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An Alternate Conceptualization of the Leisure Constraints Measurement Model

Formative Structure?

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Abstract

In this paper, we question researchers' assumption that the leisure constraints measurement model holds reflective structure and offer an alternative conceptualization consistent with the structure of constraints indicators. We contend that constraints indicators follow a formative structure and that reflective specifications violate the psychometric assumptions underlying the common factors model. After clarifying conceptual distinctions governing formative and reflective measurement, we then offer an empirical example to demonstrate its application and present several guiding criteria for developing and assessing formative indices. By improving our ability to correctly model the constraints measurement model, formative specifications have the potential to resolve a number of confounding measurement issues, advance our understanding of leisure constraint and negotiation processes, and enhance delivery of leisure services.

Keywords: *leisure constraints, formative measurement, structural equation modeling*

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A Problem Exists

Several years ago, Godbey, Crawford, and Shen (2010) provided a thorough review of leisure constraint research conducted over the past two decades adopting the hierarchical model of constraints. The model, originally proposed by Crawford and colleagues (Crawford & Godbey, 1987; Crawford, Jackson, & Godbey, 1991; Jackson, Crawford, & Godbey, 1993), consists of three broad classifications of leisure constraints arranged hierarchically; intrapersonal, interpersonal, and structural. They hypothesized that constraints are experienced sequentially such that eventual leisure behavior is dependent on the successful negotiation of each form of constraint beginning with factors most proximal to the individual (i.e., intrapersonal) to those most distal (i.e., structural). In Godbey et al.'s review, they highlight a variety issues with which researchers have struggled and provide instructive direction for future research. An issue raised in their review, and the focus of this paper, relates to the assumptions underlying the conceptualization and analyses of constraint measures. Godbey et al.'s discussion highlights concern with the performance of existing constraints scales, noting weak factor loadings and scale reliability. These measurement issues also raise concern over the validity of the dimensional structure of constraints and, ultimately, their hypothesis relating to hierarchical processes.

It is our contention that both their tripartite model and most associated measures are adequate. Rather, the problem lies in authors' conceptualization of the measurement model. Leisure researchers have assumed measures of constraints follow a reflective form where variation in the manifest indicators is accounted for by their latent domain (i.e., the dimensions of constraints). However, we contend that constraint measures more closely approximate the form of what Bollen and Lennox (1991) refer to as "formative indicators" (also referred to as "composite cause" or "cause indicators"; Brown, 2006). Rather than reflecting the latent construct, formative indicators "cause" the latent factor (Bollen & Lennox, 1991; Fornell & Bookstein, 1982). As such, analytical techniques that are more consistent with procedures underlying index construction, as opposed to scale development, are most appropriate (Bollen & Lennox, 1991; Diamantopulos & Winklhofer, 2001).

The choice of a formative versus a reflective measurement model is driven by the causal priority between the indicator and the latent variable (Bollen, 1989). For reflective models, directionality (see Panel 1, Figure 1) emanates from latent construct to the observed measure. This is based on the assumption that the individuals' responses to the measures are thought to vary as a function of the latent variable (Borsboom, Mellenbergh, & van Heerden, 2004). In this sense, the measures are thought to share a common cause. Alternately, for formative models, the reverse is true; causality flows from the indicator to the latent construct (see Panel 2, Figure 1). In this case, because the latent construct is conceived as an explanatory combination of its indicators, changes in the indicators give rise to changes in the latent construct (Fornell & Bookstein, 1982).

When considering the dimensions of constraints and their accompanying measures, it becomes immediately apparent why a reflective conceptualization is problematic – both conceptually and empirically. For example, authors' measures of structural constraints often include items referencing crowded settings, access to transportation, financial resources, convenience, knowledge of services available, other commitments, and time deficit (e.g., Hawkins, Peng, Hsieh, & Eklund, 1999; Nyaupane & Andereck, 2008; Nyaupane, Morais, & Graefe, 2004; Walker, Jackson, & Deng, 2007; Raymore, Godbey, Crawford, & von Eye, 1993). In this context, it is difficult to imagine that the variation in each of the indicators emanates from a single latent construct. That is, the variation in respondent's perceptions of setting density (crowding) is likely to be indepen-

dent of their financial resources; or their access to transportation is not likely to be tied to their work or personal commitments. Thus, the assumptions underlying reflective models are incongruent with current conceptualizations and measures of the tripartite leisure constraints model.

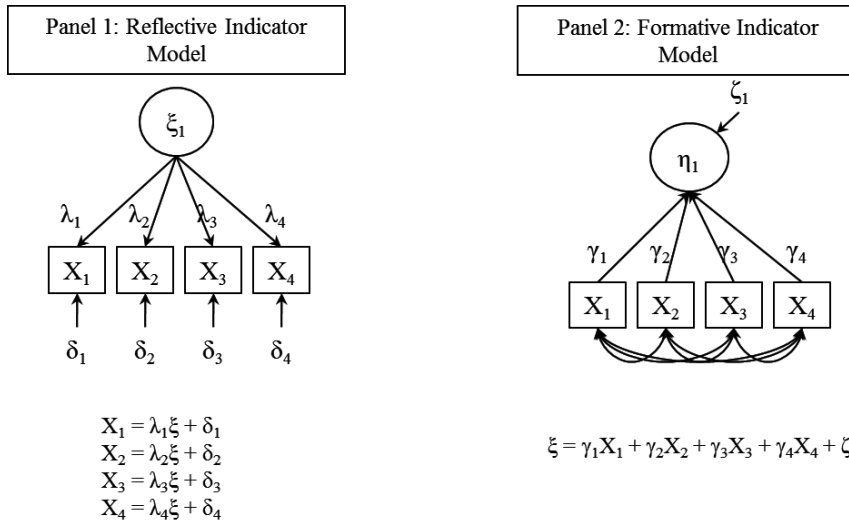

Figure 1. Reflective and Formative Measurement Models

With this in mind, the purpose of the paper is to present an alternative approach for conceptualizing leisure constraint measurement models that enables researchers to move beyond these existing measurement conundrums. We begin by providing insight on the theoretical background underlying the development of formative indicators and metrics for their assessment. Using an exemplar drawn from the literature, we also draw parallels to contemporary measures of leisure constraints and highlight shortcomings of existing analytical procedures that assess their psychometric properties. We then provide an empirical example demonstrating alternate analytical procedures for testing formative models using data from one of our previous investigations. We conclude with a reiteration of the need to revisit conceptualization of the leisure constraints measurement model, and its implications for both leisure research and practice.

Why the Problem Exists: Reflective and Formative Measurement

Conceptual Distinctions

A great deal of attention has been devoted to developing measures of various leisure phenomena (e.g., motivation, specialization, enduring involvement, place attachment, commitment, etc.) with sound psychometric properties over the last 30 years. The advent of structural equation modeling techniques has also further facilitated the use and assessment of multi-item scales. Because many aspects of leisure are assumed latent, particularly those related to individuals' thoughts and feelings about leisure and the contexts in which it is experienced, efforts to measure these phenomena have relied on multi-item scales which are considered to have superior validity and reliability. Researchers studying leisure constraints have continued this line

of thinking. Following a tradition in quantitative social psychology and in accordance with classical test theory (Lord & Novick, 1968), they have almost exclusively conceptualized the leisure constraints measurement model to be reflective (see Panel 1 in Figure 1). In so doing, several key assumptions are made. First, as noted, the direction of causality trails from the latent construct to the measured indicator. As such, variation in the latent variable precedes variation in the indicators (see equations in Panel 1, Figure 1). Consequently, the indicators ought to share a common theme and are interchangeable. This interchangeability, theoretically, enables researchers to measure a specific construct by sampling a few relevant indicators of the domain underlying the construct (Churchill, 1979; Nunnally & Bernstein, 1994). Inclusion or exclusion of one or more indicators from the domain does not materially alter the content or validity of the construct (Bollen, 1989). Because the indicators share a common theme, they are also assumed to be strongly and positively correlated (Brown, 2006). Last, it is also assumed that given the items share a common theme, it is assumed that they will have the same antecedents and consequences (Cenfetelli & Bassellier, 2009)

Alternately, for formative measurement models where the indicators define the construct, directionality flows from the measured items to the latent construct (Bollen & Lennox, 1991; see Panel 2, Figure 1). Unlike the reflective model, this model does not assume that the measures are caused *by* a single underlying construct. Rather, it assumes that the measures have an impact *on* the construct. As such, no assumptions are made of inter-item collinearity. In fact, Jarvis, MacKenzie, and Podsakoff (2003, p. 202) have suggested that it would be "entirely consistent for formative indicators to be completely uncorrelated." Given this, measures of internal consistency reliability are not appropriate (Bollen & Lennox, 1991). Also, the consequences of dropping one of the indicators are potentially serious. Decisions guiding the selection of items should best attempt to capture the domain of interest (Coltman, Devinney, Midgley, & Venaik, 2008; Rossiter, 2002). Thus, dropping a causal indicator has the potential to omit an important element of the composite latent construct and change the meaning of the variable. Finally, formative indicators have the same antecedents and consequences (Cenfetelli & Bassellier, 2009). Referring back to the measures often used for structural constraints noted in the introduction (e.g., crowded settings, access to transportation, financial resources), it is unlikely factors influencing people's perceptions of setting density would also drive their access to transport or financial resources. Similar, the extent to which they impact people's preference and access to leisure is not likely uniform.

Thus, Table 1 provides a summary of the distinguishing characteristics of formative and reflective measurement models discussed above. Given these distinctions, a construct should be modeled as having formative structure if the indicators manifest the following conditions (Bollen & Lennox, 1991; Jarvis et al., 2003): (a) indicators are viewed as defining characteristics of the construct, (b) changes in the indicators will result in changes in the construct, (c) changes in the construct are not expected to cause changes in the indicators, (d) the indicators do not share a common them, (e) removing an indicator can change the conceptual meaning of the construct, (f) a change in the value of one of the indicators is not assumed to be associated with changes in other indicators from the same domain, and (g) the indicators are not assumed to have the same antecedents and consequences.

The Issue of Psychometric Assessment

The conceptual distinctions outlined above have empirical implications that also inform our understanding of the measurement model. Where procedures for assessing reflective indicator scales have been around for over 100 years (Spearman, 1904) along with other complimentary psychometric assessments, formative indicator models have a comparatively brief history.

Table 1

Summary: Framework for Assessing Reflective and Formative Models

Considerations	Reflective Model	Formative Model
Direction of causality	From the construct to the indicators • Variation in the construct causes variation in the indicators	From the indicators to the construct • Variation in the indicators causes variation in the construct
Characteristics of indicators used to measure the construct	Indicators are manifested by the construct • Indicators share a common theme • Indicators are interchangeable • Adding/dropping an indicator does not change the meaning of the construct	Indicators define the construct • Indicators share a common theme • Indicators not interchangeable • Adding/dropping an indicator can change the meaning of the construct
Indicator intercorrelations	Indicator should have high positive intercorrelation • Measures should possess internal consistency reliability	Indicators should share the same valence with little covariation • Internal consistency not a consideration
Nomological net of construct indicators	Indicators expected to have the same antecedents and consequences	Indicators not expected to have the same antecedents and consequences

While growing in popularity in business, marketing, and organizational behavior research (for reviews, see Diamantopoulos et al., 2008; Diamantopoulos & Winklhofer, 2001; Jarvis et al., 2003), they have yet to appear in the leisure literature. From this developing literature, several authors have begun to make recommendations on potential metrics for assessment (Diamantopoulos et al., 2008; MacKenzie, Podsakoff, & Podsakoff, 2011) while others have rejected these metrics claiming that assessments of validity and reliability are inappropriate.

Suggestions for potential reliability assessment with formative indicators include test-retest (DeVillis, 2003) or correlating indicators with an alternate measure of the focal construct (MacKenzie et al., 2005). Alternately, for validity, Bollen (1989) has suggested examining that the γ-parameters that reflect the effect of the formative indicators on the latent construct. A significant effect implies item-level validity. Similarly, at the construct level, several authors have also suggested examining the constructs' effect on theoretically relevant outcomes (Bollen & Lennox, 1991; Diamantopoulos et al., 2008). In this case, validity would be demonstrated through statistically significant prediction.

Authors who resist the use of quantitative assessments of validity and reliability for formative indicators typically cite the measures' lack of covariation that undermines assessment of internal consistency and convergent validity (Rossiter, 2002; Straub, Boudreau, & Gefen, 2004). For constraints indicators, we cite two other pragmatic concerns that warrant consideration. For reflective indicators that comprise a scale designed to measure a particular latent phenomena, establishing validity and reliability is considered an important goal. This allows the researcher to measure the particular phenomena across a range of contexts, populations, and time. For constraints indicators, however, the development of a valid and reliable scale that transcends context makes little conceptual sense. Given that the constraints to leisure (and just about any behavior for that matter) are influenced by a range of factors (e.g., gender, race, ethnicity, lifecycle, time

period), it is unlikely that a single universal scale could be developed to reasonably be administered in the field. Consequently, researchers often draw from the pool of items available in the literature and/or develop their own context-specific items. Arguments for the use of generic indicators with a history of solid psychometric performance have the potential to miss the salient constraints relevant to the population of interest.

Another concern relates to the potential exclusion of an item owing to a low factor loading and/or its influence on a dimension's internal consistency. Given both factor loadings and internal consistency are driven by the covariance structure among a set of indicators (Brown, 2006) there is potential to exclude items not because of the degree to which they reflect a salient constraint but, rather, because of how well they relate to other items within the particular dimension. Consequently, in the context formative measurement, use of the pillars of psychometric assessment that govern the performance of reflective scales has potential to guide the researcher in directions detrimental to their research objectives.

An Exemplar Taken from the Literature

To provide an example of the issues associated with considering constraints indicators as reflective, we drew on Raymore et al.'s (1993) study of leisure constraints among high school children using the hierarchical model. From the outset, we emphasize that our critique is not directed toward the quality of their research, the conceptual foundations underlying the hierarchical model, or even the indicators themselves. Our concern lies with their conceptualization of the measurement model, the associated analysis, and metrics used to evaluate the model. While it could be considered unfair to apply contemporary understandings of empirical adequacy to analyses conducted over 20 years prior, the issue remains prevalent in the literature (see Casper, Bocarro, Kanters, & Floyd, 2011; Hawkins et al., 1999; Hubbard & Mannell, 2001; Jun & Kyle, 2011; Nyaupane & Andereck, 2008; Nyaupane et al., 2004; Walker et al., 2007) and, to date, has not been questioned. We choose Raymore et al.'s paper to focus our discussion largely due to several authors pointing to this work as "validating" the hierarchical model (Godbey et al., 2010; Mannell & Iwasaki, 2005). We contend that incorrect assumptions concerning the nature of the measures and the resulting empirical evidence undermines such claims.

Beginning with empirical evidence, the data presented in Table 2 contains the observed measures, factor solution, and composite reliabilities[1] reported by Raymore et al. (1993, p. 106). First, with regard to the strength of the factor loadings, one can see the values are conspicuously low. While Raymore et al. report that their model fit the data well (e.g., GFI=.938, RMSR=.054), establishing model fit is a necessary but insufficient condition for evaluating the plausibility of the measurement model (Brown, 2006). In reviews of the business and organizational behavior literatures conducted by Diamantopoulos, Riefler, and Roth (2008) and MacKenzie, Podsakoff, and Jarvis (2005), they reported that model fit indices (e.g., CFI, GFI, SRMR and RMSEA) can fail to detect model misspecification. Consideration of parameter estimates is also required to provide substantive evidence in support (or lack) of the hypothesis being tested (i.e., the three-dimensional structure is a valid representation of leisure constraints). Raymore et al. established that the predicted variance/covariance matrix (Σ) adequately resembled the sample variance/covariance matrix (S), but it did not substantively address concern over what is being measured. The issue is intimately tied to construct validity; i.e., what is the relationship between the observed indicator and the latent construct for which it was designed to reflect. Factor loadings

[1]Raymore et al. (1993) did not report composite reliabilities in their original work. We derived these from their reported factor loadings and calculated using Raykov's (1997) procedure.

provide empirical evidence of this association (Brown, 2006). At a more stringent level, Fornell and Larcker (1981) have suggested that latent constructs failing to capture at least 50% of the variance in their manifest indicators are questionable. This requires factor solutions generating loadings equal to or greater than .708 (i.e., $.708^2$=.5). As displayed in Table 2, no loading approaches this value with the highest value being .595. While we think most would agree that the Fornell and Larcker cut-off is a very (perhaps overly) demanding requirement of data collected outside of a laboratory environment, concern remains even when applying more relaxed tolerances. In the context of applied research, Hair, Anderson, Tatham, and Black (1998, p. 111) noted that "factor loadings greater than $\pm$0.30 are considered to meet the minimum level; loadings of $\pm$0.40 are considered more important; and if the loadings are $\pm$0.50 or greater, they are considered practically significant." Thus, while four of Raymore et al.'s 21 items were below the .3 cutoff suggested by Hair et al., more troubling is that only two items had loadings above .5. Raymore et al. defend their decision of retaining items with small loadings because of their significant t-values[2]. Several authors, however, have noted that significance even for low loadings can be achieved owing to sample size (Byrne, 1998; Cudeck & O'Dell, 1994). With an *N* of 363 responses, this appears to be the case.

Other empirical concerns over construct validity stemming from Raymore et al.'s (1993) factor solution are also reflected in the average variance extracted (AVE; Fornell & Larcker, 1981) which we calculated for each dimension of constraints. Fornell and Lacker's AVE measures the amount of variance captured by a latent construct with values of .5 and higher providing evidence of convergent validity. As displayed in Table 2, all three AVEs for the constraint dimensions are equal to or less than .30. Last, while the composite reliability (i.e., measure of scale reliability) estimates approach the acceptable threshold value of .7 (Hair et al., 1998), their values are being inflated by the number of items loading on each factor (Raykov & Marcoulides, 2011). For example, the removal of the two weakest items (X_3 & X_5) loading on the "intrapersonal" dimension lowers the composite reliability from .74 to .62. The same issues are evidenced in each of the other dimensions.

This example illustrates that when evaluating the Raymore et al. (1993) and subsequent published leisure constraints measurement models using the rubric accompanying reflective measurement, a number of questions can be posed concerning the adequacy of the measures. For researchers who report the solutions of their measurement models (and many don't), use of the previously discussed indicators of validity (e.g., strength of factor loadings, inter-item correlations, AVE) and reliability (e.g., composite reliability) provide limited empirical evidence in support of the dimensional structure of leisure constraints. The root of these empirical conundrums can be traced back to model misspecification; (a) indicators don't share a common theme, (b) construct does not account for variation in the indicators, (c) indicators are not correlated, and (d) indicators are not likely to share the same antecedents (e.g., factors influencing perceptions of crowding are not likely to influence respondents' access to money) or outcomes. In the following section we provide an empirical illustration for testing a formative measurement model in comparison to reflective models using data collected by the first author.

[2]T-values test the H_o that parameter estimate equals 0. Values $\geq$ 1.96 allow the researcher to reject the H_o.

Table 2

Raymore et al. (1993) Factor Loadings and Factor Correlations

Intrapersonal (ρ_{xx}=.74; AVE=.30)		λ	λ^2	δ
Y_1	I'm too shy to start a new leisure activity	.331	.110	.890
Y_2	I am more likely to start a new leisure activity that my family would think is alright	.479	.229	.771
Y_3	I am unlikely to do a new leisure activity that makes me feel uncomfortable	.292	.085	.915
Y_4	I am more likely to do a new leisure activity that my friends thought was alright	.415	.172	.828
Y_5	I am more likely to do a new leisure activity that is in keeping with my religious beliefs	.307	.094	.906
Y_6	I am more likely to do a new activity that doesn't make me feel self-conscious	.541	.293	.707
Y_7	I am more likely to do a new leisure activity that doesn't require a lot of skill	.347	.120	.880
Interpersonal (ρ_{xx}=.68; AVE=.28)				
Y_8	The people I know live too far away to start a new leisure activity with me	.498	.248	.752
Y_9	The people I know usually don't have enough time to start a new leisure activity with me	.428	.183	.817
Y_{10}	The people I know usually have enough money to begin a new leisure activity with me	.023*	.001	.999
Y_{11}	The people I know usually have too many family obligations to start a new leisure activity with me	.349	.122	.878
Y_{12}	The people I know usually know what new leisure activities they could do with me	.152	.023	.977
Y_{13}	The people I know usually don't have enough skills to start a new leisure activity with me	.280	.078	.922
Y_{14}	The people I know usually don't have transportation to get to a new leisure activity with me	.595	.354	.646
Structural (ρ_{xx}=.69; AVE=.26)				
Y_{15}	I amore likely to do a new leisure activity if the facilities I need to do the activity are not crowded	.470	.221	.779
Y_{16}	I am unlikely to do a new leisure activity if I have other commitments	.165	.027	.973
Y_{17}	I am more likely to do a new leisure activity if I have transportation	.430	.185	.815
Y_{18}	I am more likely to do a new leisure activity if I know what is available	.319	.102	.898
Y_{19}	I am unlikely to do a new leisure activity if the facilities I need to do the activity aren't convenient	.456	.208	.792
Y_{20}	I am unlikely to do a new leisure activity if I don't have time	.263	.069	.931
Y_{21}	I am more likely to do a new leisure activity if I have money	.326	.106	.894

Latent Factor Correlations	ρ
Intrapersonal ↔ Interpersonal	.420
Intrapersonal ↔ Structural	.693
Structural ↔ Interpersonal	.695

* Not statistically significant at $p < .05$

An Empirical Application

Context and Data

The data we used was collected in 2002 from subscribers to Cleveland Metroparks' *Emerald Necklace* publication. For greater detail on the study context and the population from which the sample were drawn, we direct readers to Kyle, Mowen, and Tarrant (2004). Survey instruments were distributed using a modified Dillman (2000) procedure which yielded 860 completed survey instruments (a 57.3% response rate).

Scale Development

While the constraint indicators were not explicitly developed with the principles of formative measurement in mind, our intent at the time was to develop a battery of items that covered the breadth of constraints that could potentially inhibit access to Cleveland Metroparks' services and facilities. The protocols we used to develop the constraint scale were consistent with criteria outlined by Diamantopoulos and Winklhofer (2001). The first step involved establishing content specification, which centers on the definition of the latent construct. This is also intimately tied to indicator specification (i.e., what indicators should be used to measure the construct) (Nunnally & Bernstein, 1994). In the context of the dimensions of constraints, while their definitions transcend context, the constraint indicators often vary across activities and populations (Godbey et al., 2010). Appropriately, leisure researchers have tended to develop indicators that are sensitive to issues confronted by specific populations in addition to those constraints endemic to the activity. While dimensionality has been a contentious issue within constraints research (Auster, 2001; Godbey et al., 2010; Shaw & Henderson, 2005), for the purpose of this illustration, we make the assumption that the definitions of the dimensions (intrapersonal, interpersonal, and structural) are narrow and unambiguous while reflective of the phenomena. The classification of the indicators into the constraint domains was comparable to past work (Raymore et al., 1993).

The second step relates to indicator specification. Unlike reflective indicators where a set of items are "chosen randomly from the universe of items relating to the construct of interest" (DeVillis, 1991, p. 55), a census of indicators is required for a formative specification (Bollen & Lennox, 1991). This implies that the items used as indicators must cover the entire scope of the latent variable as reflected in its definition. In the context of constraints measurement, indicators should accurately capture the breadth of constraints faced by populations of interest relative to the activity of interest. This does not mean that index purification is not possible through the removal of items. Rather, it stresses the need to select indicators that sufficiently capture the construct's domain content. Our goal was to include items that best reflected the most salient factors constraining Cleveland residents' access to Cleveland Metroparks facilities and services. Consequently, the constraints items were adapted from earlier studies in addition to consultation with staff from Cleveland Metroparks (Buchanan & Allen, 1985; McGuire, 1984) and consisted of 19 items; five measuring intrapersonal constraints, three measuring interpersonal constraints, and 11 measuring structural constraints. The items were prefaced with a question asking respondents to indicate if they felt they visited Cleveland Metroparks as often as they would like; 63.4% indicated "no." Respondents were then requested to indicate the extent to which the 19 items reflected reasons for not visiting as often as they would like. Items' measurement anchors were "not a reason" (1) through "major reason" (5).

Modeling and Identification

The issue of model identification is especially important for formative models (Diamantopulos & Winklhofer, 2001) and has some bearing on our choice of measures and the models that we choose to estimate. As with all structural equation models, the ability to estimate parameters is dependent on having sufficient information to be able to solve each of the equations (i.e., the number of unknowns not exceeding the number of knowns) (Brown, 2006). The knowns refer to elements of the input matrix to be analyzed and unknowns refer to the parameters to be estimated. Reflective measurement models with at least three indicators (or two indicators if correlated with another latent factor comprised of two or more indicators) are algebraically identified; six parameters to be estimated (three factor loadings and three error variances) and six input elements (three variances and three covariances). Measurement models consisting solely of formative indicators like the one displayed in Panel 1 of Figure 2, however, are not identified. MacCallum and Brown (1993) have indicated that many identification problems of formative indicator constructs stem from indeterminacies associated with the scale of measurement and the construct-level error term (i.e., the ζs in Figure 2). For scaling, Edwards (2001), advised standardizing the formatively measured construct by fixing its variance to unity given that fixing path parameters precludes estimating standard errors of theoretically interesting relationships. Additionally, for identifying the construct-level error term, three approaches have been broadly applied (Diamantopoulos et at., 2008); (a) add at least two unrelated reflectively-measured constructs as outcome variables (Panel 2 in Figure 2), (b) adding two theoretically appropriate reflective indicators to the formatively measured construct (Panel 3 in Figure 2), or (c) a mixture of these two approaches that would include a single reflective indicator and a reflectively-measured construct as an outcome variable (Panel 4 in Figure 2).

Beyond fixing the variance of the dimensions of constraints to unity, we chose to estimate a model conceptually similar to that displayed in Panel 2 of Figure 2. Our decision to test a model of this form was driven by the absence of single reflective indicators of the constraint dimensions. No such indicators were included on the instrument. The model we tested, displayed in Figure 3, has the three dimensions of constraints predicting four dimensions of place attachment (Williams & Roggenbuck, 1989; Kyle, Graefe & Manning, 2005; Jorgensen & Stedman, 2001). Place attachment was comprised of four reflective dimensions measured with 16 items: (1) place dependence—examines the functional utility people ascribe to place based on the setting's ability to support desired outcomes (Stokols & Schumaker, 1981); (2) affective attachment—reflects people's emotional ties to the physical environment (Low & Altman, 1992); (3) social bonding —the social ties that bind people to place (Low & Altman, 1992); and (4) place identity—the extent to which the self is imbedded in the landscape (Proshansky, 1978). Building from past work demonstrating an association between place interaction and place attachment (Hidalgo & Hernandez, 2001), we anticipated that those least constrained would express strongest attachment to Cleveland Metroparks setting and facilities.

Analyses

We analyzed the data using LISREL (V8.8). The pattern of missing data followed a missing completely at random distribution (MCAR). Multiple imputation was used to impute missing values in PRELIS (11%; Little & Rubin, 2002). An examination of normality revealed a mild departure from normality. In response, we chose to use the Satarra-Bentler scaled χ^2 (Satorra & Bentler, 1988) to evaluate the fit of the measurement models; both reflective and formative.

While partial least squares (PLS) approaches to estimating formative models are prevalent in the literature, our decision to test the hypothesized model using a covariance-based (CB)

estimation procedure was driven by the approach's ability to account for error. In PLS, the focal construct (η) is assumed to be fully determined by its indicators (Centefetelli & Bassellier, 2009; Diamantopoulos, 2011). That is, the variance of the disturbance term (ζ) is assumed to be zero. This assumption makes the overall assessment of the formative measurement model problematic given that it is not possible to evaluate how well the indicators collectively function in explaining the construct (Williams, Edwards & Vandenberg, 2003). Covariance-based procedures also provide the user with an assessment of overall model fit. This allows the researcher to determine the extent to which the hypotehsized model fits the collected data and to compare against potential competing explanations (Henseler, Ringle, & Sinkovics, 2009). Last, CB software such as LISREL also offer a number of diagnostics (e.g., modification indices and expected parameter changes) which can assist with model respicification.

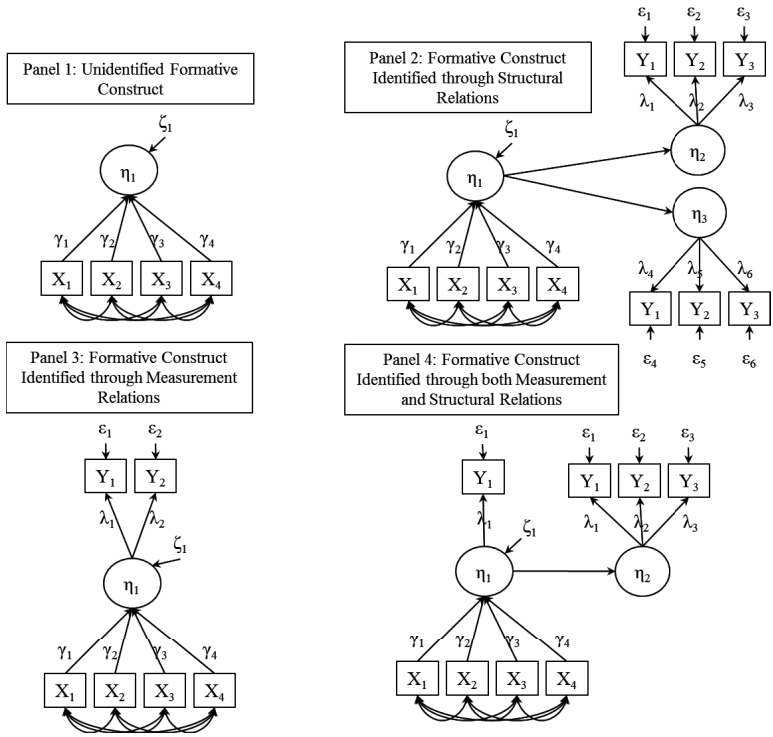

Figure 2. Assessing Identification Status (Adapted from Jarvis et al., 2003)

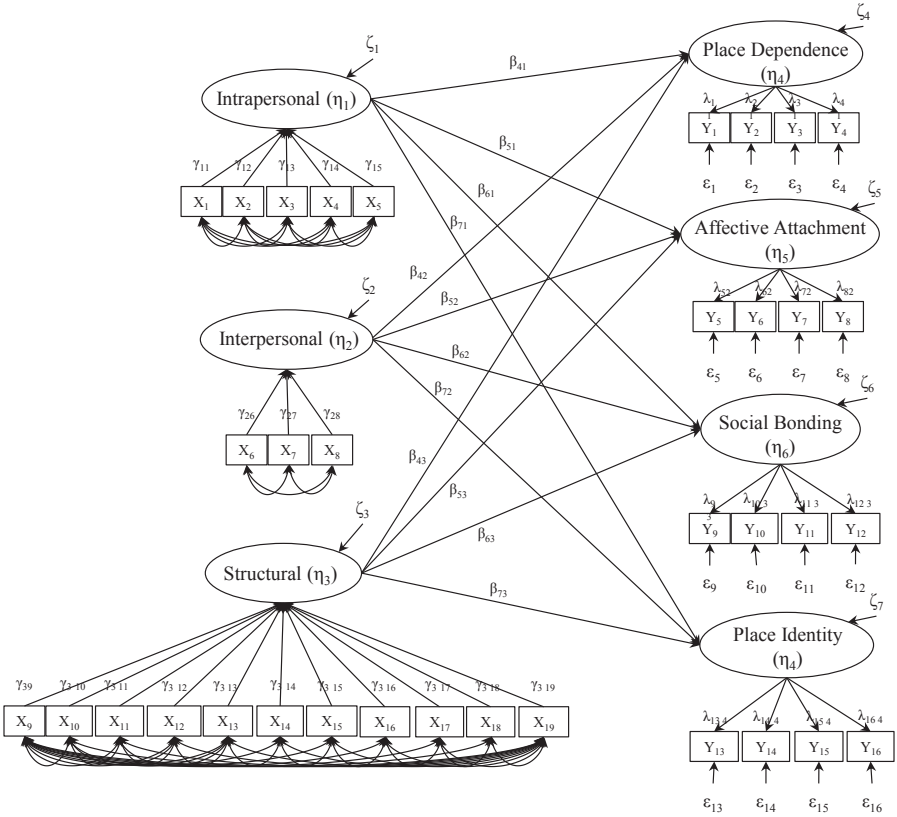

Figure 3. Formative Structural Model

Assessing the Reflective Conceptualization

Before testing the formative measurement model, for comparison, we also tested a reflective conceptualization of the constraints measurement model. The confirmatory factor solution is displayed in Table 3. Beyond a poor fit to the data ($SB\chi^2_{(df=149)}$=2737.360, RMSEA=.163, NNFI=.688, NFI=.718, CFI=.728), 10 of 19 loadings fell below.40; indicating that the dimensions of constraints were accounting for less than 16% of the variation in each of these indicators. Typically, the next step in the analysis would be to parse poorly performing items (i.e., items with low factor loadings; see Hair et al.'s [1998] criteria noted above) and rerun with the goal of arriving at a well-fitting and parsimonious model. As noted, however, the removal of items has potential to remove important factors that may constrain leisure preference and engagement. While factor loadings provide insight on the relationship between the indicator and its latent construct, it does not provide an assessment of the degree to which individual constraint indicators could be relevant factors inhibiting the leisure experience. Thus, like the exemplar we discussed earlier, model misspecification is evidenced in the fit indices and parameter estimates. This misspecification is directly attributable to the criteria outlined in Table 1.

Table 3

Leisure Constraints Reflective Measurement Model

		λ	*t*	λ^2	ε
Intrapersonal (ρ_{xx}=.60; AVE=.25)					
Y_1	Poor health	.242	-	.059	.941
Y_2	Fear of crime	.314	4.980***	.099	.901
Y_3	Not at ease in social situation	.435	5.531***	.189	.811
Y_4	Pursue recreation in areas other than parks	.637	5.924***	.406	.594
Y_5	Don't like to participate in nature or outdoor recreation activities	.380	5.327***	.144	.856
Interpersonal (ρ_{xx}=.57; AVE=.31)					
Y_6	No one to go with to parks	.498	-	.248	.752
Y_7	Friends/family prefer to recreate elsewhere	.525	11.521***	.276	.724
Y_8	Conflicting schedules with my spouse/companion	.636	12.879***	.404	.596
Structural (ρ_{xx}=.91; AVE=.59)					
Y_9	The lack of information about existing parks and park programs in Northeast Ohio	.209	-	.044	.956
Y_{10}	The lack of time	.787	5.761***	.619	.381
Y_{11}	Work commitments	.700	5.710***	.490	.510
Y_{12}	Parks are too far away	.261	4.587***	.068	.932
Y_{13}	I have no way to get to parks	.122	2.916**	.015	.985
Y_{14}	Park facilities and programs cost too much	.367	4.249***	.135	.865
Y_{15}	Parks and facilities are too crowded	.302	5.143***	.091	.909
Y_{16}	Parks and facilities are over-developed	.805	4.851***	.648	.352
Y_{17}	Too busy with other activities	.742	5.770***	.551	.449
Y_{18}	Too busy with family responsibilities	.105	5.737***	.011	.989
Y_{19}	Lack of transportation	.209	2.596**	.044	.956

Latent Factor Correlations	r
Intrapersonal ↔ Interpersonal	.813
Intrapersonal ↔ Structural	.660
Structural ↔ Interpersonal	.753

** p< .01, *** p < .001

Goodness of fit indices: $SB\chi^2_{(df=149)}$=2737.360, RMSEA=.163, NNFI=.688, NFI=.718, CFI=.728

The Formative Conceptualization

Before testing the formative measurement model, we examined the indicators' collinearly using the indicators' variation inflation factor scores (VIF; Diamantopoulos et al., 2008; Götz & Liehr-Gobbers, 2004). As we noted earlier, excessive collinearity is undesirable in formative models. The highest correlation we observed was r=.784 among two structural constraint indicators: "I have no way to get to parks" and "parks are too far away." We then regressed the two structural constraint indicators on a measure of visitation over the preceding 12 months (in SPSS). The analysis produced a VIF of 2.48; a value well below threshold of 10 that Hair et al. (1998) indicated problematic. Most other items were weakly correlated.

For the formative measurement model, the analysis illustrated that model fit the data well (see bottom of Table 4: $SB\chi^2_{(df=309)}$=733.356, RMSEA=.040, NNFI=.971, NFI=.972, CFI=.983) demonstrating adequate congruence between the observed data and the values expected under the model tested. For the individual parameter estimates, six of the 19 indicators had a significant influence on the endogenous constraint dimensions. For intrapersonal constraints, significant predictors were constraints related to health (X_2, γ=.394, p<.01) and preference for other settings (X_4, γ=.678, p<.01). For structural constraints, significant factors were issues

related to the lack of information about existing parks and programs in the area (X_{10}, γ=-.488, p<.01), parks being too far away (X_2, γ=.359, p<.01), not having any transportation to the parks (X_2, γ=.271, p<.05), and parks being over developed (X_2, γ=.455, p<.01). The interpersonal constraint measures were not significant.

Table 4

Leisure Constraints Formative Index (γi on ηi)

Intrapersonal		γ	*t*
X_1	Fear of crime	.142	-
X_2	Poor health	.394	2.655**
X_3	Not at ease in social situations	.286	1.594
X_4	Pursue recreation in areas other than parks	.678	2.797**
X_5	Don't like to participate in nature or outdoor recreation activities	.241	-1.225
Interpersonal			
X_6	Friends/family prefer to recreate elsewhere	.468	-
X_7	No one to go with to parks	.542	1.023
X_8	Conflicting schedules with my spouse/companion	.163	1.032
Structural			
X_9	The lack of time	.032	-
X_{10}	The lack of information about existing parks and park programs in Northeast Ohio	.488	3.061**
X_{11}	Work commitments	.034	.073
X_{12}	Parks are too far away	.359	2.786**
X_{13}	I have no way to get to parks	.271	2.030*
X_{14}	Park facilities and programs cost too much	.070	.0352
X_{15}	Parks and facilities are too crowded	.064	.983
X_{16}	Parks and facilities are over-developed	.455	2.989**
X_{17}	Too busy with other activities	.153	1.866
X_{18}	Too busy with family responsibilities	-.062	-.495
X_{19}	Lack of transportation	.178	-.025

Goodness of fit indices: $SB\chi^2_{(df=309)}$=733.356, RMSEA=.040, NNFI=.971, NFI=.972, CFI=.983

Using some of the metrics that have been reported in the literature to assess reliability and validity portrays the scale questionable. For example, for reliability, McKenzie et al. (2005) have suggested correlating indicators with an alternate measure assessing the focal construct. While we did not have a global measure of constraints, we did have a measure of visitation over the previous 12 months. we anticipated that those most constrained would report visiting less. The resulting correlations were relatively weak (r<.2) and varied in valence. Perhaps indication of respondents having negotiated many of the listed constraints. For validity, Bollen's (1989) suggestion to examine the influence of the indicators (γs) on the latent construct (ηs) might also raise suspicion given that only six of 19 indicators had statistically significant influence. In both instances, for the reasons outlined earlier, assessment of validity and reliability of constraint indicators is antithetical to the intent of the scale's development; i.e., to identify factors constraining leisure preference and participation.

Summary of Structural Relationships

For the structural coefficients (see Table 5; place attachment factor solution presented in appendix), to varying degrees, only intrapersonal and structural constraints were statistically significant predictors of the dimensions of place attachment. Intrapersonal constraints were

a negative predictor of all four dimensions of place attachment; place dependence (β=-.273, p<.01), affective attachment (β=-.167, p<.01), social bonding (β=-.235, p<.01), and place identity (β=-.153, p<.05). As anticipated, the more personally constrained respondents' felt, the less attached they were to Metroparks settings and facilities. Individual item effects are displayed in Table 5. Constraints associated with poor health (X_2 indirect effect: place dependence=-.108, p<.01; affective attachment=-.066, p<.01; social bonding=-.093, p<.01; place identity=-.060, p<.05) and preferences for other recreation sites (X_5 indirect effect: place dependence=-.108, p<.01; affective attachment=-.113, p<.001; social bonding=-.159, p<.001; place identity=-.104, p<.001) each negatively influenced the dimensions of place attachment.

Table 5

Summary of Direct Effects (γi on ηi)

Place Dependence	β	SE	*t*	R^2
Intrapersonal (β_{41})	-.273	.023	-2.908**	.125
Interpersonal (β_{42})	.055	.008	.512	
Structural (β_{43})	-.223	.035	-2.868**	
Affective Attachment				
Intrapersonal (β_{51})	-.167	.014	-2.581**	.063
Interpersonal (β_{52})	-.053	.006	-.540	
Structural (β_{53})	-.144	.023	-2.442*	
Social Bonding				
Intrapersonal (β_{61})	-.235	.021	-2.765**	.072
Interpersonal (β_{62})	-.016	.004	-.292	
Structural (β_{63})	-.104	.025	-1.856	
Place Identity				
Intrapersonal (β_{71})	-.153	.021	-2.535*	.045
Interpersonal (β_{72})	-.058	.011	-.548	
Structural (β_{73})	-.099	.031	-2.001*	

** p< .01, *** p < .001

Similarly, structural constraints were a negative predictor of place dependence (β=-.223, p<.01), affective attachment (β=-.244, p<.01), and place identity (β=-.099, p<.05) (see Table 3). The more inclined respondents were to indicate structural factors inhibited their access to Cleveland Metroparks settings and facilities, the less likely they were to express an attachment to these settings and facilities. Specifically, issues related to the lack of information about existing parks and programs in the area (X_{10} indirect effect: place dependence=-.109, p<.01; affective attachment=-.052, p<.05), parks being too far away (X_{12} indirect effect: place dependence=-.080, p<.05), not having any transportation to the parks (X_{13} indirect effect: place dependence=.-.060, p<.05), and parks being over developed (X_{16} indirect effect: place dependence=-.101, p<.05; affective attachment=-.066, p<.05; social bonding=-.047; place identity=-.018) were most significant in inhibiting the development of place attachment (see Table 6).

Table 6

Summary of Indirect Effect (γi on ηi)

		Indirect Effect			
		Place Dependence	Affective Attachment	Social Bonding	Place Identity
Intrapersonal					
X_1	Fear of crime	.039	.024	.033	.022
X_2	Poor health	-.108**	-.066**	-.093**	-.060*
X_3	Not at ease in social situations	-.078	-.048	-.067	-.044
X_4	Pursue recreation in areas other than parks	-.185***	-.113***	-.159***	-.104***
X_5	Don't like to participate in nature or outdoor recreation activities	-.066	-.040	-.057	-.037
Interpersonal					
X_6	Friends/family prefer to recreate elsewhere	.026	-.025	-.007	-.027
X_7	No one to go with to parks	.030	-.029	-.009	-.031
X_8	Conflicting schedules with my spouse/companion	.009	-.009	-.003	-.009
Structural					
X_9	The lack of time	-.007	-.005	-.003	-.003
X_{10}	The lack of information about existing parks and park programs in Northeast Ohio	-.109**	-.070*	-.051	-.048*
X_{11}	Work commitments	-.008	-.005	-.004	-.003
X_{12}	Parks are too far away	-.080*	-.052*	-.037	-.036
X_{13}	I have no way to get to parks	-.060*	-.039	-.028	-.027
X_{14}	Park facilities and programs cost too much	-.016	-.010	-.007	-.007
X_{15}	Parks and facilities are too crowded	-.014	-.009	-.007	-.006
X_{16}	Parks and facilities are over-developed	-.101*	-.066*	-.047*	-.045
X_{17}	Too busy with other activities	-.034	-.022	-.016	-.015
X_{18}	Too busy with family responsibilities	.014	.009	.006	.006
X_{19}	Lack of transportation	-.040	-.026	-.019	-.018

* $p < .05$** $p < .01$, *** $p < .001$

Problem Solved?

The purpose of this paper was to critique leisure researchers' misconceptualization of the leisure constraint measurement model and present an alternative analytic approach that is more consistent with the form of constraints indicators. We have argued that because contemporary measures of leisure constraints follow a formative structure, factor analytic approaches are inappropriate owing to incorrect assumptions concerning the measurement model. Conventional metrics for assessing validity and reliability, designed for more traditional reflective measurement models, are also inappropriate. To date, most leisure constraint researchers have assumed their measures are reflective (see Godbey et al., 2010 for review) where correlations among the observed measures associated with a specific latent constraint dimension are directly attributed to that dimension. With formative indicator models, however, causality extends from the observed measure to the latent construct (Bollen, 1989; Bollen & Lennox, 1991). No expectation is assumed for inter-item correlation. This distinction has direct implications for the type of analyses that are appropriate for each type of measure. Factor analytic approaches that have governed leisure constraint research for the past 20-plus years have produced a body of empirical evidence

that undermines claims on the tenability of the dimensional structure underlying the hierarchical model (i.e., the existence of intrapersonal, interpersonal, and structural constraints). Propositions related to the temporal structure and negotiation of the modes of constraint have also been overshadowed by concerns related to construct validity and scale reliability. It is our contention that these issues could be resolved by conceptualizing constraint measures as formative and using analyses that are congruent with this type of measurement. Our empirical example provided an illustration of one latent variable modeling technique for analyzing formative indices along with discussion of the conceptual and empirical issues that must be addressed when conducting the procedure. While not quite "solving the problem" just yet, the technique responds to the theoretical assumptions that underlie the formative measurement characteristics of leisure constraint indicators. Continued testing in varied contexts will begin to reveal the bounds of the procedure along with building on a literature related to formative analysis that remains in its infancy. Most importantly, the procedure has the potential to lay to rest many of the lingering concerns underlying the measurement of constraints. These issues have hindered the testing of hypotheses that have implications for understanding leisure behavior among diverse populations and across a range of contexts.

By embracing the potential for using formative measures, researchers also are better to positioned to utilize indicators that are specific to the population or context of concern. In our pursuit of external validity, researchers have striven to develop scales that transcend context and have the potential for broad application across people, place, activity, and time. The abstraction of context, however, has the potential to ignore important information germane to the context of interest. We argue, especially in the context of constraints measurement, that the blind adherence to "established" measures and the psychometric rules governing their adequacy undermines the advancement of constraints research. Generic measures, produce generic findings that are applicable only to nonexistent generic populations. Tailoring measures to be sensitive to the nuance of context and utilizing analytical tools that are consistent with the assumptions underlying their measurement properties will undoubtedly produce stronger findings that are of theoretical and applied value. In the context of constraints research, the generalizability of the hierarchical model lies primarily in its classification of constraint domains and the propositions related to how these domains are temporally distinguished and negotiated. The use of context-specific indicators does not violate the propositions related to the model. Rather, it better situates the researcher to minimize Type 1 and Type 2 error when testing hypotheses driven by the model's tenets.

The modeling procedures we have described in this paper also have the potential to provide better insight for understanding which individual constraints most strongly hinder participation or access. Factor analyses of reflective scales do not directly inform the researcher of which individual items are constraining. Factor loadings only provide insight on the nature of the relationship between the manifest indicators and their latent factors (Brown, 2006). When we regress the latent factors onto other endogenous constructs, the information provided by the regression weight(s) also only provides insight on the latent factor's influence on these other outcomes. Alternately, as displayed in Table 4, we can immediately determine which items have the strongest influence on the latent outcomes (i.e., dimensions of place attachment). An understanding of which constraints most directly hinder access, participation, preference, or even attachment provides an agency with specific information on how they might be able to deliver their services in ways that limit or mitigate the constraint.

A limitation to note concerning our investigation relates to the selection of constraint indicators. First, the indicators that we chose to include for interpersonal constraints were limited and, in retrospect, may not reflect the breadth of constraints that may fall within this dimension as reflected in Raymore et al.'s (1993) investigation. Consistent with the suggestion offered by Diamantopoulos and Winklehofer (2001), decisions on the selection of constraint items should be driven by the need to capture the range of factors that might constrain behavior. Beyond having little influence on the dimensions of attachment at both the item and construct level, the limited number also prevent other useful analyses. Bollen and Ting (2000) introduced an approach (vanishing tetrad test: VTT) that can empirically assist the researcher to determine if their measures are formative or reflective. Unfortunately, the test requires at least four indicators per construct. The test, however, would be a useful complement to the framework outlined in Table 1.

Finally, a flurry of recent publications in the management and information sciences literature illustrates that consensus on the conceptualization and analyses of formative scales has yet to fully develop (Aquirre-Urreta & Marakas, 2012; Bagozzi, 2011; Bollen, 2011; Cenfetelli & Bassellier, 2009; Dimanatopoulos, 2011; Edwards, 2011; Hardin, Chang & Fuller, 2008a, 2008b; Jarvis, MacKenzie, & Podsakoff, 2012; Kim, Shin, & Grover, 2010; Marakas, Johnson & Clay, 2007; Petter, Straub, & Rai, 2007). The contrasting opinions among scholars is diverse. Some authors question the validity of formatively measuring latent constructs (Edwards, 2011; Hardin et al., 2008a; Kim et al., 2008), others fervently oppose the claim (Marakas et al., 2007), and others have highlighted problems of biased parameter estimates emerging from misspecified formative models (Cenfetelli & Bassellier, 2009; Jarvis et al., 2012). While these arguments, in both support and opposition, will likely play on for several more years, the need for empirical evidence remains. The growing acceptance of formative measurement has the potential to reflect a paradigm shift in the manner in which we conceptualize and analyze latent phenomena. Leisure researchers can contribute to resolving these issues by testing measurement models of constraint indicators and other constructs that follow a formative structure.

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Appendix A: Place Attachment Reflective Measurement Model

		λ	*t*	λ^2	ε
Place Dependence (ρ_{xx}=.89; AVE=.67)					
Y_1	I prefer Cleveland Metroparks over other public recreation settings/facilities	.673	-	.453	.547
Y_2	For the recreation activities that I enjoy most, the settings and facilities provided by Cleveland Metroparks are the best	.787	20.173	.619	.381
Y_3	For what I like to do, I couldn't imagine anything better than the settings and facilities provided by Cleveland Metroparks	.853	21.491	.728	.272
Y_4	I enjoy visiting Cleveland Metroparks more than any other sites	.813	20.715	.661	.339
Affective Attachment (ρ_{xx}=.89; AVE=.67)					
Y_5	Cleveland Metroparks means a lot to me	.696	-	.484	.516
Y_6	I am very attached to Cleveland Metroparks	.809	21.385	.654	.346
Y_7	I feel a strong sense of belonging to Cleveland Metroparks and it settings/facilities	.814	21.514	.728	.272
Y_8	I have little, if any, emotional attachment to Cleveland Metroparks and its settings/facilities•	.637	17.174	.661	.339
Social Bonding (ρ_{xx}=.63; AVE=.36)					
Y_9	My friends/family would be disappointed if I were to start visiting other settings and facilities	.620	-	.384	.616
Y_{10}	If I were to stop visiting Cleveland Metroparks' sites, I would lose contact with a number of friends	.479	10.917	.229	.771
Y_{11}	Many of my friends/family prefer Cleveland Metroparks over other sites	.688	13.871	.473	.527
Place Identity (ρ_{xx}=.83; AVE=.63)					
Y_{12}	I feel Cleveland Metroparks is a part of me	.864	-	.746	.254
Y_{13}	I identify strongly with Cleveland Metroparks	.878	30.835	.771	.229
Y_{14}	Visiting Cleveland Metroparks says a lot about who I am	.602	18.756	.362	.638

** p< .01, *** p < .001

•Item reverse coded

Goodness of fit indices: $SB\chi^2_{(df=71)}$=387.144, RMSEA=.074, NNFI=.974, NFI=.972, CFI=.978