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BERT WEIJTERS

Bert.Wejters@vlerick.com

ELKE CABOOTER

NIELS SCHILLEWAERT

Niels.Schillewaert@vlerick.com

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BERT WEIJTERS

Vlerick Leuven Gent Management School

ELKE CABOOTER

Ghent University

NIELS SCHILLEWAERT

Vlerick Leuven Gent Management School

Contact:

Bert Weijters

Vlerick Leuven Gent Management School

Tel: +32 09 210 98 76

Fax: +32 09 210 98 75

Email: Bert.Weijters@vlerick.be

ABSTRACT

Questionnaires using Likert-type rating scales are an important source of data in marketing research. Researchers use different rating scale formats with varying numbers of response categories and varying label formats (e.g., 7-point rating scales labeled at the endpoints, fully labeled 5-point scales, etc.) but have few guidelines when selecting a specific format. Drawing from the literature on response styles, we formulate hypotheses on the effect of the labeling of response categories and the number of response categories on the net acquiescence response style, extreme response style and misresponse to reversed items. We test the hypotheses in an online survey (N=1207) with eight experimental conditions and a follow-up study with two experimental conditions (N = 226). We find evidence of strong effects of scale format on response distributions and misresponse to reversed items, and we formulate recommendations on the choice of a scale format.

Keywords: Rating scale format; Response styles; Number of response categories; Response category labels.

1. INTRODUCTION

A great deal of what we know about consumers is based on questionnaire data. When creating questionnaires, researchers face several design-related choices. One such choice concerns the format of rating scales used to administer Likert items (e.g., a five point rating scale where 1 = “strongly disagree” and 5 = “strongly agree”). The choice for a particular rating scale format can be broken down into two major components: the number of response categories to be offered, including the choice for an odd or even number of categories, and the labeling of response categories. Marketing researchers use different Likert formats to administer marketing scales. Commonly used formats include those with five, six or seven categories, either fully labeled (i.e., all response categories are explicitly labeled) or labeled at the extremes (e.g., labeling the first category with “strongly disagree” and the last category with “strongly agree”) (Bearden & Netemeyer, 1999; Bruner, James, & Hensel, 2001). Table 1 provides an overview of formats that are regularly used in marketing research, based on an analysis of the scale formats used in the marketing scale inventory by Bruner et al. (2001) and research published in the International Journal of Research in Marketing between 2004 and 2009.

Insert Table 1

Self-report measurement quality remains an ongoing concern (e.g., Rossiter, 2002; Sharma & Weathers, 2003; Strizhakova, Coulter, & Price, 2008), but the choice of a specific format appears to receive relatively little attention in marketing research. However, the rating scale format might affect the quality of questionnaire data. Greenleaf (1992a) suggested that response category labels and the number of response categories may influence the level of response bias and called for further research on the matter. However, specific evidence of response bias due to the scale format remains scarce in the marketing literature (see Weathers, Sharma & Niedrich 2005 for a notable exception). An important reason for this gap is that most research on response styles has focused on only a single response scale format. For example, Arce-Ferrer (2006) use 7-point Likert scales with endpoint labels; Baumgartner and Steenkamp (2001) and De Jong, Steenkamp, Fox, and Baumgartner (2008) use 5-point fully labeled Likert scales; Greenleaf (1992a) uses 6-point Likert scales with endpoint labels. As a consequence, it is not clear how response styles differ across the response scale formats used in these studies. This issue is of importance, as there is no complete standardization in terms of response scale formats across studies in marketing research (although two formats are dominant; cf. Table 1) and cross-study comparability and generalizability are at stake.

To address this issue, the current study compares some of the most commonly used response scale formats in terms of three key response biases: net acquiescence response style (NARS), extreme response style (ERS), and misresponse to reversed items (MR)[1]. We focus on NARS, ERS, and MR because they bias observed means, variances and internal consistencies of scales, three parameters that are generally of interest in marketing research.

2. CONCEPTUAL BACKGROUND

2.1. RESPONSE STYLES

The central tendency of rating scale measures is directly influenced by a directional bias called Net Acquiescence Response Style (NARS; Greenleaf 1992a; Baumgartner & Steenkamp, 2001; Rossi, Gilula, & Allenby, 2001). This response style concerns the extent to which respondents tend to show greater acquiescence (tendency to agree) rather than disacquiescence (tendency to disagree) with items, irrespective of content. Extreme response style (ERS) is defined as the tendency to disproportionately use the extreme response categories in a rating scale (Greenleaf 1992a, b; Baumgartner & Steenkamp, 2001). ERS affects the spread in observed data (Baumgartner & Steenkamp, 2001; Greenleaf 1992a; Rossi, Gilula, & Allenby, 2001).

[1] In the current article, we do not include Midpoint Response Style (e.g., Weijters, Schillewaert & Geuens 2008) because we study the effect of including (or omitting) a midpoint.

To counter the effect of NARS, the use of balanced scales has been suggested (Paulhus, 1991)[2]. A balanced scale contains reversed items, that is, items that are coded in the opposite direction of their non-reversed counterparts (e.g., “I feel sad” would be a reversed item measuring happiness). Unfortunately, respondents often show a particular bias when responding to such items, in that they often respond in the same direction to two items that are opposite in meaning, that is, agree to an item and its reversal or disagree to an item and its reversal. This bias is labeled as a misresponse to reversed items (MR). A growing body of evidence indicates that MR cannot be equated with NARS (Wong, Rindfleisch, & Burroughs, 2003; Swain, Weathers, & Niedrich, 2008; Weijters, Geuens, & Schillewaert, 2009).

2.2. RESPONSE STYLES AND SCALE FORMAT

Exploratory research suggests that the scale format influences response styles. For example, Hui and Triandis (1989) illustrate how different formats yield response distributions that are substantially different in shape irrespective of content. Though intriguing in many respects, previous studies on the relationship between response styles and response formats are limited for one or several of the following reasons.

First, some studies use secondary data in which content and format are confounded to an unknown extent (e.g., Alwin & Krosnick, 1991; Andrews, 1984). Furthermore, we are not aware of studies that have related different formats to a broad set of response styles that capture biases in terms of central tendency (NARS), spread (ERS), and internal consistency (MR). Finally, student samples may be inappropriate for studying response styles, as young adults with a high level of education typically show lower levels of several response styles (Narayan & Krosnick,

[2] Contrary to NARS, ERS cannot be corrected for in advance (i.e., during scale construction). However, techniques have been developed to correct for response styles statistically, e.g., the procedures by Baumgartner and Steenkamp (2001) or Greenleaf (1992a), and the new improved technique to convert ERS by De Jong et al. (2008).

1996; Greenleaf, 1992a; Marín, Gamba, & Marín, 1992; Knauper, 1999; Mirowsky & Ross, 1991).

In summary, evidence on the relation between scale formats and response styles is far from conclusive. Nevertheless, there are good theoretical reasons to expect such a relation. Most research on response styles has focused on differences between individuals or groups of individuals (e.g., Baumgartner & Steenkamp 2001; De Jong et al., 2008; Greenleaf, 1992a, b; Rossi et al., 2001). There is consensus, however, that response styles are a function not only of individual characteristics but also of the stimuli, that is, the questionnaire items and format (Baumgartner & Steenkamp, 2001; Paulhus, 1991). In previous work, researchers have made conjectures about such effects (e.g., Greenleaf, 1992a) and Arce-Ferrer (2006) recently provided evidence that the perceived meaning of response categories plays a key role in response styles.

3. HYPOTHESIS DEVELOPMENT

According to Tourangeau, Rips, and Rasinski (2000), respondents perform a set of cognitive processes when answering questionnaire items: (1) comprehension (they attend to the question and interpret it), (2) retrieval (they generate a retrieval strategy and then retrieve relevant beliefs from memory), (3) judgment (they integrate the beliefs into a conclusive judgment), and (4) response (they map the judgment onto the available response categories and answer the question). Response-style bias can occur as a result of problems during one or more of these processes (Krosnick, 1991; Swain et al., 2008). In the current study, we focus on the response process because the translation of a judgment into an answer clearly depends on the response categories provided, that is, the format of the scale (Tourangeau et al., 2000).

We construct our hypotheses around two main mechanisms through which formats affect response styles. First, different response scale formats imply differences in the perceived meaning and salience of response categories, thus changing the chance of their being selected (Arce-Ferrer, 2006; Schaeffer & Presser, 2003). Second, response scale formats vary in the extent to which they force ambivalent and indifferent or truly neutral respondents to choose sides when responding; this has an effect on response distributions (Nowlis, Khan, & Dhar, 2002).

We study the labeling of response categories and the number of response categories offered. As for labeling, we center our attention on the two most common approaches (cf. Table 1): labeling all response categories versus labeling the endpoints only (Hippler & Schwarz, 1987, p. 111). As for the number of response categories, we include the two most popular formats, 5- and 7-point scales (cf. Table 1). To assess the impact of a midpoint, we also include 4-point and 6-point scales in our study. Accordingly, and in line with recent methodological research in this area (Lozano, Garcia-Cueto, & Muñiz, 2008), we limit the current study to scale formats using 4 points to 7 points[3]. For conceptual and analytical reasons, we classify the different numbers of response categories along two orthogonal dimensions, "midpoint inclusion" and "gradations of (dis)agreement" as follows: 4-point scale = no midpoint, 2 gradations of (dis)agreement; 5-point scale = midpoint, 2 gradations of (dis)agreement; 6-point scale = no midpoint, 3 gradations of (dis)agreement; and 7-point scale = midpoint, 3 gradations of (dis)agreement. In what follows, we formulate hypotheses concerning the effect of the scale format characteristics on NARS, ERS, and MR.

3.1. LABELING OF RESPONSE CATEGORIES (ALL OR ENDPOINTS ONLY)

Using endpoint labels without intermediary labels makes it easier to construct a rating scale, as only two labels have to be formulated. Also, this format seems intuitively more in line with an interval scale assumption. On the other hand, formats with all categories labeled facilitate interpretation both by respondents and

[3] We note that binary response formats may also be common, especially in (psychological) research using Item Response Theory. However, the focus of the current article is on Likert scales.

researchers (Wildt & Mazis, 1978). A fully labeled format is also associated with higher reliability (Alwin & Krosnick, 1991; Krosnick, 1991; Weng, 2004). However, this increase in reliability may be partially due to response style bias (Greenleaf, 1992a).

When all response options are verbally labeled, the intermediate options are more salient. Respondents use the meaning of the labels that are provided to them when mapping judgments to response scales (Rohrmann, 2003; Wegner, Faulbaum, & Maag, 1982; Wildt & Mazis, 1978). Salient options will attract more responses due to their increased accessibility (Posavac, Sanbonmatsu, & Fazio, 1997; Posavac, Herzenstein, & Sanbonmatsu, 2003); as a result, respondents tend to be attracted to labeled points (Krosnick & Fabrigar, 1997).

Labels denoting (dis)agreement make the valence of a negative/positive response more explicit. As respondents have a desire to show agreeableness (Schuman & Presser, 1981; McClendon, 1991), the clarity and salience of full labeling is likely to reinforce the felt pressure to agree. As a result, the response distribution may shift to the positive side as a result of full labeling.

H1: Labeling all response categories leads to higher levels of NARS.

In line with this, when the intermediate options become more salient through full labeling, we expect a shift towards those intermediate categories at the expense of the extreme categories (Simonson, 1989). In contrast, using verbal labels only for the endpoints attracts respondents to the endpoint categories (Krosnick & Fabrigar, 1997). Hence, we hypothesize:

H2: Labeling all response categories leads to lower levels of ERS.

When all response categories are verbally labeled, the meaning of each response category to the respondent is less ambiguous than in situations where only end labels are provided (Lazovik & Gibson, 1984). For the latter, respondents need to figure out the meaning of the intermediate response categories to determine the option that comes closest to expressing their opinion. In doing so, respondents can attach different meanings to the same response option (Arce-Ferrer, 2006; Schaeffer & Presser, 2003; Schwarz et al., 1991). For instance, with a 4-point scale with the end labels fully disagree/fully agree, the second option in the row can get the meanings “slightly disagree”, “disagree”, or even “agree”. With labels for the end points only, selecting the right response option will be more challenging when respondents need to make up the right meaning for each response category (Krosnick, 1991). Because reversed items are generally more difficult to answer (Steenkamp & Burgess, 2002; Swain et al., 2008), this extra amount of cognitive difficulty at the response phase will increase the level of MR. Conversely, a fully labeled version enhances interpretation and facilitates response (Rohrmann, 2003); as a result, it will be clearer to respondents that two same direction responses to reversed items are inconsistent.

H3: Labeling all response categories leads to lower levels of MR.

3.2. MIDPOINT

The issue of whether or not to offer a midpoint has been disputed for decades (e.g., Converse & Presser, 1986; Garland, 1991; Moser & Kalton, 1972; O’Muircheartaigh et al., 2000). The major argument in favor of offering a midpoint simply states that respondents with a truly neutral stance need to have the possibility of choosing the middle option and not to be forced to choose a polar alternative (Schuman & Presser, 1981). Offering a midpoint allows respondents to indicate neutrality or ambivalence and makes people more comfortable when selecting a response option (Nunnally, 1967). Opponents argue that the midpoint is an easy way out for respondents, leaving them the possibility to avoid thinking about the issue (Converse & Presser, 1986). Following this line of reasoning, omitting the midpoint would increase data quality (Klopfer & Madden, 1980).

The midpoint attracts truly neutral/indifferent respondents on the one hand and ambivalent respondents on the other hand (Nowlis et al., 2002). Both types of respondents will be forced to choose an option when no midpoint is offered (Schuman & Presser, 1981). Because neutral or indifferent respondents do not hold strong positive or negative evaluations, they are unlikely to experience task-related distress when they are forced to choose. As a result, when no midpoint is offered, these respondents will randomly shift their response in either direction to the closest category. For these respondents the omission of a midpoint will leave the distribution unaffected (Parducci, 1965; Presser & Schuman, 1980).

Ambivalent respondents, on the other hand, do hold strong beliefs at both ends of the scale. For them, the midpoint response is the result of their inability or unwillingness to make the required trade-offs to choose sides (Nowlis et al., 2002). According to Nowlis et al. (2002), respondents who are forced to choose sides will make use of heuristics in order to reduce the conflict. Consequently, ambivalent respondents will focus on the most important attribute of the evaluation object. This means that the direction of the distribution can be either positive or negative or remain unaffected.

However, both Velez and Ashworth (2007) and O'Muircheartaigh (2000) have found a disproportional movement of negative answers to the midpoint when it was provided. This phenomenon can be explained by the negative affect induced by the task. When the midpoint is omitted, the frustration for being forced to choose may bring along task-related negative affect. It is noted that these negative affective reactions to conflicting situations often produce negativity dominance, meaning that when thoughts are conflicting, negative thoughts tend to become more salient and dominant (Dhar, 1997; Rozin & Royzman, 2001; Schimmack & Colcombe, 2002). As a result, unless evaluation objects have a dominant attribute that is positively or negatively evaluated and that can be easily used for heuristic processing, ambivalent respondents will tend to react negatively in the absence of a midpoint. We thus hypothesize that when no midpoint is offered, ambivalent respondents (and approximately half of the indifferent respondents) will tend to express disagreement, whereas they would have selected the midpoint if it had been offered. As a consequence, we expect a higher level of NARS when a midpoint has been added because of the disproportional decrease in negative answers compared to positive answers. We also expect a decrease in ERS, as ambivalent respondents who would have selected the extreme alternatives when the midpoint is omitted (Nowlis et al., 2002) will opt for the midpoint if it is provided.

H4: NARS increases when adding a midpoint.

H5: ERS decreases when adding a midpoint.

In the case of an even-numbered format, truly neutral respondents will randomly shift between positive and negative response options. They will probably do so for nonreversed items as well as for reversed items related to the same topic. Consequently, there is more chance that these respondents will contribute to a higher level of MR. As stated earlier, ambivalent respondents experience negative affect in absence of a midpoint and consequently tend to respond negatively. If this happens in response to both a nonreversed item and a reversed item related to the same topic, MR will result. We thus hypothesize:

H6: MR decreases when adding a midpoint.

Note that we expect ambivalent respondents to disagree to both an item and its reversal; we will refer to this as negative MR.

3.3. GRADATIONS OF (DIS)AGREEMENT

Previous research has provided recommendations on the optimal number of response categories drawing from a diversity of theories. From an information theory perspective, it has been suggested that a scale range must be refined enough to allow for maximal information transmission (Cox, 1980; Garner, 1960). In this tradition, Green and Rao (1970) dismiss the use of two to three response categories, favoring the use of six or 7-point scales instead, as these formats perform well in recovering continuous latent variables.

Subject-centered research has demonstrated that respondents may not optimally use some response formats for reasons that are mainly cognitive and/or motivational in nature (Krosnick, 1991; Hippler & Schwarz, 1987; Weathers et al., 2005). Studies in the subject-centered tradition with a focus on cognitive limitations have tried to identify the optimal number of response categories based on reliability measures, often finding higher reliability with an increasing number of response alternatives (e.g., Chang, 1994; Matell & Jacoby, 1971; Preston & Colman, 2000). However, the increase in reliability might be merely due to response styles (Cronbach, 1950; Greenleaf, 1992a; Peabody, 1962).

From a motivational perspective, respondents want to meet expectations set by the survey situation and provide information to the researcher. The availability of extra response categories allows respondents to differentiate their responses within the range of responses that express agreement or disagreement (Krosnick, 1991). By doing so, respondents can qualify the strength of their opinion (Ghiselli, 1939). Respondents will consequently bring more variation in their answers, but the valence of the answer will not change. In other words, negative answers will vary in their level of being negative but will not become positive, and positive items will vary in their level of being positive but will not become negative (Marsh & Parducci, 1978). As a result, we do not expect that an increasing number of gradations will lead to a difference in NARS or in MR as such. However, due to the higher variation in the intermediate response range, we do expect a decrease in the level of ERS (Hui & Triandis, 1989).

H7: ERS decreases when more gradations of (dis)agreement are offered.

3.3.1. Labeling and midpoint

When the midpoint is present, full labeling is likely to affect both NARS and ERS. The hypothesized impact of the midpoint on NARS varies according to whether respondents interpret the midpoint for what it stands, that is, the neutral point. Such an interpretation of the midpoint is more likely when the midpoint is labeled. In a fully labeled scale, the midpoint and the intermediate options become more salient. These effects will reinforce the decrease in ERS. We thus hypothesize:

> H8: The full labeling of the response categories strengthens the positive effect of offering a midpoint on NARS.

> H9: Full labeling of the response categories strengthens the negative effect of offering a midpoint on ERS.

As stated earlier, when the midpoint is offered, MR will decrease, as the midpoint will attract respondents who otherwise might have misresponded (Velez & Ashworth, 2007). When the scale is fully labeled, it will become more readily apparent that one is responding inconsistently to a reversed item (Rohrmann, 2003). Consequently, we hypothesize:

> H10: The full labeling of the response categories strengthens the negative effect of inclusion of a midpoint on MR.

3.3.2. Gradations and midpoint

When a midpoint category is present, an increase in the number of gradations is likely to affect its perceived width. The provision of more intermediate categories around the midpoint reduces the size of the middle category, as it stimulates respondents to express their attitude even if their attitude is only slightly positive or negative (Weems & Onwuegbuzie, 2001; Matell & Jacoby, 1972). Some indifferent respondents – who would normally choose the middle position – now opt for one of the nearby categories. These respondents will be randomly distributed across the negative and positive sides, leaving the level of NARS unaffected (Parducci, 1965). As discussed, adding more gradations and adding a midpoint both reduce ERS. The reason is that non-extreme options attract respondents who might otherwise have responded extremely. Because fewer respondents opt for the extreme options when more gradations are provided, we expect that the negative effect of offering a midpoint on ERS will be smaller than when only few response options are provided. As both effects draw from the same pool of otherwise extreme respondents, we expect that the effects offset one another:

> H11: The presence of a midpoint offsets the negative effect of adding more gradations of (dis)agreement on ERS.

The reduction in perceived width of the middle response category in scales with more gradations will probably lead to more MR. Because more respondents do make a choice, they can make processing errors and respond wrongly on a reversed item. As a result, we expect that including a midpoint does lead to a decrease in MR but that this decrease will be lower when there are more response options. In particular, this implies that 7-point scale formats show higher MR than that shown by 5-point scale formats.

> H12: Adding more gradations reduces the negative effect of offering a midpoint on MR

3.3.3. Gradations and labeling

As discussed, in a fully labeled scale, the salience of the intermediate options results in lower levels of ERS and higher levels of NARS. For NARS, we do not expect an interaction effect of labeling and gradations, as adding extra response categories does not change the valence of the answers (Marsh & Parducci, 1978). On the other hand, adding more gradations will lead to a decrease in ERS. However, this effect is likely different according to the degree of labeling. In a fully labeled scale, we expect the decrease of ERS, due to the addition of extra response options, to be weaker when compared to an endpoint-only setting. The reason is that in a fully labeled scale, some of the respondents already shifted their responses towards the more salient intermediate response categories.

> H13: Fully labeling scales weakens the negative effect of adding more gradations of (dis)agreement on ERS.

We do not expect that adding extra gradations has an unconditional direct effect on MR. However, we do expect such an effect for scales with endpoint labels. A fully labeled scale makes all response options salient and clear for the respondent, which facilitates responding (Rohrmann, 2003). In the case of an endpoint-only format, we expect an increase in MR when more gradations of (dis)agreement are offered. When extra response options are added in an endpoint-only setting, respondents need to put more cognitive effort in both attaching meanings to the extra response options and keeping these meanings in mind. The resulting cognitive resources limitation is likely to result in MR (Swain et al., 2008).

> H14: In formats with labels for the endpoints only, adding more gradations of (dis)agreement leads to an increase in MR

4. METHODOLOGY

4.1. EMPIRICAL STUDY 1

4.1.1. Design

To test our hypotheses, we conducted an online survey, orthogonally manipulating the labeling of the response categories (either only the extreme response categories were labeled or all response categories were labeled) and the number of response categories (4 to 7). The response category labels were the Dutch back-translated equivalents of “strongly disagree” (“Helemaal niet akkoord”), “disagree” (“Niet akkoord”), “slightly disagree” (“Eerder niet akkoord”), “neutral” (“Neutraal”), “slightly agree” (“Eerder akkoord”), “agree” (“Akkoord”), and “strongly agree” (“Helemaal akkoord”). In the fully labeled conditions with only 4 or 6 categories, the neutral category was dropped. In the fully labeled conditions with 4 and 5 categories, we also dropped the categories “slightly agree” and “slightly disagree”. The respondents were randomly assigned to the conditions. This resulted in the following cell counts. All labeled: 4-point (N=137), 5-point (N=153), 6-point (N=143), 7-point (N=150). Extreme categories labeled: 4-point (N=175), 5-point (N=156), 6-point (N=154), 7-point (N=139).

4.1.2. Sample

The sample was randomly drawn from all Dutch-speaking men on the panel of an Internet market research company in Belgium, who are representative of local Internet users. Only men were invited to participate because of reasons not related to this study but to the questionnaire of which the current items were part. A total of 1,207 people responded (response rate = 27%). The ages ranged from 15 to 65 years with a median of 49. In our sample, 42.2% of respondents did not have any formal education after secondary school, while 57.8% did.

4.1.3. Instrument

The questionnaire consisted of two parts, one including items to measure MR and an intention measure to be used for illustrative purposes, and the other part designed to measure NARS and ERS. The first set of questions consisted of multi-item measures for three constructs, containing both reversed and non-reversed items. A specific brand in the GPS product category was used as the study topic. We included the following three reversed item pairs to calculate the level of misresponse (Bearden & Netemeyer, 1999): (a) "Compared to other products, this product is important to me" and "I am not interested in this product"; (b) "I love this brand" and "I find this a very bad brand"; (c) "This brand really resonates with me" and "In no case would I use this brand". Each item pair was used to compute an indicator of MR. Specifically, the MR score for a reversed item pair was 1 for a respondent who responded positively or negatively to both items (before reverse coding the item responses) and 0 otherwise (Swain et al., 2008). This operation resulted in three MR indicators, labeled a, b, and c. The intention items included to illustrate the impact of response bias were "I would like to try this product", and "Next time I make a purchase in this product category, I will consider the product that was shown".

The second part of the questionnaire consisted of items that were included with the specific aim of measuring NARS and ERS. In particular, we randomly sampled 21 items from as many unrelated marketing scales in Bearden and Netemeyer (1999) and Bruner et al. (2001). We thus made sure that the contents of these items had no substantial true correlations. This was confirmed by the low inter-item correlations, ranging from .03 to .10 across conditions. As the items were randomly sampled from existing marketing scales, they were highly heterogeneous, and 21 items could be reasonably assumed to be sufficient to validly measure NARS and ERS (Greenleaf, 1992b; Weijters et al., 2008).

To create measures of NARS and ERS, we used log odds. The odds refer to the ratio of the probability that the event of interest occurs to the probability that it does not, and are often estimated by the ratio of the number of times that the event of interest occurs to the number of times that it does not (Bland & Altman, 2000). An important advantage of using odds-based measures of NARS or ERS is that it facilitates interpretation and that it does not require an assumption of interval measurement level of the rating scales (which is a requirement when using means or measures that capture the deviation from the midpoint, for example). Sample odds ratios are limited at the lower end, as they cannot take on negative values, but not at the upper end, resulting in a skewed distribution. However, the log odds ratio can take any value and has an approximately normal distribution centered around zero (Bland & Altman, 2000). NARS was computed as the log odds of the number of agreements plus one over the number of disagreements plus one (the ones were added to avoid zero values):

$$\text{NARS} = \ln((\text{\# agreements}+1) / (\text{\# disagreements}+1)), \tag{1}$$

where ln indicates the natural logarithm and # (dis)agreements stands for a count of the items to which a positive (negative) response was given. Similarly, ERS was computed as the log odds of the number of extreme responses plus one over the number of non-extreme responses. Extreme responses were defined as responses in the most positive and the most negative categories:

$$\text{ERS} = \ln((\text{\# extreme responses} + 1) / (\text{\# non-extreme responses} + 1)). \tag{2}$$

NARS and ERS had a range from -3.09 (which corresponds to ln(1/22) for respondents who did not engage in NARS or ERS) through 3.09 (which corresponds to ln(22) for respondents who answered all items positively or extremely). An NARS (ERS) value of zero indicates that a respondent gave as many positive (extreme) responses as negative (non-extreme) responses. The correlation between NARS and ERS was -.08 (p = .004).

To assess concurrent validity, we estimate the correlation between our proposed NARS measure and the traditional NARS measure based on the mean of the items, as well as the correlation between our proposed ERS measure and the traditional ERS measure based on the standard deviation of the items (Greenleaf, 1992a; Baumgartner & Steenkamp, 2001). Because the traditional measures are specific to scale formats, we average the correlations of the new and traditional measures across the eight experimental conditions. For NARS the correlation is .74, for ERS the correlation is .78. Hence, the shared variance (i.e., r^2; Fornell & Larcker, 1981) exceeds 50% in both cases, providing evidence in support of concurrent validity of the proposed measures.

4.1.4. Findings

Figure 1 shows the model we test. In line with Weijters, Geuens, & Schillewaert (in press b), we create three indicators for NARS and three indicators for ERS by splitting the items in three groups (items 1, 4, 7... for group 1; items 2, 5, 8... for group 2, etc.). As a result, we can model NARS and ERS as two latent factors with three scale level indicators each, thus accounting for unique variance in the response style indicators due to content specificity and random error. MR is modeled as a latent factor with three binary indicators: each indicator is based on one reversed item pair and takes on a value of 0 if no MR occurs for this item pair and a value of 1 if MR does occur for this item pair[4].

Insert Figure 1

We code the experimental variables as follows. The labeling manipulation is used as the grouping variable (group one contains the conditions where only the extremes are labeled, group two contains the conditions where the response categories are fully labeled). The manipulations related to the number of scale points (gradations and midpoint) are coded by means of effect-coded variables. For gradations, we create a variable that takes on a value of -1 for conditions with 2

[4] We verified that using a summated score for MR gave parallel results and led to the same substantive conclusions.

gradations of (dis)agreement and a value of 1 for conditions with 3 gradations of (dis)agreement. For the midpoint, we create a variable that takes on a value of -1 if no midpoint is present and a value of 1 if a midpoint is present. We also include a contrast variable to account for the gradation by midpoint interaction, coding the 7-point condition as 1 and the other formats as -1/3. This variable thus captures the effect (not explained by the main effects) of simultaneously having 3 gradations and a midpoint (i.e., a 7-point scale). The coding scheme is summarized in Table 2.

Insert Table 2

We specify NARS, ERS, and MR as latent factors with three indicators each. The NARS, ERS, and MR factors are regressed on the experimental variables. The regression weights capture the effects of increasing the number of gradations to 3 and of including a midpoint, or both, relative to the grand mean and while controlling for the other experimental manipulations.

Group differences in the NARS, ERS, and MR intercepts reflect the effect of labeling. We assess the labeling effects by means of Wald chi^2 tests (testing the hypothesis of a null effect). For the hypothesis tests, we use alpha=0.05 as the threshold for statistical significance, but we do report exact p-values for completeness. We estimate the model with the WLSMV estimator in Mplus 5.1 (Muthén & Muthén, 2007). As respondents were randomly assigned to groups, the measurement parameters (factor loadings, indicator residuals and indicator intercepts) were set to equality across groups (extremes labeled versus all labeled).

The model fits the data acceptably well ($chi^2(57) = 107.71$, $p = .0001$; CFI = .952; TLI = .953; RMSEA = .038). All indicators have substantial and highly significant standardized factor loadings (.589, .577, .573 for NARS; .806 .835, .831 for ERS; .428, .855, .842 for MR[5]; all $p<.001$), indicating that the multiple indicators for each response style indeed tap into a common underlying dimension. In other words, the convergent validity of the multiple indicators per response style is supported. The

[5] As pointed out by the Area Editor, it is interesting to see that the loading of the first indicator (a) on MR is smaller than the other two. Indicator a refers to the product, while b and c are about the brand.

variance explained (R^2) by the experimental variables is 11.3% for ARS, 15.3% for ERS, and 45.2% for MR. The observed proportions of MR are shown in Table 3. The model estimates are shown in Table 4.

Insert Tables 3 and 4

By means of Wald chi² group-difference tests, we test for group differences in regression weights (i.e., moderating effects of labeling). We set invariant regression weights to equality across groups (i.e., the estimates are equal for the extremes labeled group and the fully labeled group; cf. Table 4). In particular, the three-way interactions of labeling, gradations and midpoint were not significant for NARS ($chi^2(1) = 0.02$, $p = 0.893$), ERS ($chi^2(1) = .99$, $p = .320$), and MR ($chi^2(1) = .02$, $p = .881$). The same is true for the two-way interactions of labeling with gradations on NARS ($chi^2(1) = .04$, $p = .834$), the two-way interaction of labeling with midpoint on NARS ($chi^2(1) = .33$, $p = .567$) (as a result, no evidence is found in support of H8), and the two-way interaction of labeling with midpoint on ERS ($chi^2(1) = 1.25$, $p = .263$) (therefore, no evidence is found in support of H9).

Insert Table 5

The group differences in the intercepts of NARS, ERS, and MR represent the effect of labeling. The intercepts of group one (extremes labeled) are zero as to the model specification, so the t-test of the intercepts in group two (all labeled) provide a test of the labeling effect. The intercept estimates are shown in the lower rows of Table 4. Labeling has a significant effect on all three dependent variables and leads to higher NARS (H1), lower ERS (H2), and lower MR (H3).

The inclusion of a midpoint leads to a significant increase in NARS (H4) and a significant decrease in ERS (H5) (cf. Table 4). The decrease in ERS is smaller when the inclusion of the midpoint is combined with an increase in the number of gradations from 2 to 3 (H11). Adding the midpoint leads to lower MR (H6). As expected, we found more negative MR (39%) than positive (2%) (binomial test $p < .001$). In line with H10, the reduction in MR due to the inclusion of a midpoint is significantly stronger in the fully labeled conditions (the parameter estimates are significantly different across groups: Wald $chi^2(1) = 13.31$, $p = .0003$; cf. Table 5). Also, the decrease in MR due to the inclusion of the midpoint is weaker when the there are 3 gradations (H12).

Increasing the number of gradations from 2 to 3 does not affect NARS, but results in a significant decrease in ERS (H7; cf. Table 4), and this effect is stronger in the extremes labeled conditions (H13) (the parameter estimates are significantly different across groups: Wald $chi^2(1) = 6.12$, $p = .013$; cf. Table 5). Increasing the number of gradations increases MR but only so in the condition with the extremes labeled (H14): the effect is non-significant in the fully labeled condition (cf. Table 4), and the parameter estimates are significantly different across groups (Wald $chi^2(1) = 4.39$, $p = .036$; cf. Table 5).

4.1.5. Impact of format on intention measures

If an analyst would want to report the trial and purchase intentions of a product, s/he might use the percentage of respondents agreeing with intention items as a simple and efficient statistic. To make the impact of the format manipulation and the resulting differences in response distributions tangible, Table 6 presents the percentage of respondents agreeing with two intention items. As shown in Table 7, the distributions were significantly affected by the labeling and inclusion of a midpoint but not the addition of a gradation of (dis)agreement. Depending on the scale format used, estimates of the percentage of responders agreeing with the intention items varied between 22.6% and 60.6%. This finding succinctly demonstrates the danger of interpreting item scores in an absolute way. The results in Table 6 also illustrate the relevance of the effects observed in the main study: conditions associated with higher NARS indeed result in higher proportions of respondents expressing a positive intention.

Insert Tables 6 and 7

4.1.6. Discussion Study 1

This first study demonstrates that the scale format components labeling and the number of response categories affect NARS, ERS, and MR. The main conclusion is thus that empirical results based on different scale formats may not be comparable. Also, interpreting levels of agreement with Likert items in an absolute sense (e.g., "the majority of respondents agree") is necessarily a tentative exercise at best.

The current practice is validated to some extent by our findings, in that formats with an even number of categories are hardly used in practice and also perform poorly in terms of MR in the current study. However, the default format in marketing scales, that is, the 7-point scale with labels at the extremes, does not necessarily provide the best data quality. The problem associated with this scale format is the higher level of MR compared to the 5-point scale.

Researchers evaluating the results of Study 1 may look for better alternatives than the default 7-point scale with labels at the endpoints by reasoning as follows. The results indicate that a 5-point scale with labels at the extremes results in better data quality, as it leads to lower MR. Labeling all response options would further decrease MR. Our results show that labeling also results in higher NARS, but, in the absence of a criterion measure, it is not clear to what extent this is problematic. To address the latter issue, that is, whether or not all response categories should be labeled, we set up an additional study.

4.2. EMPIRICAL STUDY 2

We set up Study 2 to investigate labeling effects more closely for 5-point scale formats. Note that labeling all response categories is more common for this number of response categories than for formats with any other number of categories (see Table 1).

4.2.1. Design and sample

We conducted an additional online survey among a sample of British respondents. For this study, we focused on 5-point scales only and manipulated the labeling of the response categories at two levels (only the extreme response categories were labeled or all response categories were labeled). The response category labels were “strongly disagree”, “slightly disagree”, “neutral”, “slightly agree” and “strongly agree”. We randomly assigned respondents to the two conditions (N = 113 for the all labeled condition; N = 113 for the extremes labeled condition). The sample was randomly drawn from all UK residents on the panel of an Internet marketing research company. Ages ranged from 18 through 85, with a median of 55 years (SD = 14.5). In our sample, 32.7% of respondents were female, and 65.5% had attended college or university.

4.2.2. Instrument

The questionnaire was inspired by Greenleaf’s (1992a) work and contained questions related to 10 diverse but common behaviors. The intentions related to all behaviors were measured on a percentage scale and used the question “How likely is it that you will do the following activities at least once during the next 2 weeks? Please give a number from 0% to 100%”. Here, 0% means “definitely not” (i.e., there is no chance I will do this the next two weeks) and 100% means “definitely will” (i.e., it is certain that I will do this activity in the next two weeks)”. This question is concrete and specific, and uses a format that has an objective meaning (probabilities) and that is clearly different from the Likert scales. For these reasons, we assume that the data obtained with this measure do not share substantial method bias with attitudinal Likert scales (Greenleaf, 1992a; Rindfleisch et al., 2008).

Later in the questionnaire, the attitude towards each behavior was probed with a 5-point Likert item and the following question: “Please indicate to what extent you (dis)agree with the following statements. In general, I like to….” Here, the following behaviors are subsequently listed: go shopping; go to a restaurant; invite friends at my place; attend a concert; go for a walk; go to the gym; play computer game(s); communicate online with friends (chat, e-mail, Facebook); go to the cinema; go to a bar to have a drink with friends. The average inter-item correlation across behaviors was .21 for the intention items and .18 for the attitude items, indicating that the activities were heterogeneous.

4.2.3. Findings and discussion: The effect of labeling on attitude-intention models

We relate intentions measured on a percentage scale to attitudes measured on 5-point Likert scales that either have all categories labeled or only the extremes labeled. This allows us to study how labeling affects model estimates in simple regression models of a type that is quite common in marketing research. The findings from Study 1 provide some hypotheses on how model estimates may be biased.

Consider a simple linear regression where intention on a percentage scale is regressed on attitude on a 5-point scale. As the intention scale is the same across conditions, differences in model estimates can be attributed to the attitude measurement effects. We expect that attitude measures in the fully labeled condition show higher NARS. This could translate in higher observed attitude means and/or lower intention intercepts (Greenleaf, 1992a). The reason for the latter is that the attitude responses will be inflated relative to the intention scores; a negative shift in intercept compensates for this. Attitude measures in the endpoints-labeled condition are expected to show higher ERS, and we thus expect higher attitude variances in this condition. A key question that relates to this but that is not addressed in Study 1 is which of the two formats shows better criterion validity. Better criterion validity would appear in a higher regression weight and higher explained variance.

We study several behaviors' attitude-intention pairs. In the questionnaire, 10 were included. A preliminary analysis shows that for one behavior, "go to a restaurant", the intention score is significantly different across conditions ($t(224) = -2.139$, $p = .034$). As this suggests that the two random samples coincidentally differ in terms of this behavior, we omit this attitude-intention pair for further analysis, leaving us with nine pairs. We verify that the nine remainder intention measures are invariant across conditions in terms of means, variances and covariances. This seems to be the case, as the nested chi square invariance tests are all insignificant: $chi^2(9) = 8.21$, $p=.513$ for the means, $chi^2(9)=13.28$, $p = .150$ for the variances, and $chi^2(36)=34.94$, $p = .519$ for the covariances. As a result, any subsequent violation of cross-group invariance in the model can be attributed to the responses to the attitude questions.

In the model of interest, every intention item is regressed on its related attitude item. The attitude items correlate freely, as do the residual terms of the intention items. Using this model, we can investigate whether the difference in the labeling of the attitude items affects model estimates.

Insert Table 8

The unconstrained model fits the data well (see the unconstrained model in Table 8), and we use this unconstrained model as the reference model against which we test invariance restrictions. The invariance restrictions test the hypotheses that parameter estimates are the same in the two conditions (all categories labeled versus extremes labeled). In the first model ("attitude means"), the chi-square difference test tests the null hypothesis that the means of the nine attitude items are equal across the two experimental conditions. This hypothesis is not rejected ($p = .284$). The subsequent tests (also using the unconstrained model as the reference model) indicate that invariance is rejected for the attitude variances, the intention intercepts and the regression weights from attitude to intention items (all $p < .05$). The model estimates for the latter parameters (that are not the same across conditions) are shown in Table 9. The data are coded as follows: “Strongly disagree” = -2; “Slightly disagree” = -1; “Neutral” = 0; “Slightly agree” = 1; “Strongly agree” = 2. Consequently, the intercept term is the expected intention score corresponding to a neutral attitude. The last four columns of Table 9 contain an index based on the ratio of the estimate in the condition with all categories labeled over the estimate in the extremes-labeled condition.

Insert Table 9

With one exception, the regression weights in the extremes condition are greater than the regression weights in the all condition. The R^2 estimates are consistently greater in the extremes condition. The intercepts are greater in the extremes condition for 7 out of 9 behaviors[6]. The variances are greater in the extremes condition for 6 out of 9 behaviors. Overall, these results support the notion that the attitude measures in the all-labeled condition show higher NARS and lower ERS.

Importantly, the explained variance, which indicates criterion validity, is consistently and substantially higher in the extremes condition. The averaged model implied regression slopes are shown in Figure 2, illustrating the higher intercept and slope for the extremes condition. In sum, the results of this follow-up study indicate that the extremes-only scale format performs better than the fully labeled scale format in terms of criterion validity.

Insert Figure 2

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[6] We note that the intention intercept test is more sensitive than the attitude means test (as attitude serves as a covariate of the experimental effect for the former).

5. GENERAL DISCUSSION

Marketing researchers use questionnaires with Likert-type rating scales in order to understand, explain and predict the behavior of respondents. However, researchers often use different rating scale formats with varying numbers of response categories and labels. This article examines the effects of these scale format characteristics on the response distributions and the level of MR in order to provide better insight in the optimal scale format choice.

In Study 1, we experimentally manipulated the rating scale format of items, varying the number of the response categories from 4 to 7, and the labels of the response categories (all-labeled versus endpoints-only). Our results demonstrate significant effects of scale format characteristics on NARS, ERS, and MR, and thereby shed light on the processes that are involved in such effects.

NARS is higher in conditions where all response categories are labeled. We attribute this effect to the clarity of a fully labeled version, which strengthens the effect of positivity bias (Tourangeau et al., 2000). A fully labeled scale format also leads to lower ERS scores due to the increased salience and attractiveness of the intermediate options. In addition, labeling all response categories leads to less MR, as it reduces cognitive load in that it clarifies the meaning of unlabeled response categories (Krosnick, 1991; Swain et al., 2008).

Including a neutral point leads to an increase in NARS due to a disproportional movement of otherwise negative responses to the midpoint. Ambivalent respondents who are forced to take sides tend to react negatively (Gilljam & Granberg, 1993). This finding is in concordance with the findings of Nowlis et al. (2002) in that the distribution shift is evoked by ambivalent respondents. However, it is not only the focus on the most important attribute that determines the choice of response category; the task-related negative emotions also play an important role.

The inclusion of a midpoint also results in lower levels of ERS and MR, and MR is even lower for scales with a midpoint when all response categories are labeled. In contrast with our expectations, the effect of including a midpoint on NARS and ERS was not strengthened by full labeling. It is possible that the strong main effects leave little room for establishing an interaction effect and/or that the mechanisms truly are additive rather than interactive.

Adding gradations of (dis)agreement does not affect NARS and MR, as the addition of extra response categories will not change the valence of the respondent's response choice (Marsh & Parducci, 1978). When only the endpoints are labeled, adding gradations leads to higher MR, due to the ambiguous meanings of the intermediate response categories for this scale format. Furthermore, MR increases with an increasing number of gradations conditional on the presence of a midpoint. Adding gradations of (dis)agreement offers the possibility to better qualify the strength of a response and reduces ERS. This effect is mitigated when all response categories are labeled or when a midpoint is present.

Study 2 focused on the effect of labeling response categories on criterion validity in simple linear regressions. Findings replicate Study 1 in that a fully labeled scale format led to higher NARS and lower ERS. More importantly, we find that criterion validity was higher in the labeled endpoints condition, meaning that the latter provided better data for estimation of linear models. It should be noted that Study 2 is only a first, preliminary study into the criterion validity effects of labeling. We discuss some suggestions for further research in the last section of this paper.

5.1. IMPLICATIONS

It is clear that scale format characteristics affect the central tendency, spread and internal consistency of self-report data. Consequently, data obtained with different formats are not comparable, and interpretations of Likert data are always relative: the probability that respondents agree with an item depends on how such agreement can be expressed. In setting up studies, researchers need to make a well-considered choice for a specific format, and they need to explicitly report this choice.

Meta-analyses need to take into account response format as a factor influencing estimates.

The practice of reporting survey results by means of percentages of respondents who agree with a statement ("top two boxes" or "top three boxes") has to be treated with great caution. As shown in Table 6, the percentage of respondents with positive trial and purchase intentions varied widely across formats (from 22.6% through 60.6%). Additionally, for regressions, differences in format lead to differences in model estimates and model fit. As shown in Table 9, formats with endpoint labels resulted in a stronger linear relation between attitudes and intentions than fully labeled formats.

Our study identifies a previously unrecognized antecedent of MR. This relates back to the four cognitive processes that respondents perform when answering an item: (1) comprehension, (2) retrieval, (3) judgment, and (4) response (Tourangeau et al., 2000). Previous work has focused on MR due to problems in comprehension (Schmitt & Stults, 1985), retrieval (Weijters et al., 2009) and/or judgment (Swain et al., 2008; Weijters et al., 2009). Our findings demonstrate that MR can also be caused by problems in mapping a judgment onto a specific response category. Related to this, the question of whether or not to include a midpoint depends not only on the particular research goals (Nowlis et al., 2002) but also on the risk for MR in the data. The inclusion of a midpoint led to a reduction in MR. Overall, we suggest avoiding scales without a midpoint, unless particular, relevant reasons present themselves.

5.2. PRELIMINARY FRAMEWORK FOR SELECTING A RESPONSE SCALE FORMAT

We propose a preliminary framework for selecting a response scale format. The current results are not conclusive, and the framework can serve as a guideline for choosing a scale format until further evidence becomes available. We base this framework on the extant literature on the topic, complemented by the two empirical studies presented in this paper. The framework is shown in Figure 3.

Insert Figure 3

As shown in Figure 3, we distinguish studies based on two dimensions: the study population and the study objective. We focus on student populations versus general populations because they are common in marketing research and because students tend to be relatively high in terms of cognitive ability, verbal skills, and experience with questionnaires. These factors are likely to facilitate processing and make respondents less prone to response biases, including MR (Knauper, 1999; Krosnick, 1991; Marsh, 1996).

In selecting the optimal number of gradations, a tradeoff presents itself between maximizing the potential information transmission (Garner, 1960; Green & Rao, 1970) versus minimizing respondent demands (Krosnick, 1991; Weathers et al., 2005). We suggest that it may be less problematic to use scales with more response categories (specifically, seven categories) for student populations (and other populations that rate high on cognitive ability, verbal skills and/or experience with questionnaires). For studies among the general population, it may be safer to stick to 5-point scales. In the current study (general population), 5-point scales led to less MR. We note that for rating scales having at least five response options, linear models can approximate the data quite well (Bollen and Barb, 1981; Srinivasan and Basu, 1989).

The choice for a particular scale format is further modulated by the study's objective. When developing a new scale, researchers may want to reduce the risk of MR by fully labeling their scales. Otherwise, results may be biased against the inclusion of reversed items. Similarly, if a researcher wants to report direct summaries of responses (i.e., opinion measurement) by using means or percentages (e.g. top boxes), it may be preferable to opt for a fully labeled 5-point scale format (or fully labeled 7-point format for students) as labeling makes the scale more directly interpretable (e.g. a "2" on a 5-point scale means "disagree" for both the researcher and the respondent). Though respondents tend to be internally consistent in this format, the downside is that they may be positively biased, so estimates should be interpreted as such.

We also stress the inherent relativity of scale responses. If a researcher wants to relate variables and estimate linear relations using correlations, regression models, structural equation models (SEM), etc., a 5- (or 7-) point scale with endpoint labels is the best choice. Respondents seem to use this format in a way that better conforms to linear models, thus providing higher criterion validity (cf. Study 2). The downside here is that reversed items may prove problematic in endpoint-labeled formats. To minimize reversed item bias, researchers can disperse same-scale items throughout the questionnaire by including buffer items or items of other scales in between (Weijters et al. 2009). In addition, when analyzing the data, researchers can include a method factor to account for reversed item bias (Weijters et al. 2009).

In a meta-analysis, the analyst can of course not select a scale format, but it is still key to take the scale format into account, particularly by including scale format characteristics as covariates (number of gradations, labeling). In replication studies, it may be safe to initially use the same scale format as the study one is replicating. Afterwards, it may in some instances be interesting to vary scale format as a boundary condition (especially in studies on factor structure).

5.3. LIMITATIONS & FUTURE RESEARCH

To conclude, we note some limitations of our study that offer opportunities for future research. We only studied Likert-type items in this study. Future research might also examine the effects of labeling and the number of response categories in other formats, such as semantic differentials.

An important limitation of Study 2 is the use of a self-report measure for assessing criterion validity. One might argue that this leaves open the possibility that 5-point Likert scales with labeled endpoints are more similar to percentage scales than to 5-point Likert scales with labels for all response categories. We admit this as a limitation, and we are in favor of further research into this topic, possibly using other criterion variables (e.g., observational data rather than self-reports). However, there are several good reasons to believe that the current empirical context makes the likelihood that the results are due to a confound small. (1) There were filler tasks in between the two measures. This reduces the chance for the carryover effects of response styles, as previous research has shown that there is a significant auto-regressive component of response styles, i.e., response styles in adjacent parts of a questionnaire are more similar than in distant parts of a questionnaire (Weijters, Geuens, & Schillewaert, in press a). (2) The response formats we used (5-point Likert scale versus percentage scale) have been reported to be very differently experienced by respondents, resulting in different response tactics and response quality (Weathers et al., 2005; Preston & Colman, 2000). In line with this, and referring to the work by Podsakoff et al. (2003) and Lindell and Whitney (2001), Rindfleisch et al. (2008) have recently recommended the use of different formats for predictor and outcome variables to minimize method bias carryover. (3) For the intention question, respondents had to fill out a percentage themselves, rather than having to pick an option from a given set. (4) The difference in R^2 is large and consistent. In sum, we consider the use of a self-report for assessing criteria a limitation rather than a fatal flaw. Nevertheless, Study 2 is a first, preliminary investigation into this topic, as more research is surely needed before we can draw solid conclusions.

A final intriguing question that remains unanswered is whether the scale format interacts with culture in affecting response styles. We conducted Study 1 with Dutch-speaking respondents and Study 2 with English-speaking respondents. The observation that the findings from Study 1 were predictive of the findings from Study 2, provides evidence in support of the generalizability of our findings across at least the two languages under study.

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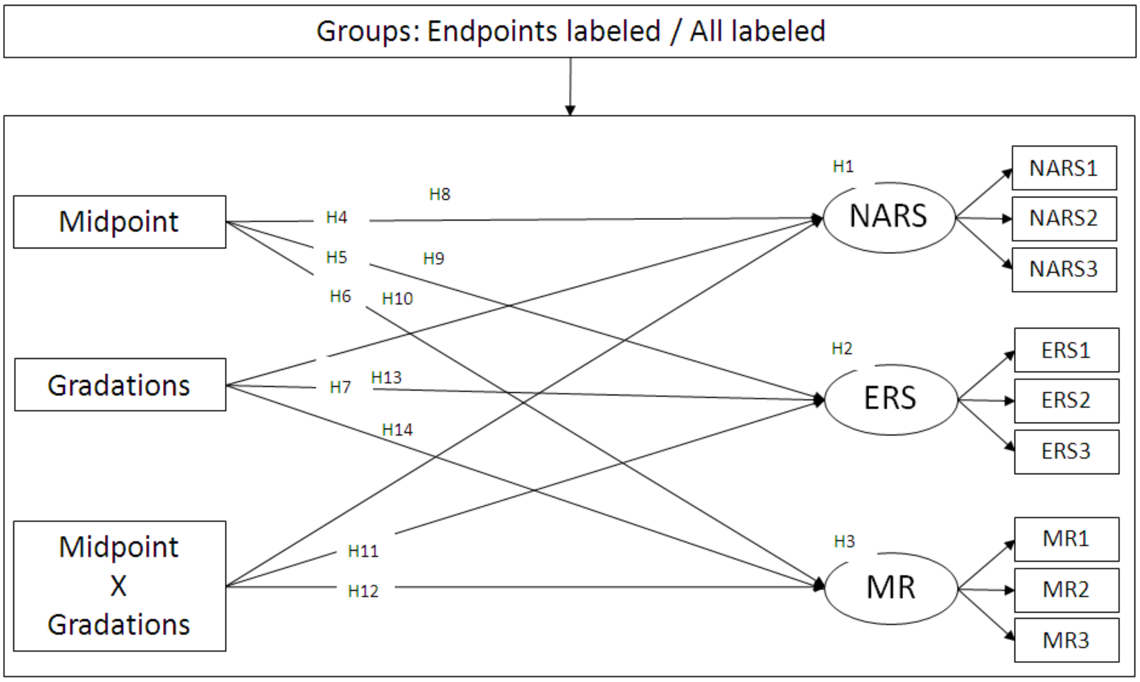
FIGURE 1

Response styles as a function of scale format characteristics (Study 1)



NARS = Net Acquiescence Response Style; ERS = Extreme Response Style; MR = Misresponse to Reversed items. Residual terms at the construct and indicator level are not shown for readability.

FIGURE 2

Labeling response options leads to different regression functions (Study 2)

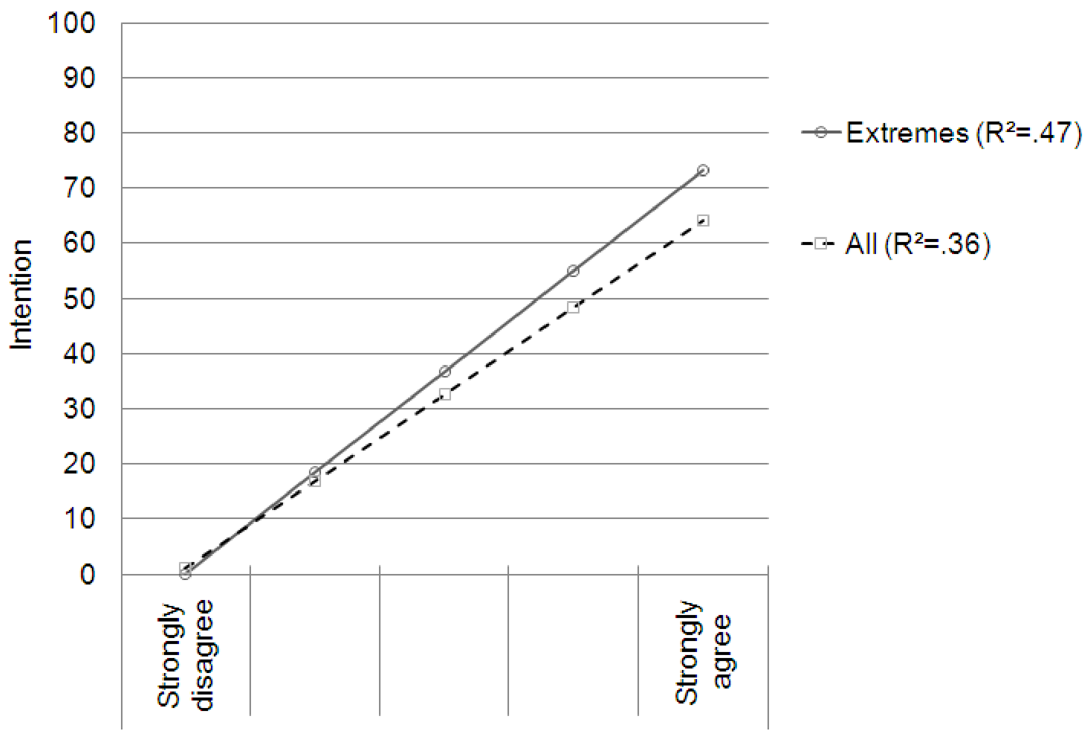


FIGURE 3

Preliminary decision framework for selecting a response scale format

Study objective		Study population: Student population	Study population: General population
Stand-alone	Scale development	5 or 7 points, fully labeled	5 points, fully labeled
	Opinion measurement (central tendency, frequencies)	5 or 7 points, fully labeled	5 points, fully labeled
	Estimation of linear relations (correlations, SEM…)	5 or 7 points, endpoints labeled. Disperse same-scale items and include a method factor.	5 points, endpoints labeled. Disperse same-scale items and include a method factor.
Comparative	Meta-analysis	Include scale format characteristics (labeling, number of gradations) as control variables.	
	Replication	Initially use the same scale format as the original study. Vary scale format to test scale format as a boundary condition.	

TABLE 1

Overview of scale formats used in questionnaires

	Bruner, James and Hensel 2001 (N = 603)		IJRM (N = 82)	
Number of response categories	Extremes labeled	All labeled	Extremes labeled	All labeled
< 4	0.5%	1.2%	6.1%	.0%
4	0.8%	.8%	3.7%	.0%
5	30.0%	2.7%	19.5%	2.4%
6	2.0%	.0%	2.4%	.0%
7	55.2%	.2%	43.9%	.0%
> 7	6.6%	0.0%	22.0%	.0%

TABLE 2

coding of experimental conditions (Study 1)

Experimental condition		Coding			
Labeling	Number of categories	Labeling	Gradations	Midpoint	Midpoint x gradations
Endpoints labeled	4	Group 1	-1	-1	-1/3
	5	Group 1	-1	1	-1/3
	6	Group 1	1	-1	-1/3
	7	Group 1	1	1	1
All categories labeled	4	Group 2	-1	-1	-1/3
	5	Group 2	-1	1	-1/3
	6	Group 2	1	-1	-1/3
	7	Group 2	1	1	1

TABLE 3

MR (% of misresponders to reversed items) by response format (Study 1)

Labeling	Number of categories	Indicator a	b	c	Average
All labeled	4	52.6%	65.7%	67.2%	61.8%
	5	11.1%	7.8%	12.4%	10.5%
	6	46.2%	60.8%	62.9%	56.6%
	7	22.0%	6.0%	16.7%	14.9%
Endpoints labeled	4	50.3%	61.1%	60.6%	57.3%
	5	27.7%	19.4%	21.3%	22.8%
	6	57.1%	68.8%	67.5%	64.5%
	7	38.1%	37.4%	39.6%	38.4%
Average		38.1%	40.9%	43.4%	40.8%

TABLE 4

Model estimates of format effects on NARS, ERS, MR (Study 1)

	DV	IV	Extremes labeled Estimate	SE	t	p	All labeled Estimate	SE	t	p	
Intercepts	NARS		0.000				0.168	0.027	6.32	0.000	H1
	ERS		0.000				-0.436	0.045	-9.67	0.000	H2
	MR		0.000				-0.490	0.084	-5.81	0.000	H3
B	NARS	Midpoint	0.078	0.018	4.32	0.000	0.078	0.018	4.32	0.000	H4
	ERS	Midpoint	-0.117	0.029	-4.09	0.000	-0.117	0.029	-4.09	0.000	H5
	MR	Midpoint	-0.703	0.081	-8.71	0.000	-1.132	0.093	-12.11	0.000	H6
	NARS	Gradations	0.017	0.019	0.91	0.183	0.017	0.019	0.91	0.183	
	ERS	Gradations	-0.242	0.044	-5.47	0.000	-0.097	0.038	-2.54	0.006	H7
	MR	Gradations	0.134	0.074	1.82	0.035	-0.090	0.077	-1.16	0.123	
	NARS	Midpoint x gradations	-0.012	0.038	-0.31	0.378	-0.012	0.038	-0.31	0.378	
	ERS	Midpoint x gradations	0.133	0.062	2.16	0.016	0.133	0.062	2.16	0.016	H11
	MR	Midpoint x gradations	0.295	0.125	2.37	0.009	0.295	0.125	2.37	0.009	H12

TABLE 5

Summary of Hypothesis Tests (Study 1)

Hypothesis	Test	Decision
H1: Labeling all response categories leads to higher levels of NARS.	t = 6.32, p < .001	Supported
H2: Labeling all response categories leads to lower levels of ERS.	t = -9.67, p < .001	Supported
H3: Labeling all response categories leads to lower levels of MR.	t = -5.81, p < .001	Supported
H4: NARS increases when adding a midpoint.	t = 4.32, p < .001	Supported
H5: ERS decreases when adding a midpoint.	t = -4.09, p < .001	Supported
H6: MR decreases when adding a midpoint.	t = -8.71, p < .001 (endpoint labels), t = -12.11, p < .001 (all labeled)	Supported
H7: ERS decreases when more gradations of (dis)agreement are offered	t = -5.47, p < .001 (endpoint labels), t = -2.54, p < .001 (all labeled)	Supported
H8: Full labeling of the response categories strengthens the positive effect of offering a midpoint on NARS.	$chi^2(1)$ = .33, p = .567	No support
H9: Full labeling of the response categories strengthens the negative effect of offering a midpoint on ERS.	$chi^2(1)$ = 1.25, p = .263	No support
H10: Full labeling of the response categories strengthens the negative effect of inclusion of	$chi^2(1)$ = 13.31, p < .001	Supported

a midpoint on MR.		
H11: The presence of a midpoint mitigates the negative effect of adding more gradations of (dis)agreement on ERS.	$t = 2.16$, $p = .016$	Supported
H12: Adding more gradations reduces the negative effect of offering a midpoint on MR	$t = 2.37$, $p = .009$	Supported
H13: Fully labeling scales weakens the negative effect of adding more gradations of (dis)agreement on ERS.	$chi^2(1) = 6.12$, $p = .013$	Supported
H14: In formats with labels for the endpoints only, adding more gradations of (dis)agreement leads to an increase in MR.	$t = 1.82$, $p = .035$	Supported

TABLE 6

% agreeing to intention items by response format condition (Study 1)

% agree	k	Item 1	Item 2
Extremes only	4	50.3%	48.6%
	5	24.5%	22.6%
	6	44.2%	46.1%
	7	27.3%	23.0%
All options labeled	4	60.6%	57.7%
	5	38.6%	37.9%
	6	51.0%	49.7%
	7	42.7%	48.0%

Item 1 = "I would like to try this product"; Item 2 = "Next time I make a purchase in this product category, I will consider the product that was shown". k = number of response categories.

TABLE 7

Chi² test for Intention measures by experimental condition (Study 1)

		Total effect	Main effects		
		Conditions	Labeling	Midpoint	Gradations
	df	7	1	1	1
Item 1	chi²	61.727	13.902	39.55	0.381
	p	0.000	0.000	0.000	0.537
Item 2	chi²	69.311	18.537	36.889	0.035
	p	0.000	0.000	0.000	0.852
Average	chi²	65.52	16.22	38.22	0.21
	p	0.000	0.000	0.000	0.648

Item 1 = "I would like to try this product"; Item 2 = "Next time I make a purchase in this product category, I will consider the product that was shown". k = number of response categories.

TABLE 8

Model fit indices for invariance tests between all labeled and extremes labeled conditions (Study 2)

	Chi² test			Chi² difference test		
Model	Chi²	DF	p	Chi²	DF	p
Unconstrained	158.13	144	0.199			
Attitude means	169.01	153	0.178	10.88	9	0.284
Attitude variances	177.92	153	0.082	19.79	9	0.019
Intention intercepts	175.71	153	0.101	17.58	9	0.040
Regression weights	187.95	153	0.029	29.81	9	0.000

TABLE 9

Regression model estimates by condition (Study 2)

	All labeled (G1)				Extremes labeled (G2)				Index(G2/G1)			
	B (s.e.)	R^2	Intercept (s.e.)	Var (s.e.)	B (s.e.)	R^2	Intercept (s.e.)	Var (s.e.)	B	R^2	Intercept	Var
Go shopping	7.6 (2.0)	0.07	69.3 (3.6)	1.2 (0.2)	13.8 (1.8)	0.27	68.1 (3.0)	1.6 (0.2)	182%	417%	98%	127%
Invite friends	18.1 (2.6)	0.23	27.6 (3.9)	0.9 (0.1)	18.0 (1.8)	0.37	30.4 (3.2)	1.7 (0.2)	100%	160%	110%	192%
Attend a concert	6.0 (1.3)	0.16	7.9 (1.8)	2.0 (0.3)	8.1 (1.4)	0.20	10.2 (2.2)	2.0 (0.3)	135%	124%	129%	100%
Go for a walk	24.7 (1.9)	0.44	34.3 (3.6)	1.1 (0.1)	25.7 (1.8)	0.53	38.0 (3.4)	1.4 (0.2)	104%	121%	111%	127%
Go to the gym	12.0 (1.5)	0.34	23.5 (2.6)	1.7 (0.2)	19.1 (1.1)	0.66	33.5 (2.1)	2.2 (0.3)	159%	194%	142%	131%
Play computer game(s)	21.3 (1.1)	0.68	38.1 (2.3)	2.8 (0.4)	22.9 (1.2)	0.69	44.3 (2.3)	2.6 (0.3)	108%	102%	116%	94%
Online with friends	22.3 (1.6)	0.43	45.7 (3.4)	1.3 (0.2)	18.9 (1.5)	0.46	55.4 (3.0)	1.9 (0.2)	85%	107%	121%	146%
Go to the cinema	10.2 (1.3)	0.33	15.3 (2.1)	2.2 (0.3)	15.3 (1.4)	0.45	18.8 (2.4)	2.1 (0.3)	150%	136%	122%	94%
Go to a bar	19.7 (1.5)	0.54	32.5 (2.5)	2.2 (0.3)	22.7 (1.6)	0.57	31.7 (2.8)	2.1 (0.3)	115%	105%	98%	98%
Average	15.8 (1.6)	0.36	32.7 (2.9)	1.7 (0.2)	18.3 (1.5)	0.47	36.7 (2.7)	2.0 (0.3)	126%	163%	116%	123%