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The Maximization Inventory

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Abstract

We present the Maximization Inventory, which consists of three separate scales: decision difficulty, alternative search, and satisficing. We show that the items of the Maximization Inventory have much better psychometric properties when compared to the original Maximization Scale (Schwartz et al., 2002). The satisficing scale is a new addition to the study of maximization behavior, and we demonstrate that this scale is positively correlated with positive adaptation, whereas the decision difficulty and alternative search scales are positively correlated with nonproductive decisional behavior. The Maximization Inventory was then compared to previous maximization scales and, while the decision difficulty and alternative search scales are positively correlated with similar previous constructs, the satisficing scale offers a dimension entirely different from maximization.

Keywords: maximization, satisficing, alternative search, decision difficulty.

1 Introduction

One of the most interesting variables in decision making research is the tendency toward "maximizing" versus "satisficing." Based originally on Simon's (1955, 1956) theory of bounded rationality, Schwartz (2000) suggested that there may be individual differences in the degree to which an individual is a "maximizer," who attempts to find the absolute best solution, versus a "satisficer," who is comfortable with a satisfactory, or "good enough," solution. Schwartz argued that not only could such tendencies influence the outcome(s) of the decision but also that maximizing could reduce psychological well-being. For example, maximizers may worry that an unforeseen option will turn out to be the best one, and as a consequence, they will try to collect as much information as possible when making even the simplest of decisions.

To examine the relationship between maximizing tendencies and well-being and mental health, measures of maximization behavior were developed. The first and most widely used measure was the 13-item Maximization Scale developed by Schwartz et al. (2002). Nenkov, Morrin, Ward, Schwartz, and Hulland (2008) subsequently examined the factor structure of the Maximization Scale and found three factors, which they labeled "alternative search," "decision difficulty" and "high standards" (pp. 377–378; Nenkov et al., 2008). The "alternative search" category consisted of six items measuring the tendency to expend resources in exploring all possible opportunities (e.g., "When I watch TV, I channel surf, often scanning through the available options even while attempting to watch one program."). The "decision difficulty" category consisted of four items representing the degree of difficulty experienced when making choices among abundant options (e.g., "I often find it difficult to shop for a gift for a friend."). The "high standards" category consisted of three items reflecting decision makers' tendency to hold high standards for themselves and things in general (e.g., "No matter what I do, I have the highest standards for myself.").

By contrast, Diab, Gillespie, and Highhouse (2008) argued that the multidimensional nature of the Maximization Scale is contradictory to the definition of maximization tendency. Defining the maximization tendency as "a general tendency to pursue the identification of the optimal alternative" (p. 365; Diab et al., 2008), Diab et al. developed the Maximization Tendency Scale. The Maximization Tendency Scale was constructed using the three high standards items from the Maximization Scale and adding six new items mainly focusing on the goal of maximizers to optimize the outcomes of decisions. In all of this scale development, satisficing—the theoretical opposite of maximizing—has never been directly measured and is only rarely mentioned in the literature.

In research on these scales, Schwartz's hypothesis concerning relationships to well-being received differential support depending on whether total scores or subscales were used. Schwartz et al. (2002) reported the results of several studies, all of which supported the hypothesized adverse relationships of maximization to psychological well-being. In their Study 1, maximization was negatively correlated with happiness, optimism, self esteem, and life satisfaction and positively correlated with depression, regret, and perfectionism. Four additional studies

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showed that Maximization Scale total scores were positively correlated with depression and negatively correlated with subjective happiness. Schwartz et al. explained that maximizers tend to engage in extensive alternative search to increase the possibility of finding the best option, but this extensive search process may induce more anticipated regret and decrease pleasure once a choice has been made. In related studies, Nenkov et al. (2008) used 2-item measures of each of the three factors. They found that scores on the high standards category were positively correlated with optimism, negatively correlated with depression, and uncorrelated with subjective happiness. Decision difficulty showed the opposite pattern, being negatively correlated with subjective happiness and optimism and positively correlated with depression.

Lai (2010) concluded that the decision difficulty category is the key factor leading to negative correlations with well-being outcomes, which supports the findings of Nenkov et al. (2008). By contrast, Diab et al. (2008) found evidence suggesting that the high standards category was responsible for this relationship, because smaller correlations were found when maladaptive personality traits were compared to the Maximization Tendency Scale rather than the Maximization Scale.

Thus, previous studies have suggested that maximization measures consist of several components, and that the relationships with well-being indices were heavily influenced by the method of measurement. To clarify the nature of the maximization construct and the degree to which its elements were related to measures of psychological well-being, the Maximization Scale and the Maximization Tendency Scale were examined in four studies conducted by Rim, Turner, Betz, and Nygren (2011). Rim et al. concluded that the Maximization Scale measures three separate factors as postulated by its authors, but only the alternative search and decisional difficulty factors are both positively correlated with each other and negatively correlated with indices of well-being. High standards correlated strongly with the Maximization Tendency Scale (consisting of mainly high standards items) and was strongly correlated with positive indices of well-being (e.g., optimism and happiness) and functioning (e.g., self-esteem and self-efficacy). The high standards subscale and Maximization Tendency Scale were positively correlated with the analytical decision making style, while the alternative search and decision difficulty subscales were positively correlated with the regret-based decision making style and with procrastination.

The item-response theory analysis in Rim et al. (2011) indicated serious weaknesses in the psychometric properties of the items of the existing scales. In addition, their experimental study confirmed that alternative search and decision difficulty were positively correlated with the maximization behavior while high standards and the Maximization Tendency Scale were not. These findings have serious implications for the measurement of maximization behavior. First, although "high standards" is a useful construct, it does not seem to fit with the concept of maximization as postulated by Schwartz and colleagues. Conceptually, the "alternative search" dimension seems closest to the construct of maximizing originally postulated by Schwartz (2000). However, the similarity in the pattern of correlations between the decision difficulty scale, the alternative search scale, and the criterion variables suggests similar consequences if not similar meanings. Thus, we propose that items focusing on the behavioral aspects (e.g., alternative search) and the emotional features (e.g., perceived decisional difficulty) should be included in the nomological network, but items not closely aligned with these aspects should be discarded (e.g., high standards).

All previous classical test theory analyses and the item-response theory analyses conducted by Rim et al. (2011) suggest poor psychometric properties. For the former analyses, most subscale alphas were below 0.70, the minimum usually considered acceptable in research. Although this may be attributed to the length of the scales, the item-response theory analyses suggest that the items themselves are not very discriminating. Also, the content of some of the items may undermine the content validity of the scale. For example, the Maximization Scale describes some maximization behaviors in specific situations that may not be universal to all respondents (e.g., "Renting videos is really difficult. I'm always struggling to pick the best ones."). Items that are too specific might confound the degree of maximization with the inexperience of the participant with the event. New items which reflect more general maximization tendencies (e.g., buying a car is more specific than buying groceries), may prove useful.

Finally, all of the alternative search and decision difficulty items on the Maximization Scale are stated in the same direction (i.e., more searching and greater perceived decision difficulty, respectively), which means that satisficing is measured only indirectly, as the presumed lower end of the maximization dimension. Direct examination of the satisficing construct would contribute to the understanding of the maximization behavior.

Based on this previous research on the nature, measurement, and correlates of the maximization behavior, the present series of studies was designed to develop and evaluate new measures of the decision difficulty and alternative search dimensions. In addition, we develop a measure of satisficing and examine its relationships to other maximizing dimensions and to indices of well-being and decision making styles.

In Study 1, we use classical test theory, factor analyses, and item-response theory to determine the best items for each of the three scales from a larger item pool. Our goal was to develop separate scales of 10-12 items each, and collectively these separate scales form the Maximization Inventory, intended to measure the maximization construct holistically. After selecting the best items for each scale, we report values of coefficient alpha for each scale, the resulting factor structure, and the estimated parameter values from an item-response theory analysis.

Study 2 was designed to investigate the relationship between the newly developed inventory and measures of well-being. The content of the new scales can be validated through their relationship to the criterion measures as demonstrated in Rim et al. (2011). Study 3 examined the relationships of the new scales to the two major maximization scales studied to date—the Maximization Scale and Maximization Tendency Scale.

2 Study 1: Scale development and psychometric examination

The purpose of Study 1 was to develop a maximization inventory consisting of separate scales that measure proper aspects of maximization behavior, specifically the decision difficulty and alternative search dimensions. While these dimensions are consistent in the literature, to date no studies have examined satisficing behavior and its relationship to the dimensions of the maximizing construct. Consequently, we also attempt to construct a satisficing scale in this study.

2.1 Method

2.1.1 Scale development

Based on psychometric findings from our previous studies (Rim et al., 2011), we constructed a large item set containing items related to four concepts: decision difficulty, alternative search, high standards and satisficing. Our strategy was to first write 20–30 items reflecting the content for each concept. We would then select the best 10–12 items based on the results of classical test theory analyses, factor analyses, and item response theory analyses. This method of scale construction combines the best of construct-based and empirically evaluated scale items.

2.1.2 Participants

Participants were 828 undergraduate students from an introductory psychology course at the Ohio State University. They received course credit for their participation. Twelve of the participants were removed because they responded to fewer than 25% of the items.

2.1.3 Procedures

Participants rated the degree of agreement to 104 items by using a standard 5-point scale with anchors. We split the data in half, so that Data Set 1 consisted of 446 participants whose data contained missing values, and Data Set 2 consisted of 370 participants who responded to every item.

2.2 Analyses

2.2.1 Factor analyses

Because the scale was originally constructed on the basis of four presumably distinct factors, we began our analysis assuming four factors. However, for a comprehensive examination, we wished to investigate models ranging from one to five factors. As mentioned in the introduction, there is considerable debate as to the exact number of factors comprising the maximization behavior (see, e.g., Rim et al. 2011). To analyze the data, we performed an exploratory factor analysis on Data Set 1 using both "comprehensive exploratory factor analysis" (CEFA; Browne, Cudeck, Tateneni, & Mels, 2008) and a Bayesian framework in WinBUGS (Lunn, Thomas, Best, & Spiegelhalter, 2000). The Bayesian framework allowed us to incorporate uncertainty in the parameters by evaluation of the posterior distribution. Among other things, this approach is robust in the face of missing data. Following correct model specification, WinBUGS simply ignores missing cases, but uses any information available to improve the estimate of the parameter (the posterior distribution). The technical details of the Bayesian exploratory factor analysis are provided in Appendix A. We adhered to common rules for the root mean squared error of approximation (RMSEA) for the exploratory factor analysis (Browne & Cudeck, 1992) followed by close inspection of the factor loadings. We then used LISREL (Jöreskog & Sörbom, 2004) to perform a confirmatory factor analysis (CFA) on Data Set 2, using the models developed in the exploratory factor analysis on Data Set 1.

2.2.2 Item and scale parameters

Item parameters were obtained using both classical test theory and item-response theory. For classical test theory, we obtained the item means, corrected item-total correlations, scale means and standard deviations, and values of Cronbach's alpha for each subscale. For the item-response theory analysis, we obtained parameters relating to item discrimination, item endorsement, and latent trait estimates (maximization tendency) by using the graded response model (Samejima, 1969). We used MULTILOG

(Thissen, Chen, & Bock, 2003) to estimate the parameters of this model. Appendix B provides the technical details of the item-response theory analysis. Once these parameters were estimated, we computed the item information functions and the test information function by using the estimates obtained for each item parameter. These functions are useful because they estimate the amount of information the item (item-information function) or scale (test-information function) provides as a function of the latent trait θ, assumed for each participant (see Appendix B).

2.3 Results

2.3.1 Factor Analyses

To develop the set of scales, an exploratory factor analysis was performed on the first data set, consisting of 446 responses to 104 items. We expected either a three or four factor model would be most suitable for our data. To be sure, we fit models ranging from one to five factors. In developing the scales, our strategy was to purify the item pool iteratively. That is, we would perform an exploratory factor analysis, determine which items to remove (on the basis of factor loadings and classical test theory results), and continue on the resulting set of items. To fit these models, we first used a Bayesian analysis to estimate the factor loadings for Data Set 1, as described in Appendix A. The first exploratory factor analysis started with 104 items. Upon close inspection of the factor loadings, scree plot, and the RMSEAs, we determined that a two, three, and a four factor model provided the best fit to the data.

After the initial exploratory factor analysis, we jointly examined the factor loadings for all three models. From these factor loadings, it was clear that several items did not provide high enough loadings onto a single factor, or they provided loadings onto multiple factors. The former group of items were eliminated due to a lack of contribution to the scale. The latter group of items was deleted to preserve the unidimensionality assumption required by item-response theory. After these items were deleted, 57 items remained for the inventory.

Another exploratory factor analysis was performed on the remaining 57 items using models ranging from two to four factors. To fit these models, we used Crawford-Ferguson Varimax oblique rotations with ordinary least squares as the discrepancy function using CEFA (Browne et al., 2008) on a small partition of the data containing no missing responses. The two factor model fit the data well ($\hat{\epsilon} = 0.057$, 90% CI = (0.052, 0.062)), and provided clear interpretations for the factor loadings. However, a few of the items failed to load onto either of the factors. The three factor model fit the data well ($\hat{\epsilon} = 0.050$, 90% CI = (0.045, 0.055)), and possessed fewer items that failed to load onto any of the factors. Additionally, the three factor model provided factors which were representative of a three factor structure consisting of decision difficulty, alternative search, and satisficing. The four factor model fit the data very well ($\hat{\epsilon} = 0.045$, 90% CI = (0.043, 0.046)), but contained a much less interpretable factor structure. These factors were similar to the three factor model, but had a few items that made the overall content of each factor difficult to pinpoint.

We then reduced the inventory to 34 items on the basis of their factor loadings as well as their classical test theory estimates. We then tested this model's fit to Data Set 2 in a CFA using LISREL (Jöreskog & Sörbom, 2004). To do so, the three factor model was restricted such that each item loaded onto a single factor, namely the factor that the item loaded highest on from the exploratory factor analysis. The three factor model fit the data very well ($\hat{\epsilon} = 0.063$, 90% CI = (0.058, 0.067)), and the factor loadings for this model are provided in Table 1. If an entry in the factor loading matrix is not available (indicated by a "-" symbol), then it was constrained to be zero. Table 1 shows that each item loads highly onto its respective factor.

As mentioned, we believe that the maximization behavior should not contain a high standards dimension. This hypothesis was confirmed in the data by means of the exploratory factor analysis, classical test theory and CFA analyses. In the exploratory factor analysis, we noticed that while the other three factors possessed items with high factor loadings and high Cronbach's alphas, the high standards factor had items that did not load highly. Additionally, the highest Cronbach's alpha we could obtain for a high standards scale was 0.68. Finally, the results of the CFA suggested that a three factor model consisting of decision difficulty, alternative search, and satisficing fit the data well. Because these three factors are quite different, we treat them as separate scales within the Maximization Inventory.

2.3.2 Item analyses

An item-response theory analysis was then performed on each of the three factors using MULTILOG on Data Set 2. Table 1 shows the item parameter estimates for the item discriminability parameters a, and each of the item endorsement parameters b_j, where $j = \{1, 2, 3, 4\}$. Items with higher discriminability parameters should be favored to items with lower values. Although no simple cutoff criterion exists for the discriminability parameter, Zickar, Russel, Smith, Bohle, and Tilley (2002) suggested that all parameters greater than 1 indicated acceptable discriminability between persons. For our 34 items, 12 items have discriminability parameters lower than 1.0. However, each scale contains several items

Table 1: Estimates for item and scale parameters. Note: λ_i is the loading for Factor i, a is the discriminability parameter, b_j are the item endorsement parameters, ITC is the item total correlation, and $\alpha_{deleted}$ is the resuling Cronbach's α if that item were deleted.

Item	λ_1	λ_2	λ_3	a	b_1	b_2	b_3	b_4	ITC	$\alpha_{deleted}$	α
1	0.32	-	-	1.17	-5.02	-2.63	-1.57	2.62	0.38	0.70	
2	0.39	-	-	1.92	-4.05	-3.00	-1.99	0.33	0.50	0.69	
3	0.38	-	-	1.49	-4.21	-2.93	-1.71	0.94	0.45	0.69	
4	0.36	-	-	1.17	-4.42	-2.80	-1.24	2.04	0.41	0.70	
5	0.27	-	-	0.86	-11.07	-3.27	-1.79	2.69	0.28	0.72	0.73
6	0.40	-	-	1.80	-4.18	-2.64	-1.66	0.99	0.49	0.69	
7	0.25	-	-	0.75	-6.80	-3.24	-1.54	3.00	0.28	0.72	
8	0.40	-	-	1.35	-5.02	-2.67	-1.95	0.40	0.41	0.70	
9	0.27	-	-	0.68	-6.94	-2.30	-0.17	5.14	0.27	0.72	
10	0.37	-	-	1.43	-4.30	-2.88	-1.98	0.81	0.44	0.69	
11	-	0.76	-	1.24	-3.55	-0.27	0.69	3.94	0.61	0.83	
12	-	0.47	-	1.27	-4.80	-1.60	-0.51	3.36	0.59	0.83	
13	-	0.54	-	1.17	-5.15	-1.83	-0.49	3.18	0.56	0.83	
14	-	0.73	-	0.91	-6.04	-1.72	-0.29	3.75	0.48	0.84	
15	-	0.46	-	0.78	-6.11	-0.58	1.26	5.42	0.42	0.84	
16	-	0.68	-	1.38	-5.69	-1.52	-0.33	3.70	0.59	0.83	0.85
17	-	0.43	-	0.87	-5.44	-1.47	0.41	5.37	0.49	0.84	
18	-	0.50	-	1.12	-5.92	-2.09	-0.97	2.35	0.52	0.83	
19	-	0.63	-	1.03	-7.16	-2.96	-1.30	3.76	0.46	0.84	
20	-	0.46	-	1.00	-6.46	-2.69	-1.45	3.48	0.48	0.84	
21	-	0.63	-	0.85	-7.74	-2.35	-0.46	4.75	0.44	0.84	
22	-	0.57	-	1.05	-5.62	-1.77	-0.48	3.31	0.49	0.84	
23	-	-	0.61	0.97	-6.12	-1.98	-0.20	4.53	0.53	0.81	
24	-	-	0.40	0.59	-6.80	-1.06	0.15	6.30	0.31	0.83	
25	-	-	0.40	1.56	-5.00	-1.44	-0.10	3.73	0.61	0.81	
26	-	-	0.50	1.44	-6.22	-2.61	-1.15	3.50	0.55	0.81	
27	-	-	0.50	1.22	-4.04	-0.59	0.46	4.24	0.61	0.81	
28	-	-	0.43	1.31	-6.70	-3.27	-1.95	3.07	0.51	0.82	0.83
29	-	-	0.35	1.07	-5.53	-1.58	-0.53	3.64	0.53	0.81	
30	-	-	0.62	1.04	-3.57	-0.67	0.30	4.28	0.48	0.82	
31	-	-	0.48	1.03	-6.57	-3.15	-1.20	4.00	0.51	0.82	
32	-	-	0.41	0.95	-7.78	-2.94	-1.54	3.15	0.42	0.82	
33	-	-	0.63	0.99	-7.36	-4.28	-1.88	4.25	0.45	0.82	
34	-	-	0.64	0.91	-7.75	-3.91	-1.66	3.92	0.42	0.82	

that demonstrate high discriminability, indicating that we could shorten our scale further, if desired.

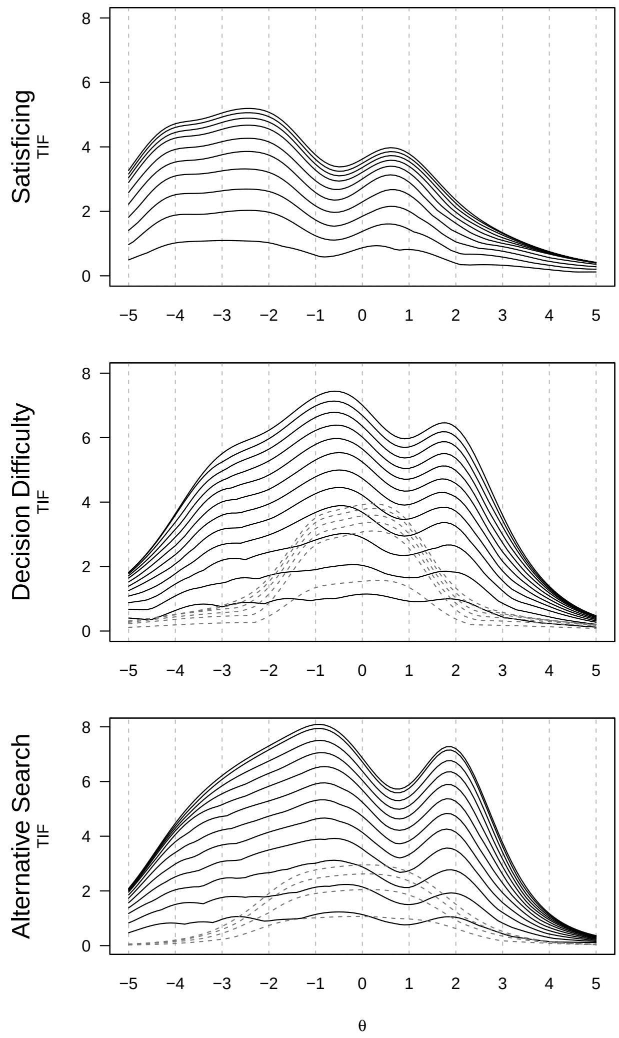
Table 1 also shows that the estimates for the endorsement parameters are sometimes extreme. This can happen if response categories are not endorsed very often. While it is true that we could have collapsed the response categories for these infrequent responses, we argue that this may distort the interpretation of these parameters.

Once the item parameters were estimated, we examined the item-information functions for each item. These functions supply the amount of information across the trait continuum for each item. As a general rule, items with high discriminability tend to have tall, narrow item-information functions, which tend to span a narrow range. By contrast, items with low discriminability tend to provide less information, but do so across a larger span of the trait continuum. Figure 1 shows the cumulative item-information functions for the items of each scale. For example, the fifth highest line for the first factor shows the amount of information provided by the first five items in the first factor. Because item-response theory assumes local independence, we can show the contribution of each item cumulatively. We continue this process until all items have been added. Thus, the highest line for each plot shows the TIF for that scale.

For comparison, we also performed an item-response theory analysis on the original data provided by Schwartz et al. (2002). On average, we found that the items comprising the Maximization Scale were not as discriminable as the items of the Maximization Inventory, but the Maximization Scale did demonstrate reasonably good psychometric properties (see Rim et al., 2011). Figure 1 shows the cumulative item-information functions for each of the items of the Maximization Scale (gray, dashed lines, bottom and middle panels). For comparison, we chose to plot these items along the same continuum as the factors employed by the Maximization Inventory, although these factors may not be equivalent. Figure 1 shows that the Maximization Inventory provides much more information than the Maximization Scale, and provides more information along a greater range of the continuum. This is especially useful for detecting extreme maximization (or extreme satisficing) behavior.

We also performed a classical test theory analysis on Data Set 2. We computed the mean and standard deviations for each item. We then computed the item total correlations and the Cronbach's alpha for each scale. The item-total correlations and the Cronbach's alpha are reported in Table 1. The item-total correlations are quite high, which suggests that these items are highly related. The Cronbach's alpha for the satisficing scale was 0.73, for decision difficulty was 0.85, and for alternative search was 0.83. Currently, these values are the highest alphas for any maximization scale that have been reported. We then determined the resulting alphas for each factor when each item was removed from the scale (denoted $\alpha_{deleted}$). This procedure is useful in determining which items could be removed to improve the overall Cronbach's alpha. Table 1 shows $\alpha_{deleted}$ for each item. Clearly, deleting any of the items from the scale would result in a deterioration of Cronbach's alpha.

Figure 1: The scaled TIF (test information function) for the three scales of the Maximization Inventory along the latent trait continuum. For each scale, the lines show the cumulative IIFs (item information functions) for each item, taken in turn. Thus, the highest line represents the TIF for that particular scale. The black lines represent scales of the Maximization Inventory and the gray, dashed lines represent the items for the Maximization Scale (middle and bottom panels).



2.4 Conclusions

In Study 1, we used a series of factor analyses and classical test theory to construct three highly reliable scales representing the decision difficulty, alternative search, and satisficing dimensions. Both the decision difficulty and alternative search scales consisted of 12 items and the satisficing scale consisted of 10 items. We also provided evidence that the high standards factor is not part of the maximization behavior. Specifically, the high standards items we developed did not load highly onto a single factor nor did they show high item total correlations. Additionally, we found that the satisficing construct is unidimensional and is not assimilated by other maximization factors (e.g., decision difficulty or alternative search). This is intriguing because satisficing has been previously assumed to be on the same dimension as the maximization behavior, but on the other end of the continuum. These findings suggest that the satisficing dimension should instead be treated as a separate, independent construct. The item-response theory analysis showed that our Maximization Inventory scale provides more information along a greater range of the continuum than the Maximization Scale. That is, our scale is better able to detect extreme maximization behavior than the Maximization Scale.

3 Study 2: Correlation study with the new scale

The purpose of Study 2 was to examine the correlations of the three new scales with the criterion behaviors used in previous research. We hypothesized that our decision difficulty and alternative search scales should be negatively correlated with measures of well being; however, our satisficing scale should be positively correlated with measures of well being. Given that this is consistent with previous research, confirming this hypothesis will constitute evidence for the construct validity of our new measures.

Previous studies of the relationship between the maximization behavior and measures of well-being included criterion variables measuring regret, decision making styles, subjective happiness and optimism scales (Diab et al., 2008; Nenkov et al., 2008; Parker, Bruin, & Fischhoff, 2007; Schwartz et al., 2002). In an attempt to replicate this previous research for our new scales, we included the Decision Making Style Inventory (Nygren, 2000; Nygren & White, 2002), the Life Orientation Test as a measure of optimism (Scheier, Carver, & Bridges, 1994), the General Self-efficacy Scale (Sherer et al., 1982), the Unconditional Self-regard Scale (Betz, Wohlgemuth, Serling, Harshbarger, & Klein, 1995), and the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999). Based on the findings of Parker et al. (2007) and Rim et al. (2011), we postulated that maximizers (i.e., participants with higher scores on decision difficulty and alternative search) would score highly on maladaptive decision making styles, whereas satificers (i.e., participants scoring highly on our new satisficing scale) would score more highly on positive adaptive decision making styles and in particular, the analytical decision making style.

3.1 Method

3.1.1 Measures

Maximization The Maximization Inventory consists of 34 items that measure three components of maximization, which are presented in their respective order in Table 3: satisficing (10 items), decision difficulty (12 items), and alternative search (12 items).

Decision making styles The Decision Making Style Inventory (Nygren, 2000; Nygren & White, 2002), composed of three 15-item scales, was used to measure decision making styles. Analytical decision making is the propensity to engage in effortful deliberation in choice situations (e.g., "In making decisions I try to evaluate the importance of each piece of information in the decision process."). The intuitive decision making style is the tendency to follow feelings and simple heuristics (e.g., "A quick, intuitive decision rule usually works best for me."). The regret-based decision making style defines the desire to minimize the anticipated regret associated with making decisions (e.g., "I tend to be someone who worries a lot over decisions I've made."). Responses are obtained on a six-point scale with response options ranging from "Strongly Agree" (6) to "Strongly disagree" (1). In Nygren and White (2005), the values of Cronbach's alpha in the development sample were 0.89 (analytical), 0.86 (intuitive) and 0.86 (regret) and in Rim et al. (2011), the values were 0.90 (analytical), 0.85 (intuitive) and 0.90 (regret).

Optimism Optimism was measured by the Life Orientation Test (LOT-R; Scheier et al., 1994). The Life Orientation Test uses six items to measure individual differences in generalized expectancies for positive versus negative outcomes. A sample item includes "In uncertain times I usually expect the best." Responses are obtained on a six-point scale with response options ranging from "Strongly Agree" (6) to "Strongly disagree" (1). The value of Cronbach's alpha was 0.78 (Scheier et al., 1994). In our sample, the value of Cronbach's alpha was 0.86.

Self-Efficacy and Self-Regard Generalized self-efficacy and global self-esteem have both been shown to be positively related to healthy functioning and to the absence of depressive symptoms (Smith & Betz, 2002). More generally, Bandura (1997, 2001) has argued the importance of self-efficacy in overall psychological adjustment, including relative freedom from depression and anxieties. This argument has been buttressed by considerable research (e.g., Bandura, Pastorelli, Barbaranelli, & Caprara, 1999). Accordingly, we included both of these constructs as criteria of well-being.

The Generalized Self-Efficacy Scale (Sherer et al., 1982) is comprised of 17 self-report items designed to measure an individual's generalized beliefs about his/her ability to perform tasks required of everyday adaptation and problem solving. For example, "Failure just makes me try harder" is positively worded, whereas "I give up easily" is negatively worded. Responses are obtained on a six-point scale ranging from "Strongly agree" (6) to "Strongly disagree" (1). Chen, Gully, and Eden (2001) summarized values of Cronbach's alpha obtained over a number of studies and characterized them as adequate to strong, ranging from 0.76 to 0.89. In our sample, the value of Cronbach's alpha for the 17 items was 0.91.

The Unconditional Self-Regard Scale (Betz et al., 1995), which contains 15 items, was designed to assess global self-esteem and unconditional self-acceptance. For example, the item "Even though I make mistakes I feel good about myself as a person" is positively worded whereas the item "I can never quite measure up to my own standards" is negatively worded. Responses are obtained on a six-point scale with response options ranging from "Strongly Agree" (6) to "Strongly disagree" (1). Values of Cronbach's alpha in two samples of college students were 0.87 and 0.90 (Betz et al., 1995). In our sample, the value of Cronbach's alpha was 0.93.

Subjective Happiness Subjective happiness was measured by Lyubomirsky and Lepper's (1999) 4-item Subjective Happiness Scale using a seven-point scale. A sample item is "Compared to most of my peers, I consider myself 'more happy' (7) to 'less happy' (1)." The range of Cronbach's alpha across 14 samples was 0.79 to 0.94 ($M = .86$; Lyubomirsky & Lepper 1999). In our sample, Cronbach's alpha was 0.88.

3.1.2 Participants

Participants were 370 undergraduate students from several sessions of an introductory psychology course, who each received course credit for their participation.

3.1.3 Procedures

Participants were administered the Maximization Inventory, the Decision Making Style Inventory, the Life Orientation Test, the General Self-efficacy Scale, the Unconditional Self-regard Scale, and the Subjective Happiness Scale.

3.2 Results

Once our inventory consisting of three scales was developed, we investigated the relationships of each of the factors to other measures. To do this, we computed the sum of the responses for each scale by participant for the first data set. We then computed the Pearson correlations between the scores. Table 2 shows the results of this analysis. Cohen (1988) and others have urged for the practical importance of interpretation, which should be gauged by the percentage of variance accounted for (r^2) or effect size. Correlations between 0.10 and 0.30 are considered small effects.

Consistent with previous findings, decision difficulty and alternative search are moderately positively correlated ($r = 0.35$). Alternative search is modestly related to satisficing. Decision difficulty and satisficing are unrelated ($r = 0.08$).

Table 2 also presents correlations between the three new scales and other related measures. We postulated that alternative search and decision difficulty would be positively correlated with maladaptive decision making styles and negatively correlated with indices of well-being whereas the reverse would be true for the satisficing scale. These hypotheses are mostly supported by the data. Compared to decision difficulty, the satisficing and alternative search scales showed moderate positive correlations with the analytical decision making style ($r = 0.62$ for the former and $r = 0.44$ for the latter). The decision difficulty showed a small correlation with analytical style ($r = 0.23$). The analytical decision style can be considered adaptive because it likely results in evidence-based decisions. None of the correlations of the maximization scales with the intuitive decision making style were of practical importance.

The most striking relationships were between the regret-based decision making style and the maximization scales. The decision difficulty scale was highly related to regret ($r = 0.80$), the alternative search scale was moderately related to regret ($r = 0.36$), and the satisficing scale was unrelated to regret ($r = 0.04$). Thus, the results suggest that a major component of perceived decision difficulty is the expectation that a decision will be followed by regret. Consistent with an aversion to future regret, Rim et al. (2011) found that decision difficulty was highly correlated with procrastination, which was not measured in this study.

Patterns of correlations of the new maximization scales with the direct well-being indices were even more interesting. The satisficing scale was positively correlated with most of these indices, including subjective happiness ($r = .44$), optimism ($r = 0.31$), self-efficacy ($r = 0.47$), and self- regard ($r = 0.44$). The alternative search scale was uncorrelated with the well-being indices, and decision difficulty was negatively correlated to optimism ($r = -0.41$), self-efficacy ($r = -0.33$), and self-regard ($r = -0.38$). Decision difficulty was uncorrelated with happiness, which was also found in Rim et al. (2011).

Table 2: Correlations of the three scales of the Maximization Inventory with measures of well-being. For $N = 370$, values of $r \geq 0.12$ and $r \geq 0.15$ are significant with $p < 0.01$ and $p < 0.001$, respectively. However, values of $r < 0.30$ correspond to a small effect size (Cohen, 1988). DMI is the Decision Making Style Inventory.

	Satisficing	Decision difficulty	Alternative Search
Satisficing	1.00	0.08	0.28
Decision difficulty	0.08	1.00	0.35
Alternative Search	0.28	0.35	1.00
Happiness scale	0.44	0.05	0.12
Life Orientation Test	0.31	-0.41	-0.07
Unconditional Self Regard	0.44	-0.38	-0.07
Generalized Self Efficacy	0.45	-0.39	0.12
DMI analytical	0.44	0.23	0.62
DMI intuitive	0.20	-0.16	-0.11
DMI regret	0.04	0.80	0.36
Maximization Scale	0.12	0.48	0.35
Maximization Tendency Scale	0.24	0.04	0.38

3.3 Conclusions

In summary, intercorrelations of the new scales and the criterion measures clearly indicate that satisficing can be reliably measured separately from decision difficulty and alternative search, and that it is positively correlated with indices of well-being and decision making styles. The patterns of correlations suggest that satisficing is a positive behavior whereas decision difficulty is a negative behavior. Thus, the data suggest that the alternative search and decision difficulty components of the maximization behavior support the theory that maximizers engage in non-productive decisional behavior, whereas the satisficing scale is positively correlated with positive adaptation.

4 Study 3: Convergent validity

The final study in this series was designed to evaluate the convergent validity of our new scales with the major extant measures of maximization, the Maximization Scale and the Maximization Tendency Scale.

4.1 Method

4.1.1 Measures

Maximization Inventory The Maximization Inventory consists of 34 items that measure three components of maximization, which are are presented in their respective order in Table 3: satisficing (10 items), decision difficulty (12 items), and alternative search (12 items).

The Maximization Scale The 13-item Maximization Scale developed by Schwartz et al. (2002) was constructed using four samples of introductory psychology students and three samples of adults. Based on the analyses of Nenkov et al. (2008), the items can be organized into three factors, “alternative search,” “decision difficulty” and “high standards” (pp. 377–378). The alternative search category consists of six items measuring the tendency to expend resources to explore all possible opportunities (e.g., “When I watch TV, I channel surf, often scanning through the available options even while attempting to watch one program.”) The four items categorized as “decision difficulty” represent experiencing difficulty when making choices among abundant options (e.g., “I often find it difficult to shop for a gift for a friend.”) The three “high standards” items reflect decision makers’ tendencies to hold “high standards for themselves and things in general” (p. 374) and include “No matter what I do, I have the highest standards for myself.” Values of Cronbach’s alpha in Rim et al. (2011) were 0.65 (alternative search), 0.69 (decision difficulty), 0.67 (high standards), and 0.74 (Maximization Scale total score).

The Maximization Tendency Scale Diab et al. (2008) argued that multidimensionality is contrary to the definition of maximization tendency, defined the maximization tendency as “a general tendency to pursue the identification of the optimal alternative” (p. 365, Diab et al., 2008). In an attempt to incorporate this definition into a scale, the Maximization Tendency Scale was constructed by adding six new items to the three high standards items

Table 3: Items of the Maximization Inventory

Number	Satisficing Items
1	I usually try to find a couple of good options and then choose between them.
2	At some point you need to make a decision about things.
3	In life I try to make the most of whatever path I take.
4	There are usually several good options in a decision situation.
5	I try to gain plenty of information before I make a decision, but then I go ahead and make it.
6	Good things can happen even when things don’t go right at first.
7	I can’t possibly know everything before making a decision.
8	All decisions have pros and cons.
9	I know that if I make a mistake in a decision that I can go “back to the drawing board.”
10	I accept that life often has uncertainty.
Number	**Decision Difficulty Items**
11	I usually have a hard time making even simple decisions.
12	I am usually worried about making a wrong decision.
13	I often wonder why decisions can’t be more easy.
14	I often put off making a difficult decision until a deadline.
15	I often experience buyer’s remorse.
16	I often think about changing my mind after I have already made my decision.
17	The hardest part of making a decision is knowing I will have to leave the item I didn’t choose behind.
18	I often change my mind several times before making a decision.
19	It’s hard for me to choose between two good alternatives.
20	Sometimes I procrastinate in deciding even if I have a good idea of what decision I will make.
21	I find myself often faced with difficult decisions.
22	I do not agonize over decisions.
Number	**Alternative Search Items**
23	I can’t come to a decision unless I have carefully considered all of my options.
24	I take time to read the whole menu when dining out.
25	I will continue shopping for an item until it reaches all of my criteria.
26	I usually continue to search for an item until it reaches my expectations.
27	When shopping, I plan on spending a lot of time looking for something.
28	When shopping, if I can’t find exactly what I’m looking for, I will continue to search for it.
29	I find myself going to many different stores before finding the thing I want.
30	When shopping for something, I don’t mind spending several hours looking for it.
31	I take the time to consider all alternatives before making a decision.
32	When I see something that I want, I always try to find the best deal before purchasing it.
33	If a store doesn’t have exactly what I’m shopping for, then I will go somewhere else.
34	I just won’t make a decision until I am comfortable with the process.

of the Maximization Scale. These new items mainly focus on the goal of maximizers to optimize the outcomes of decisions. Rim et al. (2011) estimated Cronbach’s alpha to be 0.80.

4.1.2 Participants

One hundred eighty undergraduate students (61% females; average participant age = 20.41) from several introductory psychology courses at The Ohio State University participated in the study in exchange for course credit.

4.1.3 Procedures

The Maximization Inventory, the Maximization Scale and the Maximization Tendency Scale were administered to the participants. Because three items from the Maximization Scale are duplicated in the Maximization Tendency Scale, they were not administered twice. Responses were obtained on a 6-point scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (6).

4.2 Results

For the Maximization Inventory, values of Cronbach's alpha were 0.89 for decision difficulty, 0.82 for alternative search and 0.72 for satisficing. For the Maximization Scale and Maximization Tendency Scale, values of Cronbach's alpha were 0.76 and 0.84, respectively. Table 2 shows the intercorrelations of the Maximization Inventory scales with the Maximization Scale and Maximization Tendency Scale. As shown, our decision difficulty scale is most highly correlated with the Maximization Scale, which is to be expected because decision difficulty is one of the two most salient components the Maximization Scale (along with alternative search). Our alternative search scale is moderately positively correlated with both the Maximization Scale and the Maximization Tendency Scale. Satisficing is not correlated with the Maximization Scale and has only a small correlation with the Maximization Tendency Scale. This pattern of correlations strengthens our contention that with the satisficing scale we are measuring a dimension of behavior that has not previously been included in maximization measurement, even though it has been implicitly assumed to be the opposite of the maximizing behavior.

4.3 Conclusions

Investigating correlations between our Maximization Inventory and the major extant maximization scales, Study 3 provided evidence that the Maximization Inventory has sufficient convergent validity. The decision difficulty scale and the alternative search scale of the Maximization Inventory were positively correlated with the Maximization Scale. The finding that the satisficing scale was not correlated with the Maximization Scale and only weakly correlated with the Maximization Tendency Scale strengthens our contention that the satisficing scale is measuring a dimension of behavior that has not previously been included in maximization measurement, even though it has been implicitly assumed to be on the opposite end of the maximization behavior.

5 General Discussion

The present series of studies were designed to develop and evaluate new measures of the maximization construct. These studies, like those presented in Rim et al. (2011), provide strong evidence that when maximizing is defined as alternative search and decision difficulty, it is negatively related to indices of psychological well-being. Further, alternative search and decision difficulty are positively related to maladaptive decision making styles. By contrast, our new measure of satisficing was positively related to indices of good mental health and adaptive decision making. This was the first attempt to measure the satisficing behavior, which is a central construct in Simon's original concept of satisficing in decision making, defined as being comfortable with a satisfactory, or "good enough," solution. The newly developed satisficing scale is a reliable 10-item scale that adds to the measurement of the maximization tendency. While satisficing has been previously assumed to be on the opposite end of the maximization continuum, we have found evidence that it is not inversely related and, as a consequence, should be treated as a separate, independent scale.

Study 2 provided additional support for previous research on maximization behaviors. Specifically, the decision difficulty and alternative search scales were negatively correlated with optimism, generalized self-efficacy, and self-regard. Decision difficulty was also positively correlated with a regret-based decision style.

The findings from these studies suggest that the maximization behavior can be broken into three components. Viewing the construct in this way may provide a solution to the inconsistent findings of well-being correlates in previous studies. Schwartz's (2000) original postulate, that maximization is negatively related to psychological well-being, is strongly supported here as long as maximization is measured using the dimensions of alternative search and decision difficulty. People who tend to search endlessly for information, who feel more difficulty in making decisions, and who assume that an optimal choice can be found if they only look long enough report lower scores on "healthy" characteristics and have higher scores on maladaptive personality measures. When the satisficing scale is included we find that satisficing tendencies are positively related to well-being. It seems that satisficers are people who understand that, while there are usually several possible good alternatives for a decision, eventually they must choose one and be willing to live with the consequences. Recently, Schwartz, Ben-Haim and Dasco (2011) argued that satisficing is a better decision making strategy which maximizes confidence in an acceptable outcome and frequently produces objectively better decision outcomes than maximizing under uncertainty. Our findings on positive relationships between satisficing and psychological well-being add to the growing body of evidence of the benefits of satisficing behaviors.

This study has yielded three short yet reliable scales of the maximizing/satisficing tendency. They should not be summed for a total score because they are measuring different things: decision difficulty and alternative search involve maximizing tendencies that impair well-being and decision making whereas the satisficing scale is positively related to well-being and adaptive decision making. The scales should prove useful in further research on these constructs. There may also be implications for improving well-being for maximizers. For example, cognitive strategies of satisficing and analytical decision making could be taught to maximizers with the goal of reducing anticipated regret and prolonged searching.

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Appendix

6 Details of the Bayesian Factor Analysis

For the EFA, we used the common factor model. Let x_{ij} denote the score for the ith participant on the jth item and let μ_j denote the overall mean for the jth item. We denote the common factor score for the ith participant on the kth factor as z_{ik} and the factor loading of the jth item on the kth factor as λ_{jk}. We denote the unique factor score on factor j for the ith participant as u_{ij}. Then, the data model for a common factor analysis is given by

$$x_{ij} = \mu_j + \sum_{k=1}^{m} \lambda_{jk} z_{ik} + u_{ij},$$

where m denotes the number of common factors. Often, this equation is written in the equivalent matrix notation, given by

$$\mathbf{x} = \mu + \mathbf{\Lambda z} + \mathbf{u},$$

for clarity. To satisfy the unidimensionality assumption of IRT, our model has no common factors ($m = 1$). The likelihood function is assumed to be multivariate normal, so

$$\mathbf{x} \sim \mathbf{MN}\left(\mu + \mathbf{\Lambda z}, \mathbf{\Psi}\right),$$

where $\mathbf{MN}(\mu, \mathbf{\Sigma})$ denotes the multivariate normal distribution with mean matrix μ and covariance matrix $\mathbf{\Sigma}$. For each element ψ_j of $\mathbf{\Psi}$, we used the continuous uniform prior from 0 to 400, or

$$\psi_j \sim CU(0, 400),$$

where $CU(a, b)$ denotes the continuous uniform distribution from a to b. For the mean score parameter vector μ, we used the prior

$$\mu_j \sim N(0, 20).$$

For $\mathbf{\Lambda}$, there are no common factors in the model so we restricted the elements of $\mathbf{\Lambda}$ such that each item could load onto only one factor. Thus, the matrix $\mathbf{\Lambda}$ can be represented by a vector, so we denote the elements of this vector as λ_j, with a truncated normal prior, so

$$\lambda_j \sim N(0, 1000) I(\lambda_j \geq 0),$$

where $I(x \geq c)$ denotes an indicator function such that if $x \geq c$, then $I(x \geq c) = 1$ and if $x < c$, $I(x \geq c) = 0$. For the factor score matrix $\mathbf{z}$, we used a multivariate normal prior, so

$$\mathbf{z} \sim \mathbf{MN}(\mathbf{0}, \mathbf{\Phi}),$$

where for each element ϕ_{ij} of $\mathbf{\Phi}$, we used a continuous uniform prior given by

$$\begin{cases} \phi_{ij} = 1 & \text{if } i = j \\ \phi_{ij} \sim CU(-1, 1) & \text{if } i \neq j \end{cases}.$$

Each factor structure was examined by the final 40,000 MCMC samples after a burn-in period of 10,000 samples. The initial values for each chain were sampled from the prior distributions.

Details of the Item Response Theory Analysis

In item response theory, we determine the probability of endorsement for the ith person on the jth item. The graded response model is an extension of this model, and it assumes m_j categories for the jth item. These categories are assumed to be ordered, making endorsement more "difficult" for category $(k + 1)$ than it was for category k.

Let a_j denote the jth item's discriminability, b_{jk} denote the difficulty parameter for the jth item on category k. Although for all of our items, we used five categories for a response, we let m_j denote the number of categories on the jth item. We denote the ability level for the ith participant as θ_i. Then the probability that participant i will endorse at or above category k on the jth item is

$$P_{i,j,k} = \frac{\exp[a_j(\theta_i - b_{jk})]}{1 + \exp[a_j(\theta_i - b_{jk})]}$$

where $k = 2, 3, ..., m_j$.