Validating Measures Of Self Control Via Rasch Measurement

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ABSTRACT

Self control has been offered as a fundamental explanation for consumption behavior in a number of marketing settings. Until recently, measurement of self control had been inadequate, with advances being made only in specific domains. Tangney, Baumeister, and Boone (2004) introduced a reflective measure of self control which has gained popularity across social science research. However, the authors did not subject this critical measure to a review of fit and function through a psychometric lens. This study reviews their measure with consideration of fit and function, applying item response theory, and more specifically, Rasch measurement. Findings suggest that moderate levels of the unidimensional construct of self control are captured by the scale but high risk groups may be neglected by the measure in its current form.

Keywords: Self Control; Rasch Measurement; Marketing

INTRODUCTION

𝒮elf control, or the individually imposed ability to regulate one's behavior, is a critical determinant of consumption behavior (Baumeister, 2002; Wilcox, Kramer, & Sen 2011). Consumers often act against their "better" judgment as their desire to acquire and consume a particular product outweighs their willpower to resist making a purchase (Hoch & Loewenstein, 1991; Hofmann, Strack, & Deutsch, 2008). Rather than rationally consider the consequences of their behavior, consumers are drawn to the salient, appealing aspects of the decision and ultimately over consume. Furthermore, consumers may have too much self control (e.g. hyperopia) and subsequently miss out on consumption decisions that would actually be in their best interest (Haws & Poynor, 2008; Keinan & Kivetz, 2008). These consumers may experience a great deal of negative emotion from acquisition or consumption and subsequently avoid the exchange setting altogether. Thus, self control is a critical factor in determining how much, if any, of a particular product an individual will consume. Measurement of self control is critical in understanding, predicting, and modeling consumption behavior.

Research Aim. This research investigates the preeminent measure of self control in social science research; Tangney et al.'s (2004) self control scale. We evaluate this measure from a Rasch measurement perspective, which is superior to classical test theory in evaluating scales which measure latent constructs.

Assumptions. In this research, we assume that the Tangney et al. (2004) measure of self control is the primary measure of self control in consumption research. This assumption is supported by the 204 citations (approximately 29 per year) the paper has received since publication in April 2004 (Social Science Citation Index search on April 6th, 2011). This assumption is further supported by a large number of recent consumer research papers involving self control utilizing the Tangney et al. (2004) measure (e.g. Haws & Poynor, 2008; Laran & Janiszewski 2011; Lynch Jr., Netemeyer, Spiller, & Zammit 2009).

Research Question. This research is driven by one question: Does the Tangney et al. (2004) measure adequately capture the construct of self control?

Contribution of Research. The primary contribution of this research is the analysis of the Tangney et al. (2004) self control measure. It is demonstrated that while the Tangney et al. (2004) measure does adequately capture moderate

levels of self control, the instrument has failed to distinguish individuals with either very high or very low levels of self control. The inability to accurately measure these individuals is problematic given the potentially harmful consumption behaviors, or lack thereof, these individuals engage. We suggest that future research consider revisions to the Tangney et al. (2004) measure.

We begin by defining and providing a theoretical framework for self control that we follow in subsequent empirical analyses. Then, we introduce the Rasch measurement model and describe its advantages relative to classical test theory. We then analyze the Tangney et al. (2004) measure of self control within the Rasch model. We conclude by discussing implications for this research and future issues to consider. Now, we provide a conceptual framework of the concept of self control.

CONCEPTUAL FRAMEWORK

Self control has been a focal point of research in consumption behavior (and more generally across all social sciences) for decades. Recent research has conceptualized self control as an individual resource, subject to depletion, that determines how apt consumers are at regulating their behavior (Krishnamurthy & Prokopec, 2010; Usta & Haubi, 2011). Anticipated emotions are a primary determinant of self control, as a positive affective forecast of emotions is more effective in helping regulating one's subsequent actions (Patrick, Chun, and Macinnis 2009). Given the complex nature of self control as a function of both physiological and neurological factors, theories of self control must adequately capture the underlying process in order to appropriately measure self control.

In this research, we adopt a dual processing model of self control represented by recent theoretical developments including the reflective-impulsive model (Hofmann et al., 2008) as well as the default-interventionist model of social cognition (Evans, 2008). These models suggest that decision making occurs either quickly, impulsively, and with minimal consideration, or that individuals are able to reject impulse in favor of more thoughtful, explicit consideration of information. Individuals who act impulsively or lack the regulatory resource to think more explicitly thus lack self control, while individuals who more carefully consider felt emotions and regulate their behavior are suggested to have self control. Thus, any adequate measure of self control must capture these differences in acting on impulse versus acting after deliberation.

MEASUREMENT OF SELF CONTROL

Prior attempts to capture self control in social science research are often context specific to a particular behavior (e.g. Brandon, Oescher, & Loftin, 1990; Rosenbaum, 1980) or only a subscale measure of self control from another concept of interest (e.g. Bearden, Hardesty, & Rose, 2001; Gough, 1987). Recent efforts has resulted in the construction of a self-report measure of self control which aims to provide an individual difference measure and predict various outcomes in psychological behavior (Tangney, Baumeister, & Boone, 2004). Utilizing classical test theory, Tangney et al. (2004) demonstrate their self-report scale of self control items (see Appendix) is a reliable measure of self control.

Before empirically considering the self control scale, we first considered theoretically whether the items fit within our existing conceptual framework. We suggest this scale of self control does indeed fit within a dual processing model of self control. Items on the Tangney et al. (2004) scale represent distinctions regarding whether individuals are impulsive and reactive in situations, or if they are more likely to carefully consider the situation before acting. For example, "I am good at resisting temptation" suggests either that individuals either carefully think before taking a course of action that may be harmful, or that they succumb to experienced emotions and make a less analytic decision. In passing this theoretical test underlying the concept of self control, this scale can now be carefully analyzed within the Rasch model to determine its appropriateness for empirical analysis.

Rasch Measurement. Despite continued use in scale development and validation, classical test theory is widely considered to be inferior when compared to item response theory and, more specifically, Rasch measurement. The Rasch model is a one-parameter logistic model within the item response theory (IRT) family in which the amount of a given latent trait in a person and the amount of that same latent trait reflected in various items can be estimated independently yet still compared explicitly to one another. Given that the Rasch model follows mathematically from

the requirement of invariance of comparisons among persons and items, a Rasch analysis is appropriate when the total score on a questionnaire is used to make inferences about an individual's level of a latent trait inherent in that individual. Classical Test Theory (CTT) also uses the total score to characterize each person, but it asserts the total score as the relevant statistic with little consideration of anomalies in the items or the respondents. Applications of the Rasch model account for these anomalies and provide a more informative score (Andrich & Luo, 2003).

The Rasch model yields a comprehensive picture of the construct under measurement and the respondents on that measure. It allows observations of respondents and items to be connected in a way that indicates the occurrence of a response as probability rather than certainty and maintains order in that the probability of providing a response defines an order of respondents and items (Wright & Masters, 1982). It is a static model, meaning that for each person having a certain amount of the given latent trait; it specifies the probability of a response in one of the categories of an item. The Rasch model uses the sum of the item ratings simply as a starting point for estimating probabilities of those responding to each item. In the case of a questionnaire, it is based upon an individual's willingness to endorse a set of items and the difficulty to endorse those items. It is assumed the difficulty to endorse is the main characteristic influencing responses (Linacre, 1999), which is reasonable in the current setting.

OBJECTIVES

The purpose of this exploratory study was to evaluate the measurement properties of the self control scale developed by Tangney et al. (2004). This study provides insight into the appropriateness of the current items in this widely used reflective measure by applying the Rasch rating scale model as an alternative to a CTT approach. The research was guided by a single, overarching research question: Does the Tangney et al. (2004) measure adequately capture the construct of self control?

METHOD

Response Frame. This study was conducted at a southeastern university, consisting of students enrolled in either an introductory business course or in an upper-level marketing course. Additional demographic information was not of interest in the original study, so that information was not collected. Participating students in the introductory business course received class credit and those in the upper-level marketing course received extra credit. The student sample was a target sample and deemed appropriate for two main reasons. First, self control is a universal construct, and regardless of age, profession, gender, or other demographic factors, everyone has some varying degree of self control. Second, Tangney et al. (2004) utilized students for evaluating their measure. Thus, a student sample more closely replicates their initial findings and provides a better standard for comparison to the original work. The initial questionnaire involving consumption behavior was compiled in the fall of 2008. Participants then completed the questionnaire at two separate time periods. Students in the upper-level marketing course completed the study in November of 2008. Students in the introductory marketing course completed the study in October of 2009.

Instrumentation. Participants completed 20 items from the Tangney et al. (2004) self control scale as part of a study involving consumption behavior. The items are bolded in the Appendix. Using a subset of items is not a statistical concern as far as impact on the overall results, since Tangney et al. (2004) have a longer (36 item) and shorter (13 item) version of the measure, both of which correlate similarly across behavior. Participants responded to each item on a 7-point scale, from 1 = *strongly disagree* to 2 = *strongly agree*. This response scale slightly differs from the original scale, which is a five point scale ranging from *not at all* to *very much*. The revised response scale is superior in terms of capturing and/or constructing a true interval measure.

Participants in the introductory course completed the study online, while participants in the upper-level marketing course completed the study via paper and pencil. The mean scores on the 20 self control items did not illustrate any statistical differences between samples (Ms = 4.35 and 4.16, SDs = .64 and .73 respectively, t_{140} = 1.62, p > .05), thus suggesting no differences across method of survey response, and also demonstrates there is no time distribution effect. The 20 items of interest were subsequently entered into WINSTEPS software (Linacre, 2005) to conduct Rasch analysis.

Data Analysis. The self-administered survey was completed by 66 students in the upper-level marketing course. These respondents comprised the first sample in the subsequent analysis (Sample A). 75 students in the introductory business course completed the survey. These respondents comprised the second sample in Rasch analysis (Sample B). Additionally, participants were combined and analyzed in a stacked sample of all participants to further validate the overall construct. If the proposed model of self control is of high quality, measures of fit should be approximately similar across both samples, demonstrating a 'ruler' of sorts.

To assess the quality of measurement scale, a three step approach was applied to a review of the Rasch analysis results. First, item misfit across individual items is considered. Then, the map of person abilities and item difficulties is reviewed. Lastly, person and item reliabilities are presented. Both samples are considered here, with the test of a quality measure involving whether both samples demonstrate minimal item misfit, dispersion across person abilities and item difficulties, and high person and item reliabilities.

RESULTS

Item Misfit. The 20 self control items were analyzed for infit and outfit with the model. Given the rating scale nature of the responses, appropriate infit and outfit statistics should lie between .6 and 1.5 for each item (Bond & Fox, 2007). Fit statistics which are too high suggest the model is inappropriate for the data. Fit statistics which are too low suggest overfit in the data, meaning that responses are too well-fitting for reality. The results of the item misfit analysis are presented in Table 1. Results demonstrate acceptable fit for almost every item except item 8 in sample A, item 15 in sample B and the combined sample, and item 16 for sample A and B. However, these misfit statistics are only slightly beyond prescribed cutoffs (Bond & Fox) and should not be a primary concern. Therefore, from a quantitative review, these items provide good fit within the model, allowing further analysis with all items as appropriate.

Table 1. Item Misfit Statistics from Rasch Analysis

Item	Sample A		Sample B		Combined	
	Infit	Outfit	Infit	Outfit	Infit	Outfit
Item 1	0.75	0.75	0.94	0.92	0.84	0.83
Item 2	1	1.03	1.19	1.18	1.09	1.1
Item 3	1.17	1.15	1.07	1.09	1.16	1.14
Item 4	1.3	1.35	0.89	0.89	1.05	1.06
Item 5	1.09	1.15	1.09	1.12	1.08	1.12
Item 6	0.79	0.78	0.85	0.88	0.86	0.87
Item 7	0.88	0.94	1.05	1.06	1.07	1.09
Item 8	1.53	1.58	1.35	1.33	1.42	1.41
Item 9	1	1.08	1.08	1.08	1.04	1.07
Item 10	0.99	0.98	0.91	0.91	0.94	0.94
Item 11	0.97	0.94	1.01	0.98	0.97	0.94
Item 12	0.89	0.89	1.03	1.01	0.95	0.93
Item 13	0.76	0.77	0.99	1.02	0.88	0.91
Item 14	1.1	1.14	0.72	0.72	0.89	0.88
Item 15	1.44	1.46	1.53	1.72	1.46	1.61
Item 16	0.56	0.57	0.5	0.51	0.6	0.6
Item 17	1.09	1.1	0.92	0.93	0.98	0.99
Item 18	0.61	0.61	1.26	1.31	1.16	1.14
Item 19	1.07	1.13	1	0.99	1.01	1.02
Item 20	0.88	0.87	0.92	0.91	0.89	0.88

Variable Maps. The variable map provides logit scores across both person abilities and item difficulties which can be compared visually to a normal distribution (Bond & Fox, 2007). The variable maps for each of the three sample runs: A, B, and combined, can be seen in Figures 1 through 3. The variable map of the combined sample demonstrates similar results to the sample B variable map, so further discussion of the findings will only compare sample A with sample B. Analysis of the variable maps demonstrates sufficient distribution across person abilities

and item difficulties. Both samples follow a pattern of normal distribution in which most individuals have moderate levels of self control and few have high or low levels. However, the positioning of items between samples raises some issues. First, item 17 in sample A, which distinguishes among individuals with higher amounts of self control, is actually the lowest measure of self control in sample B. Furthermore, some items (such as item 1 and item 15) predict higher levels of self control in one sample and lower levels of self control in the other. Lastly, while sample A has an approximate match between the distribution of people across items, sample B does not have enough items that distinguish among individuals with very high levels of self control. These issues question the set of items used to formulate a measure of self control. A reanalysis of the self control with the full scale may be in order to determine whether better fit between persons and items across the variable map is present. Inclusion of the remaining items may increase the ability to differentiate perceived self control at high levels within individuals. Further consideration of these issues is provided in the discussion.

Figure 1. Sample A Variable Map


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                          PART — MAP — ITEM
                           <more>|<rare>
      2                          +
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                                 |
                            39   |
                                 ||
                                 | T
      1                 56 6   T+
                        60       |
                        65       |     Item15
                  19 3   32 35 S|S  Item5
          2   21 25 45 53 58 63 9  |   Item13
       11 14 28 30 40 42 47 5   7   |   Item1   Item16 Item4
          16 22 24 33 36 48 51 M|   Item12 Item19 Item7    Item9
    1  15 18 23 27 29 37 38 50 54 57 61 66  |   Item18 Tempta
      0                    4   62   +M Item14
          10 13 17 20 26 44 49 52 59 S|   Item11 Item8
                        31 41      |   Item3
             12 34 43 46 55        |   Item10
                        64 8   T|   Item2
                                 |S
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     -1                          +
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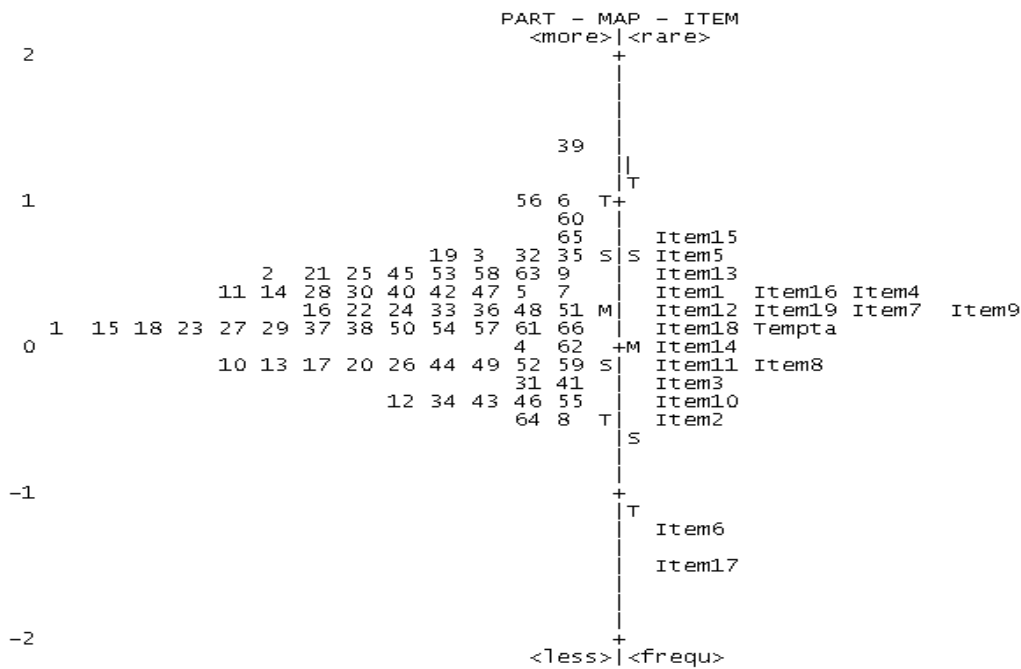
Figure 2. Sample B Variable Map

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                              PART - MAP - ITEM
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        1                          29   +
                                12 70   |
                                    8  T|
                                   32   |
                                        |
                           17 53 55    |T
                           34 35 67  S|
                     31 41  5    62    |   Item8
                  28 39 51 59 61       |S  Item17
                     20 50 69          |   Item13    Item14    Item16    Item2
               13 25 40 44 48 57       |   Item6
         10 22 36 54 60 63 71 73 75  M|   Item19    Item20    Item5     Item9
        0     1 18 21  3   4 46 52  9  +M  Item10    Item3
        11 15 26 30 42 45 49 64 66  7   |   Item1     Item15    Item4
                  14 19 33  6   65     |
                     16 37 56          |   Item12
           2    27 43 58 68 72 74  S|S
                                        |   Item11
                                        |   Item7
                                        |T
                                   38   |
                                23 47  T|
                                        |   Item18
       -1                              +
                                        |
                                   24   |
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       -2                              +
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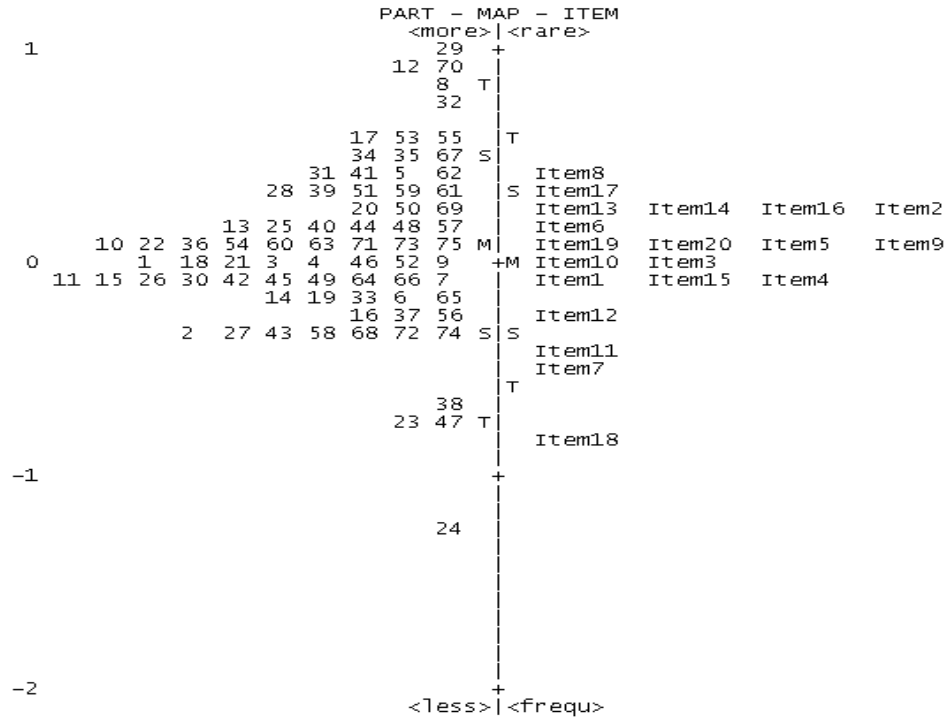

Figure 3. Combined Sample Variable Map

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                              PARTS - MAP - ITEMS
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   2                               +
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                                   |
                                   |
                            3      |
                            2      |
   1                      1 7      +
                      5   6 8  T|
                          3 6   |T
                              6  |
                      1 1   3 5 5 |
              2 2 2 3 3 3 3 3 4 5 5 6 9 S|
                2 3 3 4 4 4 5 5 5 6 6  |S Item1 Item6
                      1 1 2 4 5 6 7    |  Item1 Item1 Item2 Item8
                      1 1 2 2 2 3 3 4 4 5 5 5 6 |  Item1 Item5
        1 1 1 1 2 2 2 2 3 3 3 4 4 5 5 6 6 6 6 7 7 7 M|  Item1 Item1 Item2
   0            1 1 1 2 2 3 4 4 4 5 5 5 6 9 +M Item1 Item1
          1 1 1 1 1 2 2 2 3 4 4 4 4 5 6 6 6 7 |  Item9
                    1 3 3 3 4 5 6   |  Item1 Item3 Item4
                      1 3 4 5 5 7 S|
                  1 2 2 4 4 5 6 7  |S Item1
                              6 8   |
                                  T|
                            3      |
                          2 4      |T Item7
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  -2                               +
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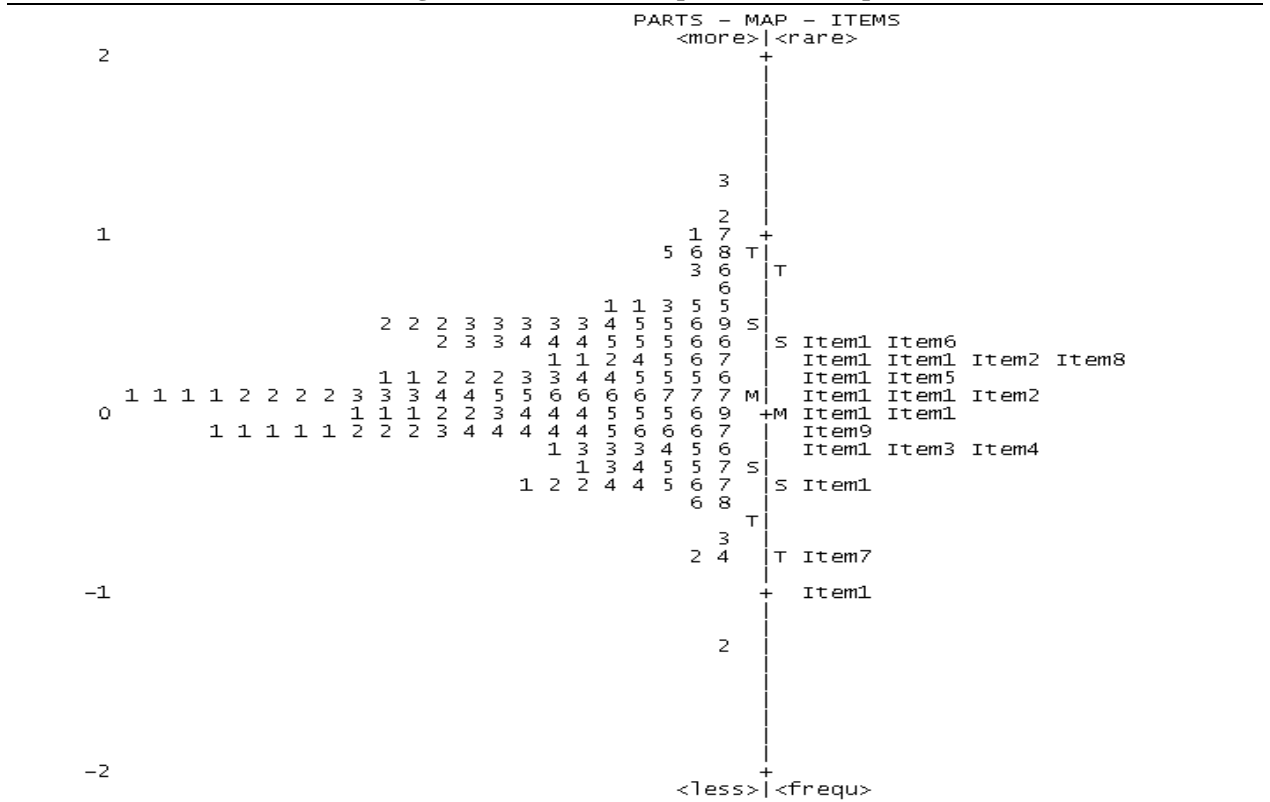
Reliability Estimates. Reliability in Rasch measurement refers to the degree to which measurement error is not present in the model (Smith, 2004). Reliability is measured in terms of both person and item reliability. For the first sample, the item reliability (.97) and person reliability (.75) both are sufficiently high. The second sample provides similar findings with an item reliability of .91 and person reliability of .78. Combining the samples provides further evidence that the person (.77) and item (.97) reliabilities are acceptable. Given how similar the reliability estimates are between samples for person and item reliability, these results suggest internal consistency in measurement and provide support for the self control items as an acceptable measure of the underlying construct.

DISCUSSION AND CONCLUSION

Research Findings. In this study, a popular measure of perceived self control in the psychological literature is investigated. We investigated whether the Tangney et al. (2004) measure of self control adequately captures the construct of self control. Results demonstrate that, across the available items in the study, the self control measure developed by Tangney et al. (2004) is capable of measuring moderate levels of self control. However, there are several concerns with widespread adoption of this measure of self control.

The major concern with the self control scale which emerged from analysis of the variable maps is that the scale does not adequately measure very high or very low levels of self control. In the variable maps for the samples, the items were distributed within +/-1.5 logits of the midpoint of ability. This suggests that individuals who are highly (not) capable of exercising self control are not being captured by this measure. In the 2nd and combined samples, the variable maps clearly demonstrated that more measures of high self control were necessary to distinguish among these individuals (i.e. the top portions of the map). It is possible this could be result of using a subset of items. That being said, this is not uncommon practice, and thus, remains a concern. More so, if the measure is functioning on the assumption that subsets can be pulled, this should hold. Even so, subsequent research could determine whether this issue is resolved by including all items in the scale.

The positioning of certain items between samples raises a red flag. As previously discussed, certain items were related to high self control in one sample and low self control in the other. This raises questions of reliability at the item level, which is a major factor that Rasch analysis aims to demonstrate (Bond & Fox, 2007). Once again, however, this could possibly be a function of the limited number of items from the original scale. Having all items may shift the 20 included here either upward or downward on the variable map, which would restore consistency in the measure. But again, as a subset of the construct, the position of the items should not change in theory, as difficulty of item should not depend on sample. Another possible explanation may relate to the nature of the scale. Since it aims to demonstrate general self control across a variety of behaviors, fluctuation may be expected within items which still capture the overall aim of the measure.

Implications. These findings have implications for research that has used the Tangney et al. (2004) measure of self control. If self control is included as a control variable or non-focal construct, the current research should not impact those findings. For example, Lynch Jr. et al. (2009) control and predict beyond self control in their measure of individual differences in propensity to plan. The researchers investigate a nomologically related construct, but self control is not a primary focus of the research. Therefore, Lynch Jr. et al.'s (2009) findings should be relatively unchanged with a revised measure of self control.

However, research that involves self control as a primary, focal aspect should reconsider their findings given the Tangney et al. (2004) measure only captures moderate levels of self control. For example, Haws and Poynor (2008) suggest that hyperopia is empirically distinct from high self control. However, use of the Tangney et al. (2004) in its current form cannot differentiate individuals with high levels of self control. Therefore, the findings of Haws and Poynor (2008) need to be revisited by comparing their hyperopia scale with a revised measure of self control that does capture high levels of self control and investigate whether hyperopia remains an empirically distinct construct.

Future Research. The self control scale developed by Tangney et al. (2004) appears to capture moderate levels of self control, yet neglects the highest-risk consumer groups. Analysis of the full and short-form self control scales may provide additional insights not found here. Future research should analyze the items from Tangney's et al.'s (2004) full and short-form self control scales via Rasch measurement to determine whether this measure still fails to capture consumers with very high or very low amounts of self control.

Further research should investigate whether dimensions of self control exist and how they combine to form an overall measure of self control. Self control has been conceptualized as a unidimensional construct in prior research, yet future research may find multiple dimensions that comprise the construct. For example, some aspects of self control may be related to one's own behaviors (e.g. Haws & Poynor 2008), while other aspects of self control may involve interpersonal or outward-focused behaviors (e.g. Baumeister, Vohs, & Tice 2007). Identifying multiple dimensions of self control may allow for more precise empirical research which investigates the role of self control in impacting various phenomena.

Given its impact on a variety of consumption decisions (Baumeister 2002), the topic of self control in general should remain at the forefront of consumer behavior research. At this stage, the measure has utility but can be improved to be more sample invariant and better targeted to the underlying construct. We suggest that future research develop new items for the Tangney et al. (2004) measure that better differentiates high and low levels of the construct. These new items should improve the predictive validity of the scale beyond its existing form. Given the broad-reaching implications of self control in consumption behavior, we expect researchers to continue investigating how individual differences in self control impact behavior.

AUTHOR INFORMATION

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APPENDIX

The Self Control Scale developed by Tangney et al. (2004). Items included below are the one that were included in the Rasch analysis. Items with an * represent the short form of the self control scale. Items with an (R) are reverse coded.

1. I am good at resisting temptation *
2. I have a hard time breaking bad habits (R) *
3. I am lazy (R) *
4. I say inappropriate things (R) *
5. I never allow myself to lose control
6. I do certain things that are bad for me, if they are fun (R) *
7. People can count on me to keep on schedule
8. Getting up in the morning is hard for me (R)
9. I have trouble saying no (R)
10. I change my mind fairly often (R)
11. I blurt out whatever is on my mind (R)
12. People would describe me as impulsive (R)
13. I refuse things that are bad for me
14. I spend too much money (R)
15. I keep everything neat
16. I am self-indulgent at times (R)
17. I wish I had more self-discipline (R) *
18. I am reliable
19. I get carried away by my feelings (R)
20. I do many things on the spur of the moment (R)

NOTES