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Nonresponse Bias and Survey Outcome Representativeness: Assessing Reasons for Nonresponse in Follow-up Surveys.

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Nonresponse Bias and Survey Outcome Representativeness: Assessing Reasons for Nonresponse in Follow-Up Surveys

by

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DEDICATION

I dedicate this dissertation to my lovely family. My husband, Kinei Lin, has been so patient, supportive, and always there for me. My precious daughter, Jada Lin, who was born during the peak of my dissertation work, is the best joy of our lives. Most importantly, special thanks to my loving father, Po-Hsien Kang, mother, Hsueh-Ying Kang-Yiu, and my sister, Yi-Huei Kang, for their endless love whenever and wherever. I am who I am because of them.

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ABSTRACT

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The current study focused on four reasons of passive nonresponse due to noncontact, on-leave, high workload, and technical constrains. Different types of nonrespondents were compared to active nonrespondents and respondents to assess the potential different impacts of nonresponse bias reflected accordingly. Relevant literature was reviewed and hypotheses regarding the mean response comparison of core survey items and organizational attitudes were tested. Data collected from 1,333 military personnel in an initial survey and 605 personnel in its follow-up survey suggested that different types of passive nonrespondents may introduce various degree of nonresponse bias and thus passive nonresponse should be viewed as a multi-dimensional variable. Contributions, implications, and limitations of the results are discussed.

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The survey method has long been established as a valuable tool in psychological research, allowing researchers to study numerous categories of psychological phenomena (Krosnick, 1999). As a common method for collecting information in social science research, the self-administered survey is a convenient and popular tool for assessing people's knowledge and attitudes about a vast array of psychosocial issues (Church & Waclawski, 1998; Groves, 1989). Because self-administered surveys are an efficient means of collecting such data, they have become a major vehicle for Industrial and Organizational psychologists and organizational behavior researchers to assess employee attitudes on a host of topics, including such issues as: satisfaction with organizational policies, working environment, or compensation systems, as well as a means of gathering information on employees' motivation, commitment, and intentional behaviors (Rogelberg, Luong, Sederberg, & Cristol, 2000; Spitzmüller & Glenn, 2006). As a communication channel for stakeholders in organizational settings, surveys provide a venue for indentifying, monitoring, and improving organizational issues (Kraut, 1996). With the evolution of internet technology, there is a trend away from paper and toward web-based surveys (Thompson, Surface, Martin, & Sanders, 2003), and the use of surveys has become more entrenched, allowing researchers to collect and analyze information from larger samples, in a shorter period of time, and at more reasonable costs (Clayton & Werking, 1998; Schmidt, 1997).

When surveys are distributed to a sample of potential respondents, there are four possible outcomes: (1) the survey is completed and returned by the **complete**

respondents, (2) the survey is partially completed and returned by the **partial respondents**, or (3) the survey is not returned by **nonrespondents**. The nonrespondents can be further categorized as (a) "passive" nonrespondents, those who did not participate in the survey for some contextual reason (e.g., because they are very busy or not available), or (b) "active" nonrespondents, those who made a conscious decision not to reply to the survey because they developed some reactance to the survey itself (e.g., they think the survey is a waste of time). (See Figure 1).

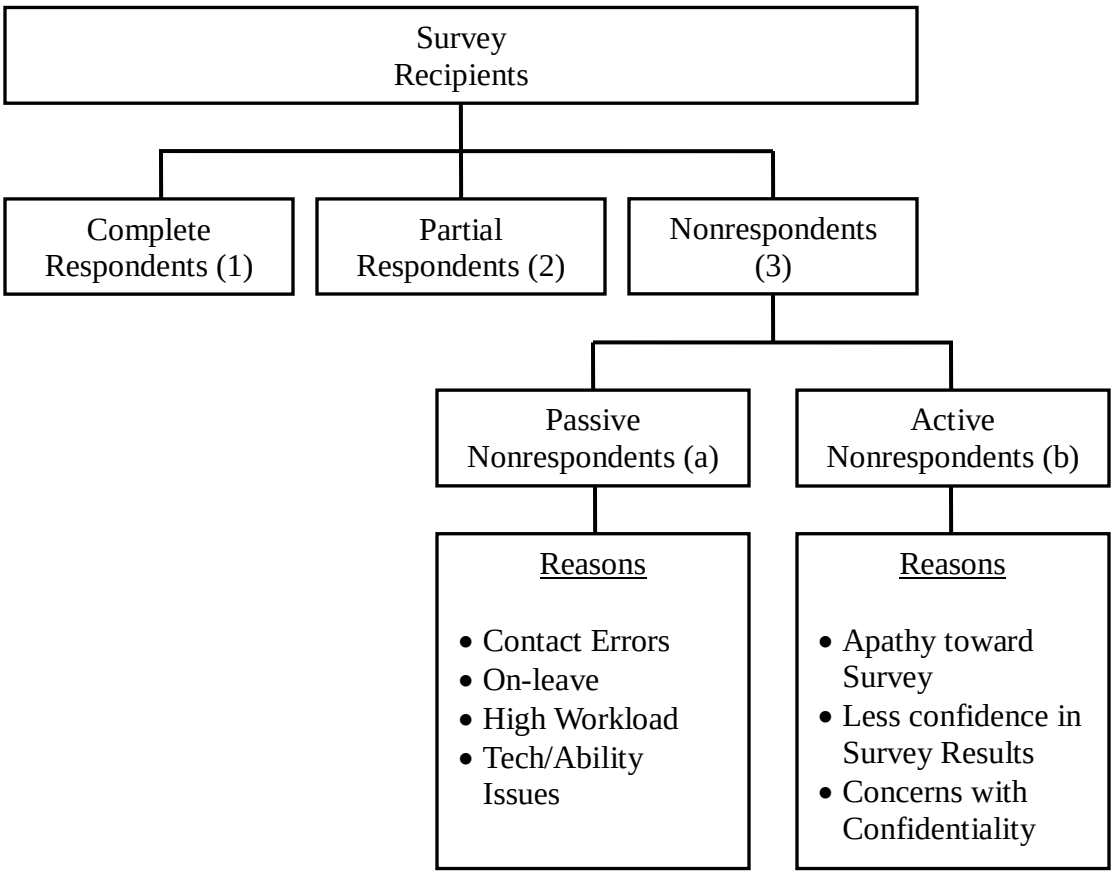

Figure 1. Possible outcomes of eligible survey recipients.

Complete respondents are survey recipients who responded to all parts of the survey and a major group that affects the overall response rate. In the parlance of survey researchers, **response rate** refers to the ratio of number of respondents and partial respondents divided by the number of surveys that were distributed (The American Association for Public Opinion Research, AAPOR, 2009). Partial respondents are those who responded to only a part of the survey and a group that may be relevant to the issue of item nonresponse (Rubin, 2004). **Item nonresponse, or item missing data**, refers to skipped items that partial respondents did not answer, whereas other items in the survey were completed (Spitzmüller & Glenn, 2006; see also Mason, Lesser, & Traugott, 2002, for further discussion about the effects of item nonresponse on survey results). Further discussion related to respondents in the current study referred to the complete respondents.

Finally, **nonrespondents** refer to those survey recipients who did not respond to the survey at all and are the group that generates the nonresponse rate (Brennan & Hoek, 1992; Moore & Tarnai, 2002; Rubin, 2004; Spitzmüller & Glenn, 2006). In contrast to response rate, **nonresponse rate** refers to the ratio of number of nonrespondents divided by the eligible survey recipients (The American Association for Public Opinion Research, AAPOR, 2009). For obvious reasons, survey nonrespondents are considered one of the most difficult groups to study (Rogelberg et al., 2000). Regarding these nonrespondents, researchers have focused on the question of the degree to which their responses (were they to be obtained) would differ from those who actually did respond to the survey. This possibility, known as **nonresponse bias** in the literature, refers to any systematic differences between nonrespondents and respondents in the way in which core survey

topic questions are answered (were the nonrespondents to answer them), thus impairing the representativeness of the survey results (Groves, 2006; Rogelberg & Stanton, 2007; Thompson & Surface, 2007; Wallen & Fraenkel, 2001).

As mentioned above, **passive nonrespondents** are survey recipients who did not respond to the survey because of some contextual reasons, such as not being contacted due to problems with mail delivery, being away from the contact place, too much workload, constraints on computer use, or negligence (Rogelberg & Stanton, 2007; Thompson & Surface, 2007). **Active nonrespondents,** on the other hand, are people who made conscious decisions to refuse to respond to the survey because they experienced reactance to the entire survey (Rogelberg et al., 2003). Major reasons for active nonresponse include: apathy toward surveys, disinterest in the survey topic, less faith in the organization's willingness to act on survey findings, and concerns with data confidentiality, privacy, and anonymity for active nonrespondents (Cho & LaRose, 1999; Newell, Rosenfeld, Harris, & Hindelang, 2004; Rogelberg et al., 2000; Spitzmüller & Glenn, 2006; Thompson & Surface, 2007).

Rogelberg et al. (2003) urged researchers to examine the effects of nonresponse bias by further identifying the specific reasons for nonresponse within the passive and active categories. Although passive nonrespondents in general were found to express similar organizational attitudes to the respondents (Rogelberg et al., 2003), it is possible that the various subcategories of passive nonrespondents, each representing a different nonresponse reason, would have responded differently from each other. For example, one may argue that if passive nonrespondents due to contact errors or on-leave had been contacted, these nonrespondents theoretically would have become either respondents, or

active nonrespondents. On the other hand, Miles, Borman, Spector, and Fox (2002) found that passive nonrespondents due to high workload or computer constraints may possess different attributes from respondents, such as organizational citizenship behavior. Groves (2006) also stated that the likelihood for passive nonrespondents due to noncontact to respond to a survey could differ from those due to technical/ability constraints. Given the above, there may be a necessity to examine the potential differences among the passive nonrespondents due to different types of nonresponse reasons.

Currently, however, there is no existing research that provides evidence to clarify the potential differences among passive nonrespondents due to the various contextual reasons, were they able to respond. Consequently, research further investigating the subclasses of passive nonrespondents in an organizational setting is needed. Such research may help organizations determine the degree to which passive nonrespondents, in general, can be treated as a group similar to the respondents.

The current study is intended to provide empirical evidence in an organizational setting to better assess the potential for nonresponse bias associated with the various contextual reasons for passive nonresponse as described above. In addition, the current study compared these different types of passive nonrespondents to active nonrespondents and respondents to evaluate the magnitude of nonresponse bias. Specifically, the current study focused on surveys conducted in a military environment to provide a context for understanding nonrespondents and the degree of nonresponse bias they may contribute by directly comparing the core survey item outcomes of respondents with the passive and active nonrespondents (from whom survey participation was successfully elicited at a later date by a follow-up survey). The following review addresses research relevant to

nonresponse bias, nonresponse in military settings, the follow-up survey method, and passive and active nonrespondents. This discussion is followed by the specific hypotheses tested in the current study.

Nonrespondents and Nonresponse Bias

Understanding the issues of nonresponse bias is essential to avoid over or underestimating the population parameters from the survey sample (Groves, 2006; Lahaut et al., 2003). With respect to interpreting the surveys that are returned, an important question centers on the degree to which the nonrespondents may be different from the respondents with regard to some relevant characteristic, thereby making suspect any generalization from the data. In other words, in order to draw adequate conclusions from the data, examining the potential impact of nonresponse bias is a necessity.

Obtaining a representative sample is crucial to survey quality because it allows researchers to generalize the findings from the survey participants to the population of interest (Krosnick, 1999; Wallen & Fraenkel, 2001). However, a survey conducted by applying adequate representative sampling techniques, such as stratified random sampling, may still potentially suffer low representativeness to the degree nonresponse bias exists (Wallen & Fraenkel, 2001). Traditionally, many researchers have pursued high response rates as the key element to ensure the survey representativeness and generalizability of survey outcomes (e.g., Baruch, 1999; Francis & Robbins, 1995; Kaldenberg, Koenig, & Becker, 1994; Luong & Rogelberg, 1998; Singleton & Straits, 1999). Concerns regarding response rate were based on the notion that individuals who did not respond to surveys might systematically differ in some relevant dimensions from those who responded, thus inducing nonresponse biases and impairing survey

representativeness and external validity (Groves, 2006). Recently however, researchers began to question the degree to which a high response rate is associated with the external validity of survey outcomes, and they found that response rate may not be the key factor to ensure survey generalizability (Curtin, Presser, & Singer, 2000; Groves et al., 2006; Keeter, Miller, Kohut, Groves, & Presser, 2000; Merkle & Edelman, 2002; Rogelberg & Stanton, 2007).

Empirical studies examining the links between response rate and the quality of survey outcomes have supported the above argument. For example, empirical studies have shown that the estimates of survey outcomes from surveys for which researchers have spent more effort to solicit high response rates did not significantly differ from those with lower response rates (Peytchev, Baxter, & Carley-Baxter, 2009). Another empirical study, conducted by Groves and Peytcheva (2008) using meta analytic techniques, demonstrated that nonresponse rate failed to predict the relative degree of nonresponse bias.

In short, the concern with nonresponse rate is different from the concern with nonresponse bias, and the latter may be viewed as a more serious problem regarding survey quality and generalizability (Thompson & Surface, 2007). Because survey representativeness refers to the degree to which a sample represents the corresponding parameters of a population of interest (Wallen & Fraenkel, 2001), Dillman (1991) suggested that it is important to study respondents and nonrespondents based on the core survey items relevant to research interests. Hence, nonresponse bias can be defined by a function of the difference between respondent and nonrespondent means of survey items (Groves, 2006), which is described as:

$bias_{nr} = \frac{M}{N}\left(\overline{y_r} - \overline{y_m}\right)$ where *M* refers to the total number of nonrespondents; *N* refers to the total number of survey recipients, and thus the element of M divided by N refers to nonresponse rate. Next, $\overline{y_r}$ is the mean of a core survey item of interest from respondents, which is determined by dividing the total sum of the scores of that item from the respondents by the total number of respondents. On the other hand, $\overline{y_m}$ is the mean of that core survey item of interest from nonrespondents, which is the outcome of dividing the total sum of the score of that item from the nonrespondents by the total number of the nonrespondents (Groves, 2006). The nonrespondent scores are obtained from a subsequent survey to which they did respond. Given the above, when nonresponse rate remains constant, the magnitude of nonresponse bias is driven by the magnitude of difference between the means of survey items from the nonrespondents and respondents (Dixon & Tucker, 2010).

Military Setting and Nonresponse

As addressed earlier, the current study focused on examining the phenomenon of survey nonresponse in a military setting. There are some potential environmental differences in surveying in a private sector versus a military setting. Military survey researchers found that a significant portion of nonresponse was due to passive nonresponse, particularly due to contact errors (Newell & Kang, 2006; Uriell, Whittam, Newell, & Hargrove, 2007), which is related to the method of survey notification. In certain military settings, those selected to participate in the survey cannot be directly contacted by the survey administrators due to constraints of the mailing system. In these cases, a survey notification is sent to the command via the military message system and

the command leaders then notify the selected personnel about the survey participation (Uriell, Newell, & Whittam, 2011). As a result, this process may create a higher possibility of nonresponse due to contact errors as the selected survey participants may have never been informed about the survey participation opportunity by their commander (Uriell et al., 2007). One more common reason for selected military survey participants not responding may be because they are on-leave or under temporary additional duty (TAD) at some other location during the survey period (i.e., Newell & Kang, 2006).

For the above reasons, Newell, Whitten, Uriell, and Kang (2010) found that the proportion of active nonrespondents was smaller than passive nonrespondents. The major factors related to active nonresponse included concerns about lack of perceived benefit for responding, being tired of survey, and survey length (Newell et al., 2004). Military personnel surveys are routinely conducted to provide leadership with information regarding different aspects of personnel attitudes (Newell & Kang, 2006). As a result, those military personnel who have been over surveyed may tend to evaluate their participation by comparing the benefits of responding to a survey in terms of its significance versus the cost, such as the time taken from their work, and refuse to respond if perceived benefits do not outweigh the cost (Uriell et al., 2007). Furthermore, compared to the private sector, there may be fewer military personnel showing a degree of reactance to being surveyed, such as considering that the survey is an invasion of privacy and a waste of time (Newell et al., 2010).

Given that a large proportion of nonresponse may be due to passive reasons, the current study focused on examining the subclasses of passive nonrespondents characterized by various passive nonresponse reasons and comparing them to active

nonrespondents. The major subclasses of passive nonresponse that were examined in the current study included: contact errors (identified by those who claimed in the follow-up survey that they were not informed about the initial survey), on-leave (from a duty station during survey period), high workload, and technical/ability issues. The group of active nonrespondents was composed of those who indicated in the follow-up survey that they did not respond because of their apathy toward survey, low confidence in how survey would be used for improvement, and concerns with data confidentiality. One active reason for nonresponse, not being interested in the topic, was not be included because the current study was not designed to compare the impact of various survey topics on survey response.

Follow-up Survey Method and Nonresponse Bias Research

The current study used a follow-up design as a technique for nonresponse bias research. A follow-up survey conducted after an initial survey is the common method for studying the nonrespondents in the initial survey (Porter & Whitcomb, 2005). As Rogelberg et al. (2000) argued, the challenge of nonresponse bias research is that there may be no single research methodology to fully assess nonresponse bias. There are several other available research techniques for studying nonresponse bias, such as use of archival databases by linking survey outcomes to a general database that contains demographic data for both survey respondents and nonrespondents; use of a series of several surveys with a time lag by comparing early respondents and late respondents, and studying intentions to respond to a later survey to compare those who intend to respond to those who do not (Groves & Peytcheva, 2008; Porter & Whitcomb, 2005; Spitzmüller & Glenn, 2006). Because follow-up surveys are designed to gather information related to

actual survey variables and the reasons for nonresponse to the initial survey, the follow-up approach was deemed more appropriate than others for the purpose of the current research.

The current study used the archival data collected in 2008 from a physical readiness related poll and its follow-up survey to investigate if different types of nonrespondents may indicate different degrees of nonresponse bias. The initial on-line physical readiness survey assessed issues regarding the perceptions of the command physical readiness program and personal physical readiness. The follow-up survey, which was a shorter paper-and-pencil survey, assessed several core survey items in the initial survey as well as the reasons for not responding to the initial survey.

There are several reasons for using this physical readiness program survey and its follow-up survey. First, the follow-up survey breaks down the phenomenon of nonresponse by identifying different reasons for nonresponse. Second, the neutral topic of the survey, physical readiness program, may limit the possibility of nonresponse due to survey topic sensitivity (McDaniel, Madden, & Verille, 1987). Third, different from the initial survey, which adopted an on-line method for data collection, the follow-up survey used a paper-and-pencil approach. Such multimode survey design is often used to improve response rate and reduce nonresponse error (Dillman & Messer, 2010; Fowler, 2009). Finally, the survey length of the initial survey, with 82 questions, and its follow-up, with 24 questions, is comparably moderate and thus may limit the potential nonresponse due to long survey length (Biner & Kidd, 1994).

Nonresponse Bias: Passive Nonrespondents vs. Active Nonrespondents

Nonresponse due to different passive reasons may indicate different degrees of impact on data representativeness compared to that due to active reasons (Stinchcombe, Jones, & Sheatsley, 1981). Rogelberg et al. (2000) conducted an interview study and identified active nonrespondents and respondents by asking 194 employees from various organizations their intention to refuse or participate in an employee satisfaction survey. These researchers found that the "anticipated" active nonrespondents, compared to the "anticipated" respondents, showed lower levels of organizational commitment, satisfaction with supervisors and jobs, belief in survey impact and employers' likelihood of effecting change, and higher levels of turnover intention. The anticipated active nonrespondents and respondents did not, however, differ in work-related demographic variables such as tenure and work status, or satisfaction with pay and promotion opportunities.

In a related vein, Rogelberg et al. (2003) conducted a survey that applied student samples and a population profiling technique to identify "anticipated" passive nonrespondents, "anticipated" active nonrespondents, and respondents. These researchers found that the "anticipated" active nonrespondents indicated less satisfaction with the survey sponsor and less conscientiousness than respondents; whereas the "anticipated" passive nonrespondents, in comparison with respondents, showed similarity in satisfaction level but a difference in conscientiousness. The above studies, however, did not investigate if different types of passive nonrespondents based on various contextual nonresponse reasons may indicate a different degree of effects on data representativeness and nonresponse bias.

As discussed previously, most researchers have treated passive nonresponse as a uni-dimensional variable. Researchers such as Groves (2006) and Miles et al. (2002), on the other hand, implied that passive nonrespondents due to high workload or technical/ability constraints may exhibit different attributes from those due to passive nonresponse reasons such as contact errors and on-leave. The current study investigated whether passive nonresponse is indeed a uni-dimensional variable and focused on examining if there is a relationship among the different types of passive nonresponse reasons with corresponding nonresponse bias by answering the three following questions. The first was to confirm if there is any difference between the means of core survey item responses from passive and active nonrespondents. The second question addressed the issue of whether the means of core survey items from passive nonrespondents due to various reasons may not differ from the ones from the respondents. The third explored the possibility of differences among the means of core survey items from the passive nonrespondents due to contact errors, being on-leave, high workload, and technical/computer issues. Specifically, respondents were identified as those who participated in and completed the initial survey. Both passive and active nonrespondents were identified as those who did not reply to the initial survey but participated in the follow-up survey. Also, because those defined as respondents to the initial survey were not included in the follow-up survey, the responses from the initial survey were assumed to be independent from those responses collected in the follow-up survey.

Organizational Attitudes: Passive Nonresponse vs. Active Nonrespondents

To further understand the passive nonrespondents, it is also important to investigate the potential attitudinal differences among passive nonrespondents due to

various nonresponse reasons, the active nonrespondents, and the respondents. Individual differences in attitudes, which may reflect survey participants' sense of social responsibility as well as their felt burden for compliance, may affect their survey responses (Porter & Whitcomb, 2005). For example, compared to respondents, passive nonrespondents may also show negative organizational attitudes, commitment, and attachment. For example, high workload may increase work-family conflicts and eventually decrease job satisfaction and organizational attachment, and increase turnover intentions (Britt & Dawson, 2005; Matthews, Kath, & Barnes-Farrell, 2010). On the other hand, Rogelberg et al. (2000) found that active nonrespondents tend to show less attachment to the organization, less satisfaction with their supervisor and job, and lower levels of organizational affective commitment (an emotion related to organizational attachment). These active nonrespondents also displayed less faith in their organization's willingness to act on survey findings (Rogelberg et al., 2000).

In a subsequent study, Thompson and Surface (2007) interviewed 58 focus group members, half of whom indicated that they had responded to a previous climate survey and half had not. These researchers found that there were no differences between respondents and nonrespondents in their attitudes toward organizational climate variables, including job satisfaction, immediate supervision, leadership, career development, personnel management, team cohesion and communications. However, this study was limited by a small sample size and the representativeness of the focus groups. Also, the authors assumed nonresponse as a one-dimensional phenomenon without further identifying nonrespondents into passive and active nature or in terms of the specific reasons for noncompliance.

At present, it remains a challenge for researchers to investigate the attitudes of the nonrespondents (Porter & Whitcomb, 2005). Given the inconsistency of the results and the paucity of empirical work, the current study used data from a follow-up survey to examine the differences in organizational attitudes among different types of passive nonrespondents, active nonrespondents, and respondents. Following the approach taken by Thompson and Surface (2007), the current study investigated the attitudinal differences among the categories of passive nonrespondents, and compared their data to active nonrespondents and self-identified respondents, which were defined as those who claimed in a follow-up survey that they had responded to the initial survey but their survey outcomes were not recorded in the system for technical reasons such as the server was down when the survey was submitted. Specifically, the current study provided data on three questions related to nonrespondent type and corresponding organizational attitudes. The first is whether there is an attitudinal difference between passive nonrespondents and active nonrespondents. The second is whether there is any evidence to believe that the various categories of passive nonrespondents and self-identified respondents would differ in their organizational attitudes. The final is whether passive nonresponse is a uni-dimensional variable in terms of organizational attitudes.

Hypotheses

The following null hypotheses were tested to determine if, compared to different categories of passive nonrespondents, active nonrespondents, respondents as well as self-identified respondents may differ with respect to data representativeness and organizational attitudes. The four categories of passive respondents included: contact errors, on-leave status, high workload, and technical and ability issues.

Hypothesis 1a: For each of the core survey items, the mean responses from the four categories of different passive nonrespondents do not differ from active nonrespondents.

Hypothesis 1b: For each of the core survey items, the mean responses from the four categories of passive nonrespondents do not differ from respondents.

Hypothesis 1c: For each of the core survey items, the mean responses from the four categories of passive nonrespondents do not differ from each other.

Hypothesis 2a: For each of the organizational attitude survey items, the mean response from the four categories of passive nonrespondents do not differ from active nonrespondents.

Hypothesis 2b: For each of the organizational attitude survey items, the mean response from the four categories of passive nonrespondents do not differ from that of the self-identified respondents.

Hypothesis 2c: For each of the organizational attitude survey items, the mean response from the four categories of passive nonrespondents do not differ from each other.

Method

Participants

To capture demographic representativeness, participants in the initial survey were randomly selected from active duty personnel in a military organization, stratified by officer/enlisted status, which was defined as containing two subcategories: enlisted, which included E1 to E9, and officer, which included W2 to W5, O1/O1E to O7. The sampling procedure resulted in 4,000 active duty military personnel who were asked (via

electronic messaging system to commands) to participate in the survey online. A total of 1,333 complete responses were returned, for a response rate of 36%.

Participants in the follow-up survey were the nonrespondents initially from the initial survey who were still on duty and had valid contact addresses. The procedure resulted in 2,488 active duty military personnel who were asked (by mail) to participate in the follow-up paper-and-pencil survey. A total of 605 complete follow-up surveys were returned, for a response rate of 28%.

Instruments

The initial survey contained 6 close-ended demographic questions, 82 close-ended questions, and 2 open-ended questions. For the purpose of this research, 4 out of 82 questions from the initial survey were analyzed. These four core survey questions appeared on both the initial and the follow-up surveys, including three four-point-scale questions concerning survey participants' perceptions of personal physical readiness, and one three-category question concerning perceptions of command physical readiness program (see Table 1).

The follow-up survey contained 24 close-ended questions and 1 open-ended question. Thirteen of the 24 questions from the follow-up survey were relevant to the current study. These 13 questions included 2 demographic questions, 4 core survey questions that appeared in the initial survey as mentioned above, and 7 questions unique to the follow-up survey. Among these seven unique questions, one assessing whether the nonrespondents from the initial survey thought that they had responded to the initial survey was used to identify the group labeled as "self-identified respondents". Although all individuals selected to be included in the follow-up survey were those recorded by the

system as nonrespondents to the initial survey, it is possible for some to claim that they had not participated in the initial survey due to server or other technical failures. Those who claimed that they had not or did not remember if they had participated in the initial survey were treated as nonrespondents (to the initial survey) for the purpose of the current study and were directed to the next question identifying the reasons for nonresponse.

The question assessing different reasons for nonresponse to the initial survey contained 13 sub response options; these were answered only by those who claimed that they had not participated or did not remember if they had participated in the initial survey. The question was included to identify the major subclasses of passive nonresponse. As described previously, one of the reasons of nonresponse, not being interested in the survey topic, was not included in the current study due to its potential confounding effect of the survey tool that the current study chose to adopt.

The remaining unique questions relevant to the current study were the five items assessing attitudes toward the organization. These organizational attitude questions were used to test Hypotheses 2a, 2b, and 2c to examine the degree to which the passive respondents generally indicate organizational attitudes similar to respondents and active nonrespondents (also see Table 1).

Procedure

Participants eligible for the initial survey were notified by an electronic messaging system sent to the commands that requested a point of contact (POC) to be designated to notify the selected personnel and asked them to voluntarily complete the online survey. The survey was accessible from July 8 to July 22, 2008 and only accessible

Table 1

Survey Item Contents and Anchors

Question	Survey	Anchors				
Core Item						
How often do you make physical fitness activity a part of your daily routine? *	Survey1 Survey2	Always	Sometimes	Rarely	Never	N/A
How often does your family participate with you in your physical fitness activities? *	Survey1 Survey2	Always	Sometimes	Rarely	Never	N/A
How often do you exercise with a friend or coworker? *	Survey1 Survey2	Always	Sometimes	Rarely	Never	N/A
Have you heard of the physical fitness initiative?	Survey1 Survey2	Yes	No	Don't Know		
Org Attitude						
This military has a great deal of personal meaning.*	Survey2	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
Feel like part of the family in this military.*	Survey2	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
Feel emotionally attached.*	Survey2	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
Could not be as attached to another organization.*	Survey2	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
Feel a strong sense of belonging in this military.*	Survey2	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree

Note. * Items were reverse scored for analysis purposes.

once by using the provided unique user names and passwords. Participants' unique user names were recorded by the system and used for limited purpose to ensure that only selected personnel complete the survey and to determine the nonrespondents to be invited in the follow-up survey. Usernames and password information were not included in the dataset provided to the researchers. The participants were informed that their responses would remain confidential, only be presented when statistically summarized with others, and not be attributable to individuals.

The follow-up survey was sent directly to those identified as nonrespondents in the initial survey via the U.S. mail system; the material included a request for participation, the paper-and-pencil survey, and a return envelope. The survey was administrated between September 2 and November 24, 2008. One follow-up reminder was mailed on September 11, 2008. Again, the participants were informed that their participation would be voluntary and their responses would be anonymous. The data collected contained no identifier.

Results

Of the 1,333 initial survey respondents, 49% were enlisted, 45% were on shore duty and 84% were male. Of the 605 follow-up surveys participants, 32% were enlisted and 54% were on shore duty when responding to the survey. The gender variable was not assessed in the follow-up survey.

Identifying Types of Nonresponse and Response

Among the 605 people who reported not responding to the initial survey, 15.5% claimed to have completed the initial survey and were classified as self-identified respondents. Of the pool, 81.8% reported not responding to the initial survey and were

then classified as nonrespondents. The rest who answered "Don't know" or responded with invalid answers were treated as missing data.

To better identify the categories of nonrespondents, a follow-up question, "Why didn't you complete the poll?" was asked with a reply option of "mark all that apply". Two trained raters categorized 143 of the 605 follow-up survey participants that indicated more than one response using the following rule. First, those who explained their nonresponse to the initial survey as "I did not want to take it," "I was concerned someone in my chain of command would see the answers," "I don't trust your organization to keep my answers confidential," "I dislike computer surveys," or "I don't believe that survey results are used to improve program/policies" were treated as active nonrespondents. Second, those who stated that "The survey Web page would not load," "The Web site was blocked due to security issues," or "I was deployed and could not access the website" were treated as nonrespondents due to technical issues. Third, those who remarked that "There are more important work demands on my time" were categorized as nonrespondents due to "workload". Fourth, those who answered that "I was on leave/TAD" were categorized as nonrespondents due to on-leave. Finally, those who replied "I was not told to complete the poll" were identified as nonrespondents due to noncontact. This process resulted in 27% of the nonrespondents being categorized as passive nonrespondents due to noncontact, 15.8% due to on-leave, 13.6% due to technical issues, and 4.8% due to high workload; 7.3% were active nonrespondents. Finally, 13.3% selected "other" were not the main focus of the current study and thus were recorded as missing data. Interrater reliability for the raters was Fleiss' *Kappa* = 1.00 ($p < .001$).

Hypothesis Testing

To test the hypotheses, Analysis of Variance (ANOVA) and Chi-square technique were applied. All analyses were conducted using SPSS 16.0.

Hypothesis 1a. Hypothesis 1a stated that, for each of the four core survey items, the mean responses from the four categories of different passive nonrespondents do not differ from active nonrespondents. An analysis of variance was conducted to compare the mean scores of the three ordinal core survey questions for the active nonrespondents against the four categories of passive nonrespondents. Based on the results of Levene's test, the assumption of homogeneity of variance for the following analysis of variance was violated; as a result, the Welch *F*-ratio was applied, a test that was also adopted for the analyses of variance for the rest of the hypotheses. Results indicated that there were significant differences among active nonrespondents and four types of passive nonrespondents for the three ordinal core survey questions, $F(4,48488.24) = 2467.68$, $p < .001$, $F(4,52983.88) = 1820.09$, $p < .001$, and $F(4,49448.47) = 2922.78$, $p < .001$, respectively.

Based on Tukey HSD post-hoc test, overall, active nonrespondents showed lower mean scores and medium to large negative effect sizes compared to the passive nonrespondents due to noncontact, on-leave, and technical issues as well as small negative effect sizes against the group of high workload (see Table 2). Also, active nonrespondents indicated significantly lower mean scores than the averages of all passive nonrespondents on the question regarding exercise as daily routine ($M = 3.39$, $SD = .60$), $t(21318.34) = -67.56$, $p < .001$, exercise with family members ($M = 1.80$, $SD = 1.23$), $t(23811.18) = -41.54$, $p < .001$, and exercise with co-worker ($M = 2.78$, $SD = .87$),

$t(22816.76) = -89.59$, $p < .001$. The results of Levene's Test for Equality of Variances were significant ($F = 3522.54$, $p < .001$, $F = 159.79$, $p < .001$, and $F = 1960.91$, $p < .001$, respectively), so the degrees of freedom were adjusted from 193551 to 21318.34, 23811.18, and 22816.76, respectively.

In terms of the categorical question asking if the individual had heard of the organization's physical fitness initiative, five pairs of comparisons between active nonrespondents and four types of passive nonrespondents as well as the total group of passive nonrespondents were performed, and a Bonferroni adjusted alpha level of .01 was adopted per pairwise comparison (.05/5). Results indicated that there were significant differences between the active nonrespondents and passive nonrespondents due to noncontact, $\chi^2(2, N = 101295.50) = 2260.78$, $p < .001$, active nonrespondents and passive nonrespondents due to on-leave, $\chi^2(2, N = 64269.39) = 7447.97$, $p < .001$, active nonrespondents and passive nonrespondents due to high workload, $\chi^2(2, N = 30211.40) = 5342.17$, $p < .001$, active nonrespondents and passive nonrespondents due to technical issues, $\chi^2(2, N = 55869.96) = 2205.01$, $p < .001$, as well as active nonrespondents and the total group of passive nonrespondents, $\chi^2(2, N = 193552.75) = 4869.27$, $p < .001$. In general, the above findings showed that active nonrespondents indicated various degrees of differences in the responses to core survey questions compared to all four categories of passive nonrespondents and thus, Hypothesis 1a was rejected.

Hypothesis 1b. Hypothesis 1b stated that each of the four survey items, the mean responses from the four categories of passive nonrespondents do not differ from the respondents. The mean scores of the three ordinal survey questions of the respondents were compared by an analysis of variance against the four categories of passive

Table 2

Mean Comparison of Core Survey Questions: Active vs. Passive Nonrespondents

	Active vs Noncontact				Active vs Onleave			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Core Survey Question								
How often do you make physical fitness activity a part of your daily routine?	-.51	.005	<.001	-.69	-.38	.005	<.001	-.47
How often does your family participate with you in your physical fitness activities?	-.38	.01	<.001	-.32	-.18	.010	<.001	-.14
How often do you exercise with a friend or coworker?	-.71	.007	<.001	-.77	-.61	.008	<.001	-.64

Note. Results were weighed based on the population of the military service. N_{active} = 19364, $N_{noncontact}$ = 81931, $N_{on\text{-}leave}$ = 44905, $N_{workload}$ = 10847, and $N_{tech\text{-}issue}$ = 36505.

Table 2

Mean Comparison of Core Survey Questions: Active vs. Passive Nonrespondents

	Active vs Workload				Active vs Tech issue			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Core Survey Question								
How often do you make physical fitness activity a part of your daily routine?	-.12	.008	<.001	-.14	-.50	.006	<.001	-.64
How often does your family participate with you in your physical fitness activities?	-.08	.015	<.001	-.07	-.76	.011	<.001	-.60
How often do you exercise with a friend or coworker?	-.22	.011	<.001	-.22	-.76	.008	<.001	-.85

Note. Results were weighed based on the population of the military service. N_{active} = 19364, $N_{noncontact}$ = 81931, $N_{on\text{-}leave}$ = 44905, $N_{workload}$ = 10847, and $N_{tech\text{-}issue}$ = 36505.

nonrespondents. Results showed that there were significant differences between respondents and the types of passive nonrespondents for the questions regarding exercise as daily routine $F(4,59006.29) = 3307$, $p < .001$, exercise with family members, $F(4,59780.29) = 1461.33$, $p < .001$, and exercise with a co-worker, $F(4,57882.45) = 1851.75$, $p < .001$.

According to Tukey HSD post hoc test, mean difference between respondents and passive nonrespondents due to noncontact for the question regarding exercise with family members was found not significant. Notably, respondents showed significantly higher scores compared to the nonrespondents due to high workload on the question regarding exercise as daily routine, exercise with family members, and exercise with a co-worker. On the other hand, respondents showed significantly lower scores than the group of noncontact on the question regarding exercise as daily routine and exercise with a co-worker, as well as than the group of having technical issues on all three ordinal core survey questions (see Table 3).

Interestingly, compared to the total group of passive nonrespondents, respondents indicated significantly lower mean scores than the averages of all passive nonrespondents on all the three ordinal core survey questions. Additional analysis was performed for the self-identified respondents. Unlike the respondents to the initial survey, the self-identified respondents that claimed their participation in the initial survey on the follow-up survey indicated significantly higher mean scores than the averages of all passive nonrespondents on the three ordinal core survey question regarding exercise as daily routine. As a result, the effect sizes detected between the respondents and the self-identified respondents are larger than those between the total of passive

nonrespondents and respondents as well as between the total of passive nonrespondents and self-identified respondents (see Table 4).

Furthermore, five pairs of comparisons between respondents and four types of passive nonrespondents as well as the total group of passive nonrespondents were conducted for the categorical question asking if the individual had heard of the organization's physical fitness initiative. A Bonferroni adjusted alpha level of .01 was adopted per pairwise comparison (.05/5). Results showed that there were significant differences between the respondents and passive nonrespondents due to noncontact, $\chi^2(2, N = 380221.51) = 409.18$, $p < .001$, respondents and passive nonrespondents due to on-leave, $\chi^2(2, N = 343195.40) = 4557.99$, $p < .001$, respondents and passive nonrespondents due to high workload, $\chi^2(2, N = 309137.41) = 3085.01$, $p < .001$, respondents and passive nonrespondents due to technical issues, $\chi^2(2, N = 334795.97) = 72.062$, $p < .001$, as well as respondents and the total group of passive nonrespondents, $\chi^2(2, N = 472475.76) = 719.70$, $p < .001$. In short, passive nonrespondents due to noncontact indicated some similarity of mean responses compared to those of the respondents, whereas other types of the passive nonrespondents showed mean differences from the respondents. Thus, Hypothesis 1b is partially supported.

Hypothesis 1c. Hypothesis 1c stated that for each of the four core survey items, the mean responses from the four categories of passive nonrespondents do not differ from each other. An analysis of variance was performed to compare the mean scores of the three ordinal core survey questions for the four types of passive nonrespondents: noncontact, on-leave, technical issues, and high workload.

Table 3

Mean Comparison of Core Survey Questions: Respondents vs. Passive Nonrespondents

	Respondents vs Noncontact				Respondents vs Onleave			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Core Survey Question								
How often do you make physical fitness activity a part of your daily routine?	-.22	.003	<.001	-.36	-.09	.003	<.001	-.14
How often does your family participate with you in your physical fitness activities?	-.003	.005	0.97	-.01	.20	.006	<.001	.16
How often do you exercise with a friend or coworker?	-.20	.003	<.001	-.23	-.10	.004	<.001	-.11

Note. Results were weighed based on the population of the military service. $N_{\text{respondent}}$ = 298291, $N_{\text{noncontact}}$ = 81931, $N_{\text{on-leave}}$ = 44905, N_{workload} = 10847, and $N_{\text{tech-issue}}$ = 36505.

Table 3

Mean Comparison of Core Survey Questions: Respondents vs. Passive Nonrespondents

	Respondents vs Workload				Respondents vs Tech issue			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Core Survey Question								
How often do you make physical fitness activity a part of your daily routine?	.17	.007	<.001	.26	-.21	.004	<.001	-.32
How often does your family participate with you in your physical fitness activities?	.30	.012	<.001	.29	-.39	.007	<.001	-.31
How often do you exercise with a friend or coworker?	.30	.009	<.001	.33	-.25	.005	<.001	-.30

Note. Results were weighed based on the population of the military service. $N_{\text{respondent}}$ = 298291, $N_{\text{noncontact}}$ = 81931, $N_{\text{on-leave}}$ = 44905, N_{workload} = 10847, and $N_{\text{tech-issue}}$ = 36505.

Table 4

Mean Comparison of Survey Questions: Respondents, Self-identified Respondents, &Total Group of Passive Nonrespondents

	Respondents vs Total Passive				Self-identified vs Total Passive			
	t	*df*	*p*	*d*	*t*	*df*	*p*	*d*
Core Survey Question								
How often do you make physical fitness activity a part of your daily routine?	-82.73	415055.57	<.001	-.26	95.21	63887.36	<.001	.51
How often does your family participate with you in your physical fitness activities?	-3.07	362981.74	0.002	-.02	44.07	56925.27	<.001	.24
How often do you exercise with a friend or coworker?	-58.65	369571.11	<.001	-.17	38.17	62802.10	<.001	.21

Note. Results were weighed based on the population of the military service. $N_{passive}$ = 174188, $N_{respondent}$ = 298291, $N_{self\text{-}identified}$ = 40948. Due to unequal variances based on the significant results of Levene's test Degrees of freedom were adjusted from 472477, 215134, and 339236, for the comparison of Respondents vs. Total Passive, Self-identified Respondents vs. Total Passive, and Respondents vs. Self-identified Respondents, respectively.

Table 4

Mean Comparison of Survey Questions: Respondents, Self-identified Respondents, &Total Group of Passive Nonrespondents

	Respondents vs Self-identified			
	t	*df*	*p*	*d*
Core Survey Question				
How often do you make physical fitness activity a part of your daily routine?	-148.59	59917.90	<.001	-.72
How often does your family participate with you in your physical fitness activities?	-47.16	50031.72	<.001	-.26
How often do you exercise with a friend or coworker?	-74.22	53940.03	<.001	-.38

Note. Results were weighed based on the population of the military service. $N_{passive}$ = 174188, $N_{respondent}$ = 298291, $N_{self\text{-}identified}$ = 40948. Due to unequal variances based on the significant results of Levene's test Degrees of freedom were adjusted from 472477, 215134, and 339236, for the comparison of Respondents vs. Total Passive, Self-identified Respondents vs. Total Passive, and Respondents vs. Self-identified Respondents, respectively.

With regard to the question about the frequency of physical fitness activity as a part of daily routine, results showed that there were significant differences among the types of passive nonrespondents, $F(3,42966.95) = 1684.84$, $p < .001$. The Tukey HSD test was applied for post-hoc comparisons. Specifically, nonrespondents due to noncontact and technical issues significantly showed the highest mean scores within the passive nonrespondents, while indicating very small differences from each other for the question regarding daily routine and exercise with a friend/co-worker and exercise with co-worker. The group having technical issues indicated highest scores within the passive nonrespondents on the question regarding exercise with family members. In addition, nonrespondents due to high workload indicated a significantly moderate to strong effect sizes compared to nonrespondents due to on-leave, technical issues, and noncontact. Similarly, passive nonrespondents showed significant differences for the question about the frequency of physical fitness activity with family members, $F(3,47924.58) = 1937.71$, $p < .001$, and for fitness activity with a friend or co-worker, $F(3,43409.23) = 1228.40$, $p < .001$. Again, the high workload group had a significantly lower score for these questions compared to the other types of passive nonrespondents (see Table 5).

For the categorical question asking if the individuals had heard of the organization's physical fitness initiative, six pairwise comparisons among four types of passive nonrespondents were conducted using a Bonferroni adjusted alpha level of .0083 per pairwise comparison (.05/6). Results indicated that all pair wise comparisons were significant, indicating that there were significant differences between the passive nonrespondents due to noncontact and on-leave, $\chi^2(2, N = 126835.89) = 4869.27$, $p < .001$, noncontact and high workload, $\chi^2(2, N = 92777.90) = 3775.48$, $p < .001$,

noncontact and technical issues, $\chi^2(2, N = 118436.46) = 235.82$, $p < .001$, workload and on-leave, $\chi^2(2, N = 5751.79) = 719.54$, $p < .001$, technical issue and on-leave, $\chi^2(2, N = 81410.35) = 2573.07$, $p < .001$, and technical issue and high workload, $\chi^2(2, N = 47352.36) = 2287.88$, $p < .001$. In summary, even though passive nonrespondents due to noncontact and technical issues indicated mean similarities on certain core survey questions, in most cases, different types of passive nonrespondents showed different levels of mean responses. Therefore, Hypothesis 1c is partially supported.

Hypothesis 2a. For each of the five organizational attitude survey items, the mean responses from the four categories of passive nonrespondents do not differ from that of the active nonrespondents. An analysis of variance was performed to compare the mean scores of the each of the five ordinal questions regarding organizational attitudes of the active nonrespondents against the four types of passive nonrespondents. Results showed that the mean differences among the active nonrespondents and four types of passive nonrespondents were significant for all five attitudinal questions, $F(4,50500.26) = 2780.05$, $p < .001$, $F(4,49750.87) = 3047.32$, $p < .001$, $F(4,56244.39) = 1518.43$, $p < .001$, $F(4,53341.97) = 1374.73$, $p < .001$, and $F(4,51397.19) = 2606.42$, $p < .001$, respectively.

Tukey HSD post-hoc test was applied to further identify the mean difference. In general, active nonrespondents showed medium to significantly large negative effect sizes compared to the four types of passive nonrespondents for the five organizational attitude questions. The exceptions (i.e., smaller effect sizes) occurred when active nonrespondents were compared to the group of passive nonrespondents having high workload for the questions regarding the organization's having personal meaning and feeling like part of the family in the military. An exception also occurred for the

Table 5

Mean Comparison of Core Survey Questions: among Passive Nonrespondents

	Noncontact vs Onleave				Noncontact vs Workload				Noncontact vs Tech issue			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Core Survey Question												
How often do you make physical fitness activity a part of your daily routine?	.13	.003	<.001	.21	.39	.006	<.001	.71	.01	.004	.015	.04
How often does your family participate with you in your physical fitness activities?	.21	.007	<.001	.17	.30	.012	<.001	.31	-.38	.008	<.001	-.31
How often do you exercise with a friend or coworker?	.11	.005	<.001	.11	.50	.009	<.001	.55	-.05	.005	<.001	-.06

Note. Results were weighed based on the population of the military service. $N_{\text{noncontact}} = 81931$, $N_{\text{on-leave}} = 44905$, $N_{\text{workload}} = 10847$, and $N_{\text{tech-issue}} = 36505$.

Table 5

Mean Comparison of Core Survey Questions: among Passive Nonrespondents

	Onleave vs Workload				Onleave vs Tech issue				Workload vs Tech issue			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Core Survey Question												
How often do you make physical fitness activity a part of your daily routine?	.26	.006	<.001	.42	-.12	.004	<.001	-.17	-.38	.006	<.001	-.64
How often does your family participate with you in your physical fitness activities?	.10	.013	<.001	.10	-.59	.009	<.001	-.46	-.69	.013	<.001	-.64
How often do you exercise with a friend or coworker?	.39	.009	<.001	.43	-.15	.006	<.001	-.18	-.55	.009	<.001	-.63

Note. Results were weighed based on the population of the military service. $N_{\text{noncontact}} = 81931$, $N_{\text{on-leave}} = 44905$, $N_{\text{workload}} = 10847$, and $N_{\text{tech-issue}} = 36505$.

comparison of the passive nonrespondents having technical issues for the question regarding not being able to become as attached to other organization (see Table 6).

Furthermore, active nonrespondents showed significantly lower mean scores than those of all passive nonrespondents on the question regarding the organization's having personal meaning (M = 3.93, SD = .93), t(22543.20) = 79.48, p < .001, feeling like part of the family in the military (M = 3.54, SD = 1.06), t(23212.95) = 89.98, p < .001, feeling emotionally attached to the military (M = 3.18, SD = 1.18), t(23881.88) = 76.33, p < .001, not being able to become as attached to other organizations (M = 2.77, SD = 1.14), t(24365.50) = 67.42, p < .001, and feeling a strong sense of belonging (M = 3.49, SD = 1.03), t(22820.68) = 91.04, p < .001. Notably, the degrees of freedom were adjusted from 197101 to 22543.20, 23212.95, 23881.88, 24365.50 and 22820.68, respectively, due to the results of Levene's Test as Equality of Variances were significant (F = 8406.80, p < .001, F = 2992.78, p < .001, F = 1181.35, p < .001, F = 575.70, p < .001, and F = 6303.25, p < .001, respectively). Given the above, the active nonrespondents were found indicating less positive organizational attitudes comparing to all four categories of passive nonrespondents; Hypothesis 2a, therefore, was rejected.

Hypothesis 2b. Hypothesis 2b stated that for each of the five organizational attitude survey items, the mean responses from the four categories of passive nonrespondents do not differ from that of the self-identified respondents. An analysis of variance was conducted to compare the mean scores of the five organizational attitude questions of the self-identified respondents to those of the four types of passive nonrespondents. Results showed that there were significant differences among the self-identified respondents and the types of passive nonrespondents for all five

Table 6

Mean Comparison of Organizational Attitude Questions: Active vs. Passive Nonrespondents

	Active vs Noncontact				Active vs Onleave			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Organizational Attitude								
The military has a great deal of personal meaning	-.80	.008	<.001	-.71	-.79	.008	<.001	-.68
Feel like part of the family in the military	-.88	.008	<.001	-.74	-.97	.009	<.001	-.82
Feel emotionally attached	-.79	.009	<.001	-.62	-.72	.010	<.001	-.57
Could not be as attached to other org	-.65	.009	<.001	-.55	-.67	.010	<.001	-.58
Feel a strong sense of belonging in the military	-.97	.008	<.001	-.82	-.97	.009	<.001	-.79

Note. Results were weighed based on the population of the military service. N_{active} = 20160, $N_{noncontact}$ = 88975, $N_{on\text{-}leave}$ = 42733, $N_{workload}$ = 10847, and $N_{tech\text{-}issue}$ = 34388.

Table 6

Mean Comparison of Organizational Attitude Questions: Active vs. Passive Nonrespondents

	Active vs Workload				Active vs Tech issue			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Organizational Attitude								
The military has a great deal of personal meaning	-.28	.012	<.001	-.27	-.74	.009	<.001	-.63
Feel like part of the family in the military	-.30	.013	<.001	-.26	-.88	.010	<.001	-.71
Feel emotionally attached	-.75	.014	<.001	-.78	-.70	.011	<.001	-.52
Could not be as attached to other org	-.51	.014	<.001	-.51	-.45	.010	<.001	-.37
Feel a strong sense of belonging in the military	-.78	.013	<.001	-.71	-.70	.009	<.001	-.54

Note. Results were weighed based on the population of the military service. $N_{\text{active}} = 20160$, $N_{\text{noncontact}} = 88975$, $N_{\text{on-leave}} = 42733$, $N_{\text{workload}} = 10847$, and $N_{\text{tech-issue}} = 34388$.

organizational attitude questions $F(4,57337.57) = 1277.42$, $p < .001$, $F(4,56214.45) = 1183.26$, $p < .001$, $F(4,64083.36) = 96.71$, $p < .001$, $F(4,60238.36) = 1013.10$, $p < .001$, and $F(4,58321.79) = 578.76$, $p < .001$. Tukey HSD post hoc test was conducted to further identify the mean differences.

Based on the Tukey HSD post hoc test, self-identified respondents showed significantly higher scores on the question regarding the organization's having personal meaning and feeling like part of the family in the military compared to the passive nonrespondents due to high workload, and slightly lower mean scores than the passive nonrespondents due to noncontact, on-leave, and technical issues. Also, self-identified respondents showed slightly higher scores in comparison to the passive nonrespondents due to technical issues on the question regarding individual's strong sense of belonging and lower than the groups of on-leave and noncontact, while showing no mean differences against the group of having high workload. Furthermore, self-identified respondents had higher scores on the question regarding individuals not being able to become as attached to other organizations compared to all types of passive nonrespondents. Although self-identified respondents also indicated highest score on the question regarding their feeling emotionally attached to the military compared to all subgroups of passive nonrespondents, the effect sizes were relatively small (see Table 7).

Compared to the averages of all passive nonrespondents, self-identified respondents also showed different patterns of mean comparisons depending on the question contents. Although the mean differences are small, self-identified respondents indicated significantly lower mean scores ($M = 3.89$, $SD = 1.17$, $M = 3.37$, $SD = 1.24$, and $M = 3.35$, $SD = 1.35$, respectively) than the averages of all passive nonrespondents on the

questions regarding the organization having personal meaning (M = 3.93, SD = .93), t(42525.55) = -5.40, p < .001, feeling like part of the family in the military (M = 3.54, SD = 1.06), t(43977.41) = -27.21, p < .001, and feeling a strong sense of belonging (M = 3.49, SD = 1.03), t(41857.20) = -17.47, p < .001. On the other hand, self-identified respondents indicated significantly higher mean scores (M = 3.30, SD = 1.29, and M = 3.16, SD = 1.22, respectively) than the averages of all passive nonrespondents on the questions regarding individual's feeling emotionally attached to the military (M = 3.18, SD = 1.18), t(45547.85) = 15.89, p < .001, and not being able to become as attached to other organization (M = 2.77, SD = 1.14), t(46082.02) = 54.54, p < .001. The degrees of freedom were adjusted from 210907 to 42525.55, 43977.41, 41857.20, 45547.85 and 46082.02, respectively, due to the results of Levene's Test for Equality of Variances were significant (F = 5043.73, p < .001, F = 2861.72, p < .001, F = 7271.26, p < .001, F = 1003.04, p < .001, and F = 184.57, p < .001, respectively). In conclusion, despite the different question contents introducing different patterns of mean comparison, self-identified respondents, on the whole, showed differences in organizational attitudes compared to all four types of passive nonrespondents. Hypothesis 2b was thus rejected.

Hypothesis 2c. Hypothesis 2c stated that for each of the five organizational attitude survey items, the mean responses from the different categories of passive nonrespondents do not differ from each other. An analysis of variance was performed to compare the mean scores of the five questions regarding ordinal organizational attitudes from the four types of passive nonrespondents: noncontact, on-leave, technical issues, and high workload. Results indicated that there were significant mean differences among the four types of passive nonrespondents for all five attitudinal questions, F(3,44707.48)

Table 7

Mean Comparison of Organizational Attitude Questions: Self-identified Respondents vs. Passive Nonrespondents

	Self-identified Respondents vs Noncontact				Self-identified Respondents vs Onleave			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Organizational Attitude								
The military has a great deal of personal meaning	-.08	.006	<.001	-.08	-.07	.007	<.001	-.07
Feel like part of the family in the military	-.19	.007	<.001	-.17	-.28	.008	<.001	-.24
Feel emotionally attached	.09	.008	<.001	.08	.15	.009	<.001	.12
Could not be as attached to other org	.35	.007	<.001	.29	.32	.008	<.001	.29
Feel a strong sense of belonging in the military	-.20	.007	<.001	-.17	-.20	.008	<.001	-.17

Note. Results were weighed based on the population of the military service. $N_{\text{self-identified respondent}}$ = 33966, $N_{\text{noncontact}}$ = 88975, $N_{\text{on-leave}}$ = 42733, N_{workload} = 10847, and $N_{\text{tech-issue}}$ = 34388.

Table 7

Mean Comparison of Organizational Attitude Questions: Self-identified Respondents vs. Passive Nonrespondents

	Self-identified Respondents vs Workload				Self-identified Respondents vs Tech issue			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Organizational Attitude								
The military has a great deal of personal meaning	.43	.011	<.001	.45	-.02	.007	.023	-.02
Feel like part of the family in the military	.39	.012	<.001	.35	-.19	.008	<.001	-.15
Feel emotionally attached	.12	.013	<.001	.12	.17	.009	<.001	.13
Could not be as attached to other org	.49	.013	<.001	.49	.54	.009	<.001	.44
Feel a strong sense of belonging in the military	-.004	.012	.997	<.001	.08	.008	<.001	.05

Note. Results were weighed based on the population of the military service. $N_{\text{self-identified respondent}}$ = 33966, $N_{\text{noncontact}}$ = 88975, $N_{\text{on-leave}}$ = 42733, N_{workload} = 10847, and $N_{\text{tech-issue}}$ = 34388.

= 1701, $p < .001$, $F(3,43392.34) = 1387.97$, $p < .001$, $F(3,52254.92) = 46.50$, $p < .001$, $F(3,47802.88) = 329.02$, $p < .001$, and $F(3,45823.13) = 659.34$, $p < .001$, respectively. Tukey HSD test was further performed to identify the mean difference in particular.

Interestingly, findings clustered based on the questions asked. First of all, passive nonrespondents due to high workload showed significantly lower means for the question regarding the organization having personal meaning and feeling like part of the family in the military than the other types of passive nonrespondents with strong effect sizes. The mean difference was not significant between the passive nonrespondents due to noncontact and on-leave for the question regarding the organization having personal meaning, as well as between noncontact and those having technical issues for the question asking if they feel like part of the family in the military. The rest of the pair wise comparisons indicated very small but significant mean differences among noncontact, on-leave, high workload, as well as having technical issues for these two questions (see Table 8).

For the question asking if the individual feels emotionally attached to the military, unlike previous two organizational questions, the results showed little but significant mean differences with very small effect sizes for all pair wise comparisons among the four types of passive nonrespondents (also see Table 8). For the questions asking if the individual could not become as attached to other organizations, passive nonrespondents due to noncontact showed small but significant mean difference compared to the group of on-leave, while high workload showed small but significant mean difference against the group of having technical issues. In terms of the question regarding feeling a strong sense of belonging to the military, passive nonrespondents due to noncontact showed no mean

differences compared to the group of on-leave; also, high workload showed very small though significant mean difference against the group of having technical issues. The rest of pair wise comparisons indicated small mean differences with small effect sizes, $p < .001$, $d < .24$ (also see Table 8).

In summary, passive nonrespondents, particularly those due to noncontact and on-leave, may generally show more similar organizational attitudes among themselves than active nonrespondents and self-identified respondents. Depending on question content, however, passive nonrespondents due to high workload and technical issues may show various degrees of differences in their organizational attitudes compared to the other passive nonrespondents. Given the above, Hypothesis 2c was partially rejected.

Discussion

The current study focused on assessing the potential different impacts of survey nonresponse bias in the military, reflected in four contextual reasons of passive nonresponse: due to noncontact, on-leave, high workload, and technical, and comparing these different types of passive nonrespondents to active nonrespondents and respondents to evaluate the magnitude of nonresponse bias. Such research may help organizations determine if passive nonrespondents should be treated as a group similar to respondents and different from active nonrespondents, as well as if the level of nonresponse bias introduced by these different types of passive nonrespondents may be comparable enough to allow them to be treated as one single group. Based on the above results, several conclusions may be drawn.

Table 8

Mean Comparison of Organizational Attitude Questions: among Passive Nonrespondents

	Noncontact vs Onleave				Noncontact vs Workload				Noncontact vs Tech issue			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Organizational Attitude												
The military has a great deal of personal meaning	.01	.005	.263	.01	.51	.009	<.001	.64	.06	.006	<.001	.06
Feel like part of the family in the military	-.09	.006	<.001	-.08	.58	.010	<.001	.58	.004	.007	.936	.01
Feel emotionally attached	.06	.007	<.001	.05	.03	.010	.057	.05	.08	.008	<.001	.06
Could not be as attached to other org	-.03	.007	<.001	-.02	.14	.012	<.001	.15	.19	.007	<.001	.16
Feel a strong sense of belonging in the military	.001	.006	.999	<.001	.20	.01	<.001	.24	.28	.006	<.001	.24

Note. Results were weighed based on the population of the military service. $N_{\text{noncontact}} = 81931$, $N_{\text{on-leave}} = 44905$, $N_{\text{workload}} = 10847$, and $N_{\text{tech-issue}} = 36505$.

Table 8

Mean Comparison of Organizational Attitude Questions: among Passive Nonrespondents

	Onleave vs Workload				Onleave vs Tech issue				Workload vs Tech issue			
	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*	M_1-M_2	*SE*	*p*	*d*
Organizational Attitude												
The military has a great deal of personal meaning	.50	.01	<.001	.60	.05	.007	<.001	.05	-.45	.01	<.001	-.52
Feel like part of the family in the military	.66	.01	<.001	.67	.09	.008	<.001	.08	-.58	.01	<.001	-.54
Feel emotionally attached	-.03	.01	<.001	-.03	.02	.009	<.001	.02	.05	.013	<.001	.05
Could not be as attached to other org	.17	.012	<.001	.17	.22	.008	<.001	.18	.05	.013	<.001	.05
Feel a strong sense of belonging in the military	.20	.011	<.001	.23	.28	.007	<.001	.24	.08	.010	<.001	.07

Note. Results were weighed based on the population of the military service. $N_{\text{noncontact}} = 81931$, $N_{\text{on-leave}} = 44905$, $N_{\text{workload}} = 10847$, and $N_{\text{tech-issue}} = 36505$.

Passive vs. Active Nonrespondents

The intention of Hypotheses 1a and 2a was to confirm the findings from the literature (Rogelberg et al., 2003) that the group of passive nonrespondents may show more differences compared to the group of active nonrespondents in terms of the survey variable outcomes. Given the results above, active nonrespondents were found to be different from all types of passive nonrespondents on both the way they answered the core survey items and their attitudes toward the organization. A conclusion can be reached that the data from the current study supported the hypotheses and enhanced the literature findings that active nonrespondents and passive nonrespondents may indeed differ in the level of impacts on nonresponse bias and the quality of survey data (Groves et al., 2009).

In general, passive nonresponents indicated higher mean scores in the core survey items measured in the current study and also showed more positive organizational attitudes than the active nonrespondents. Therefore, it may be crucial for nonresponse survey researchers to investigate how large the proportion of active as well as passive nonresponse is within the study sample to help estimate the relative impact on data generalizability. For instance, if the proportion of active nonrespondents is relatively small, then the nonresponse bias generated by the active nonrespondents may be limited and thus may be ignored when considering data adjustment or manipulation.

Passive vs. Respondents & Self-identified Respondents

Hypothesis 1b was intended to confirm the findings from the literature that the group of passive nonrespondents may show similarity to the respondents in terms of the survey variable outcomes and organizational attitudes (Rogelberg et al., 2003). Results,

however, generally did not support the hypothesis. Respondents exhibited small effect sizes of mean comparisons against the passive nonrespondents due to on-leave and small to moderate effect sizes against the passive nonrespondents due to high workload and technical issues group on all ordinal core survey items. Small to moderate effect sizes were also found when respondents were compared to the passive nonrespondents due to noncontact on two out of three ordinal core survey items. These results suggest a need for further research into the inconsistency of the findings in the previous literature. In short, passive nonrespondents may potentially introduce nonresponse bias and thus developing participant recruiting strategies to reduce the amont of passive nonrespondents may show its effect on improving data quality and representativeness.

Furthermore, the magnitudes of the effect sizes related to the mean comparisons between the respondents and passive nonrespodents appeared to be smaller than those between the respondents and active nonrespondents. A conclusion may be drawn that the level of impact on nonresponse bias due to passive nonrespondents may be smaller than for the active nonrespondents. Interestingly, when comparing respondents to all nonrespondents, the corresponding effect sizes were even smaller than those between the respondents and passive nonrespodents. This finding once again supports the argument that passive and active nonrespondents should be viewed as two different groups; otherwise, the estimated nonresponse bias would be misleading.

Hypothesis 2b focused on the issue of whether the group of passive nonrespondents may show more similarity to the self-identified respondents in organizational attitudes. The results indicated that such similarity was only partially supported by the data. Depending on the types of questions, self-identified respondents

showed small to medium effect sizes of mean comparisons to the four different groups of passive nonrespondants. The finding thus suggested that passive nonrespondents may potentially show differences in organizational attitudes compared to the respondents – if self-identified respondents are the same group as the respondents.

Interestingly, additional results indicated that respondents and self-identified respondents may not be identical. For example, respondents and self-identified respondents seemed to show different effect sizes on the core survey questions when compared to the passive and active nonrespondents. Although the question of whether self-identified respondents and the respondents indicate similar organizational attitudes remains unanswered, the results suggested that future research will be needed to determine if passive nonrespondents may indicate differenct organizational attitudes compared to the respondents. From the perspective of research design, the finding also questioned the efficacy of using data from self-identified respondents to estimate those from the real respondents. Similarly, the finding also raised a question regarding the validity of adopting the concept of "anticipated" passive and active nonrespondents as anticipated passive and active nonrespodents may not be the same group of the real passive and active nonrespodents (Rogelberg et al., 2000; Rogelberg et al., 2003).

Types of Passive Nonrespondents

Hypotheses 1c and 2c were intended to test if it is reasonable to treat the passive nonresponse as a uni-dimensional variable; and were only partially supported by the results. More specifically, passive nonrespondents due to noncontact and technical issues may be more similar to how they answered the core survey items as well as how they view their organization. This finding contradicted to the statement that passive

nonrespondents due to noncontact are different from those nonrespondents with technical/ability constraints (Groves, 2006; Groves et al., 2009; Iarossi, 2006; Miles et al., 2002).

In terms of orgnizational attitudes, few differences were found between the noncontact and on-leave groups. On the other hand, passive nonrespondents due to high workload generally showed large differences in terms of the way they answered the core survey questions and their organizational attitudes compared to the other types of passive nonrespondents. Depending on the question content, the group having high workload and technical issues may indicate similar organizational attitudes. Thus, findings regarding orgnizational attitudes agreed with the statement of Groves (2006) and Miles et al. (2002). In short, even though passive nonrespondents, except those having high workload issues, may overall indicate similar organizational attitudes, the degree to which they introduce nonresponse bias may vary by the reason for nonresponse.

Given the above, traditional view of treating passive nonresponse as a uni-dimentional variable and assuming that passive nonresponse due to the various contextual reasons may all reflect a similar degree of nonresponse bias may be problematic. Findings from the current study provided evidence to support the argument of Rogelberg et al. (2003) that there is indeed a need to explore the subclasses of nonresponse within the passive and active nonrespondents. As a result, it may be important for the survey researchers to recognize that passive nonresponse may be a multi-dimenitonal issue and the effect of each sub-class of passive nonresponse on data representitiveness should be considered when applying data adjustment or manipulation to compensate for nonresponse bias.

Interaction between Survey Content and Types of Respondents

Results from the current research indicated that the impact of nonresponse bias may be a product of the interaction between the content of a survey item and the type of nonresponse. For example, with respect to the question regarding exercise with family members, the noncontact and technical issues groups showed a moderate mean difference, whereas very limited differences were found for the other two ordinal core survey questions. On the other hand, the on-leave group showed more similarity with the high workload group for the question regarding exercise with family members, while indicating moderate differences on the other two ordinal core survey questions. As suggested by Rogelberg et al. (2000), nonresponse bias may be contextually driven. The quality of survey data can be affected by the design of survey questions (Fowler, 1995). In addition, because the three ordinal core survey questions asked about the frequency of getting fitness activity, it is reasonable to believe that the passive nonrespondents due to high workload would not have much spare time for physical exercise and thus responded to these questions with the lowest compared to the other types of passive nonrespondents. Also, for the questions regarding organizational attitudes, passive nonrespondents due to on-leave were to found score the highest. This result may be because military personnel may develop a stronger emotional attachment to the organization while they are away from their work duty. Further research is needed to determine how survey content and question types may interact with the types of passive nonrespondents by utilizing more validated survey items in different topics.

Limitations and Suggestions

Because the current study used cross-sectional data from a single organization survey, there are several reasons to be tentative about the conclusions. Limitations of existing research and recommendations for future academic research are addressed below. First, several limits can be addressed due to the use of a follow-up survey as the research method. The response rate of 28% for the follow-up survey seemed low. Yet, this rate approached the typical response rate acquired from other Department of Defense surveys (i.e., about 28 to 30%; see Moradi, 2010; Uriell et al., 2007). Also, a low response rate does not necessarily imply that the survey lacks generalizability (Groves, 2006; Krosnick, 1999). For example, by analyzing 235 survey estimates from 30 articles with a mean nonresponse rate of 35%, Groves (2006) found that low nonresponse rate by itself did not predict nonresponse bias.

Based on the assumption of simple random sampling with equal response probabilities, such low response rate issues may be corrected by adopting weighting techniques to adjust survey outcomes based on the ratio of respondents and the research population (Little & Vartivarian, 2005; Mason et al., 2002; van Goor & Stuiver, 1998). The current study employed weights based on the enlisted/officer status of initial nonrespondents (who did not participate in the initial survey), and applied the weights to the follow-up survey outcomes to estimate the representativeness of the total nonrespondents to adjust survey outcomes for the purpose of data representativeness as addressed previously. Nonetheless, whether the data acquired from the respondents in the initial survey as well as passive and active nonrespondents through the follow-up survey is truly representative to the total population remained unanswered.

In addition, a follow-up survey would not allow the researcher to acquire any information for those who participated in neither the initial nor the follow-up survey. In the case of the current study, approximately 43% of the selected individuals did not respond to the initial or the follow-up survey, after illegible surveys and selected individuals who could not be located for the follow-up survey were eliminated. This study thus failed to provide further investigation into this group of nonrespondents and the relative magnitude of nonresponse bias, which should supposedly be the main focus of a nonresponse bias study but the most difficult group to be reached. Future survey researchers may adopt both database approach as well as the follow-up survey approach to capture the true nonrespondents. Particularly, a researcher may incorporate the database approach such as gathering baseline data about the population from an across organizational census.

Also, because no follow-up surveys were sent to the initial respondents, the question remained unanswered whether any response differences are not due to the time lag as the follow-up survey was administered at a later date. To answer this question, future research should also include the initial respondents in the follow-up survey to investigate the time effect. Furthermore, this study did not acquire other demographical variables such as gender, race, age, or education background or education level as covariates to examine the potential moderating effects. Future studies may utilize the database approach by linking to other archival databases or design a follow-up survey that includes such variable to allow demographic analysis.

Secondly, the surveys adopted in the current research were not originally designed for the purpose of studying nonresponse bias. As a result, these surveys limited the

number of core survey questions to be assessed to provide more sufficient information to support the statement of conclusion. Also, the lack of questions regarding organizational attitudes in the initial survey limited the opportunity to examine the corrosponding data for the real respondents but only allowed to gather information from the self-identified respondents. However, it is possible to believe that self-identified respondents may differ from the real respondents in their organizational attitudes given the differences in the way they answered the core survey items as discovered previously. An improvement on research method with more systematic-designed validated core survey questions may be considered in the future.

Also, future researchers may examine how different types of questions interact with the types of nonrespondents, such as sensitive questions about financial status or additive behaviors. A researcher can also look into how the degree of interaction between the types of questions and types of nonrespondents may correlate the level of nonresponse bias. For example, an experimental design study may be considered to study if neutral questions that indicate lower level of interaction may contribute to lower level of mean differences across different types of non/respondents, compared to questions that indicate higher level of interaction such as questions assessing an individual's attitudes toward surveys. It may also be interesting to investigate if different types of passive and active nonrespondents differ in various organizational dimensions, such as commitment, job satisfaction, tenure, leadership, stress level, fatigue, and work life balance.

Furthermore, results found in the current study may generalize better for military organizations. To the extent that military organizations differ from other organizations, however, results may not generalize equally across all organizational contexts. Depending

on the type of industry an organization is in, the types and proportion of passive and active nonrespondents may differ from those in a military setting. As a result, the impacts of passive and active nonrespondents on data representativeness and nonresponse bias may be contextual driven in terms of industry and organization types. For some specific organizations, a researcher may consider to investigate if there are different types of passive nonrespondents other than those due to noncontact, on-leave, high workload, and technical issues impacting nonresponse bias. In addition, a researcher may find the proportion of active nonrespondents is dramatic enough to further examine the subclasses of active nonrespondents and the corresponding level of impact on nonresponse bias.

Conclusion

Nonrespondents remain as one of the most challanging groups to be studied. In the current study, a follow-up survey approach allowed the researcher to identify the types of passive nonrespondents and assess the potential differences compared to active nonrespondents and survey respondents in terms of their answers to core survey items as well as attitudes toward the organization. Results suggested that it may be beneficial for survey researchers to frequently conduct a follow-up survey to determine the proportion of each nonresponse group as well as their relative impacts on nonresponse bias. Accordingly, data adjustment or manipulation may be applied to efficiently improve data representativeness.

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