality on answers obtained after the first 55%.

Table 5. Estimates^a (percent) with and without calibration for the standard design and the SDT design

	Standard design (n = 7,238)		SDT design (n = 1,590)	
	Calibrated estimate ^b	Response rate at 55% ^d	Response rate at 64% ^d	Response rate at 55% ^c
Living alone	21.8	19.4	20.5	19.9
Unemployed	5.6	4.3	5.0	4.8
Not working	34.7	33.9	35.3	35.3
On sick leave	8.9	7.9	8.7	8.4
On sick leave more than 15 days during last year	11.1	10.6	12.9	11.5
Consuming alcohol more than three times a week	2.4	2.6	2.7	2.8
Increased alcohol consumption	4.9	4.2	3.8	3.8
Impaired dietary habits	3.3	2.7	3.2	3.0
Decreased physical activity	14.2	13.4	11.2	11.0
Stress most of the time	10.0	8.9	8.0	7.7
Bad sleep quality	15.3	14.9	16.0	16.4
Too little rest	7.2	6.6	8.1	7.8
Poor health (SF1) ^e	3.8	3.5	3.6	3.5
Low trust in health care	25.4	24.8	22.2	21.9
No friend to count on	8.9	8.4	11.3	10.9
Difficulties managing running expenses	17.8	15.2	16.1	15.1
Poor economic situation	14.8	12.7	12.1	11.2

Note. Data weighted to adjust for different sample designs. Only responses to the full-length questionnaires are included.

^a Estimates for all questions that were identical in the three designs except for vitality, mental health and life satisfaction, which consisted of several items and were thus excluded.

^b Calibrated estimates based on registry data on age, country of origin, municipality, marital status, education, and occupation.

^c Results at the time when 55% response rate was reached.

^d Results at the end of the data collection period (55% for standard design and 64% for SDT design).

^e Medical Outcome Study Short Form-36.

Thus the SDT design yielded better data quality in terms of missing pages and item nonresponse on sensitive questions than the standard design.

5. Discussion

Survey data play an important role in today's society but response rates to surveys are declining (De Leeuw and De Heer 2002; Ekholm et al. 2009). The literature includes approaches to encounter this – however, according to recent research some of the strategies suggested in the past (e.g., additional reminders and compliance strategies) might have a negative effect on data quality and attitudes towards surveys (de Graaf et al. 2004; Bergman and Brage 2008). In this study, we used SDT as a means to increase intrinsic motivation and in that way improve response rates, respondent satisfaction and data quality. Using SDT, we redesigned a questionnaire and a data collection process that

Table 6. Percent respondents missing at least one page and item nonresponse at different response rate cut-offs by experimental design

	SDT design %	Mixed design %	Standard design %	Data collection effect ^a	Questionnaire effect ^b	Total effect ^c
Number of respondents	1,590	304	7,238			
Respondents missing at least one page						
0–20%	5.4	6.1	8.8			
21–40%	5.4	10.6	11.3			
41–55%	5.8	5.4	12.6			
> 55%	7.9	26.4				
Total	5.8	9.4	10.7	-1.3	-3.6**	-4.9***
	$\chi^2 = 1.8$	$\chi^2 = 13.4$	$\chi^2 = 27.3$			
	$p = 0.61$	$p = 0.004$	$p = 0.000$			
Respondents missing at least one question (of all questions) ^d						
0–20%	20.0	14.4	21.2			
21–40%	19.3	15.3	21.2			
41–55%	21.0	17.3	20.8			
> 55%	17.9	36.6				
Total	19.7	17.6	21.1	-3.5	2.1	-1.4
	$\chi^2 = 0.95$	$\chi^2 = 8.9$	$\chi^2 = 0.15$			
	$p = 0.81$	$p = 0.03$	$p = 0.93$			
Respondents missing at least one sensitive question ^d						
0–20%	10.6	8.4	14.5			
21–40%	10.5	9.6	13.8			
41–55%	12.0	13.5	14.7			
> 55%	6.8	29.5				
Total	10.4	12.2	14.3	-2.1	-1.8	-3.9***
	$\chi^2 = 4.1$	$\chi^2 = 11.1$	$\chi^2 = 0.86$			
	$p = .25$	$p = .01$	$p = .65$			

Note. Data weighted to adjust for different sample designs. Only responses to the full-length questionnaires are included. 0–20% denotes the responses that contribute to a response rate up to 20% (early respondents). >55% denotes responses that arrived when 55% response rate was already achieved (late respondents).

Two-tailed z -test for two independent samples ** $p < 0.05$; *** $p < 0.01$.

^a Difference mixed design – standard design.

^b Difference SDT design – mixed design.

^c Difference SDT design – standard design.

^d Identical closed questions in the two questionnaire versions.

we compared with standard versions in an experimental design. We found that the SDT design as used in this study resulted in larger response rates, greater satisfaction and better data quality.

In a previous study, based on qualitative interviews, we found that respondents with different types of motivation to participate in surveys stressed different aspects of respondent satisfaction and burden (Wenemark et al. 2010). The present study is, to our knowledge, the first in the survey literature to study the effects of using SDT as a basis for survey design. Thus this study extends previous research by applying a new theoretical perspective to increase respondent motivation in a self-administered survey.

This study also sheds some new light on response rates and data quality. Several authors have shown that response rates are only weak predictors of the magnitude of nonresponse bias (Curtin et al. 2000; Keeter et al. 2000; Merkle and Edelman 2002; Groves 2006). Similarly, increasing response rates will not necessarily reduce nonresponse bias in a specific survey (Groves 2006; Peytchev et al. 2009). Recent research suggests that strategies to increase response rates might not be worth the extra cost and effort (Heerwagh et al. 2007). The few extra percentage points in response rate tend to derive from respondents from groups that are already well represented in the data (Rogelberg et al. 2003; Groves 2006). However, in this study the largest absolute improvement in response rate with the SDT design was among the youngest age group (18–29 years), a group that is often problematic in terms of response. In addition, previous research suggests that late respondents provide data of poor quality (De Rada 2005). However, our data show that the additional percentage points in response rate improved estimates compared with calibrated values. Even though the calibrated values do not equal true values, the plausibility is supported by the results indicating that the largest changes between raw and calibrated estimates are for the variables “poor economic situation” and “living alone,” which are often underrepresented in self-administered surveys. In addition, the number of respondents who missed at least one page of the questionnaire and the other aspects of data quality shown did not decrease among the late respondents in the SDT design. Thus in this study the additional responses at the end of the data collection period seemed to contribute to better data quality.

Some limitations of this study should be mentioned. First, the three designs (SDT, mixed, and standard) differed from each other with regard to more than one aspect, e.g., the various aspects of the SDT design were clustered. This makes it impossible to draw conclusions on effects of a specific factor. In addition, some of the factors in the SDT design are similar to traditional nonresponse reduction strategies. As this is the first study to apply SDT to survey research, the overall goal was to evaluate the potential effects of a complete set of factors.

A second limitation is the four respondent evaluation questions. They were inspired by the IMI scale (Intrinsic Motivation Inventory (IMI); McAuley et al. 1989) but have not been validated in their present form. The correlation was high between how interesting and important the questions were as well as how easy the questions and the language in the questions were. Future studies will be needed to explore suitable measurements of satisfaction for the survey context. Another limitation is that data was collected by two government agencies. However, every effort was made to make it clear that Östergötland County Council was responsible for the survey in all three designs. In addition, in this study we applied research on intrinsic motivation from other areas of research to the survey context. Future studies are, therefore, needed to validate the proposed mechanisms in a survey context and to examine potential interactions between them.

Some of the factors in the SDT design are consistent with previous research and other theories in the survey literature. For example, Dillman's tailored design method also predicts that shorter questionnaires and easier questions will increase response rates (Dillman 2000). The questionnaire design in this study, however, also had an effect on respondents' perception of survey importance, which has a less obvious

relation to, for example, questionnaire length and cognitive burden. Previous research also suggests that a prenotification letter has a positive effect on the response rate (Dillman et al. 1995). In this study the prenotification letter is probably an important explanatory factor with regard to the large data collection effect early in the data collection period. When the thank you reminder postcard is sent (in the standard data collection) the data collection effect decreases to just above one percentage point. Although these two contacts seem to achieve the same effect in terms of increased response rates, the prenotification letter may have the advantage of being perceived as less pressuring than a reminder. Since this experiment was not designed to study single factors, future research is needed to disentangle the roles of the individual factors.

To what extent can the results from this study be generalised? This study involved a survey topic that the respondents may have been inherently interested in (i.e., their own health). The possibilities of intrinsically motivating respondents probably vary across different surveys and different populations. In this study, the SDT-based questionnaire appealed especially to women and the youngest age groups; the SDT data collection, on the other hand, achieved larger response rates among men and people aged 45–64 years. This shows further that different respondents will appreciate different aspects of the survey design even within the same topic. The practical circumstances in a specific survey might also restrict a fully SDT-inspired design. In this study we had reasonable freedom to reject or redesign aspects of the questionnaire and of the data collection process that did not fit our theoretical idea. In other surveys, this might not be possible to the same extent. Many surveys have requirements and restrictions that might affect intrinsic motivation negatively but serve other purposes. One example is the practice of using traditional or established questions and scales. Such scales might not be respondent-friendly, up-to-date or interesting for the present population but are needed to ensure comparability.

In this study, the SDT-based questionnaire included only about half as many questions as the standard questionnaire and therefore collected much less quantitative information. The reduction of the number of questions also involves a scientific trade-off since some established questions and scales with difficult or old-fashioned language were avoided in the SDT-based questionnaire. Moreover, the anonymity used in the SDT-based data collection made linkage to register data impossible. These losses need to be set against the potential benefits of more satisfied respondents and a higher response rate. From a practical perspective, the SDT-based data collection also reduced the costs for printing and sending reminder questionnaires, and reduced the time spent on answering telephone calls. Thus different designs have different advantages and disadvantages. Future research can help weigh the trade-off between the different choices.

In conclusion, we found SDT to be an interesting additional source to provide ideas on how to design surveys with the potential to intrinsically motivate respondents. The SDT design as used in this study yielded greater satisfaction among respondents and improved response rates with similar or better data quality compared with the standard design. The results suggest that it is possible to improve response rates in a way that also promotes data quality and positive experiences for the respondents. An important challenge for future research is to develop surveys that are valuable and interesting not only for the researchers but also for the respondents.

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Received May 2010

Revised April 2011