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Introduction and Literature Review

As the field of tourism research has matured over the last few decades, there has been increased reflection on the best practices of quantitative survey research (Dolnicar, 2015). This is evidenced by numerous articles about how to best ask survey questions (Dolnicar, 2013; Dolnicar, Grün, & Yanamandram, 2013), how to reduce biases in surveys (Araña & León, 2013; Yüksel, 2017), and the pros/cons of various segmentation strategies (Dolnicar & Grün, 2008; Ernst & Dolnicar, 2018). However, one topic that has been largely ignored is the value of reversed polarity items within scale development. Reverse polarity items are essentially items that are worded in a different direction (positive or negative) from the rest of the items within the scale.

Reversed polarity items have been embraced within scale development for their believed ability to help reduce acquiescence bias (Churchill, 1979; Weijters, Geuens & Schillewaert, 2009), solve problems in the perceived redundancy of multi-item constructs (Mayerl & Giehl, 2018), and to provide a “more complete coverage of the underlying content domain” than the sole use of positively worded items (Weijters et al., 2009, p. 2). It is believed by many that the reverse nature of reversed polarity items helps “reduce response speed and promote cognitive reasoning in the subjects” (Salazar, 2015, p. 192). Essentially, the notion is that ‘speed kills’ quality in surveys and that anything causing respondents to slow down and think, is good for data quality.

The tourism literature has generally taken this advice at face value without considering the abundance of literature on the many pitfalls of including reversed polarity items within multi-item psychometric scales (Herche & Engelland, 1996; Mayerl & Giehl, 2018; Salazar, 2015; Swain et al., 2008; Weijters et al., 2009). It is widely acknowledged that “reversed-polarity items may present a substantive problem...because of the resulting degradation of scale unidimensionality” (Herche & Engelland, 1996, p. 366). Weijters et al. (2009, p. 2) call this “reverse-item bias” because of the common finding that “reversed items tend to show lower factor loadings and lead to lower internal consistency because of their weaker correlation with the nonreversed items that measure the same construct.” In essence, reverse-coded items have been shown to result in low correlations between positive and negative items resulting in the reversed polarity items of a unidimensional scale to load on their own, separate factor (Mayerl and Giehl, 2018).

With the limited discussion of these pitfalls within the tourism literature, we provide two separate case studies on how reversed polarity items can cause reliability and validity problems when developing and adapting scales within tourism research. The first case study walks through the negative effects of reversed polarity items on the psychological empowerment subscale within the Resident Empowerment through Tourism Scale (Boley & McGehee, 2014; Boley et al., 2014). The second case study provides a similar analysis for how the reversed polarity items of the Perceived Stress Scale weaken the scale’s overall psychometric properties. Following these two case studies, suggestions on how the tourism literature should move forward are provided considering the need to reduce acquiescence bias, while also ensuring scales have construct validity.

Methodology

Analyses and Indicators of Reliability and Validity

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to investigate how the inclusion or exclusion of reversed polarity items affect the psychometric properties of the Resident Empowerment through Tourism Scale and the Perceived Stress Scale. Exploratory factor analyses using varimax rotation were used to see how the reversed polarity items within scale affect eigenvalues, dimensionality, variance explained, factor loadings and Cronbach alpha. Confirmatory factor analysis switches the focus from the dimensionality and structure of the scales to how well the items within the scale measure the latent construct (Hair et al., 2010). This is important to consider when using reversed polarity items because one wants to make sure that the items included in their scale are effectively measuring the construct of interest. This is termed convergent validity by Hair et al. (2010, p. 686), because the focus is on ensuring that the items of a scale “share a high proportion of variance in common” and converge together to measure the latent construct. Estimates of interest to gauge the effects of reversed polarity items within confirmatory factor analysis include strength of standardized regression coefficients (i.e., factor loadings), average variance explained, construct reliability, and model fit. According to Hair et al. (2010), scales should have standardized regression coefficients in excess of 0.50 (ideally above 0.70) and explain more variance than not (i.e., at least 50%). They should also have construct reliability estimates above 0.70 with estimates from incremental model fit indices (e.g., CFI, TLI, etc.) greater than 0.90, as well as absolute model fit indices (e.g., RMSEA, etc.) less than 0.08.

DATA COLLECTION

Resident Empowerment through Tourism Scale

The Resident Empowerment through Tourism Scale (RETS) was developed by Boley and McGehee (2014) to measure resident perceptions of psychological, social, and political empowerment from tourism development. The dimension of Psychological empowerment focuses on how tourism development can either enhance resident pride and self-esteem from tourists desiring to see the unique features of their community or tourism’s ability to psychological disempower residents through offering tourism products that embarrass residents from their lack of authenticity (Boley et al., 2014; Scheyvens, 1999).

The data used to test the effects of reversed polarity items within the Psychological Empowerment Scale comes from a large-scale data collection within Floyd, Botetourt, and Franklin County, Virginia. These three counties were chosen based upon their similarities in tourism product (i.e., each located along the Blue Ridge Parkway), nearly-identical per capita tourism expenditures (\$1,400-\$1,600 per resident), and comparable unemployment levels near 6% in 2012. Data were collected from residents at their homes using a self-administered on-site questionnaire. A census-guided, systematic random sampling strategy was employed following the work of Woosnam (2011), whereby questionnaires were left at residences to be picked up later the same day. Over a six-week period, 1,784 households were approached, with 1,021 individuals contacted. Of those intercepted, 37 were not permanent residents or heads-of-households. From the remaining 984 households, 703 returned completed a useable survey resulting in 71% response rate.

2.2.2 Perceived Stress Scale

The Perceived Stress Scale was developed by Cohen, Kamarck, and Mermelstein (1983) to measure the appraisal of stress in individuals' everyday lives. At the time of its creation, the inclusion of reversed polarity items was the norm, without much consideration of potential implications. This scale is different than the empowerment scales in that the 'reversed polarity' items actually use positive language, as the scale is measuring the negatively-associated construct of stress. A slightly modified version of the Perceived Stress Scale was recently employed in a study of tourism-related stress among residents of Hawaii (Jordan, Spencer, & Prayag, 2019). Respondents were asked how often they felt or thought a certain way in the last 30 days because of *tourism*, on a scale where 0 represented "never" and 4 represented "very often."

The data used to test the effects of reversed polarity items within the Perceived Stress Scale come from a cross-sectional study of Oahu residents conducted from July 2015 to April 2016. Questionnaires were distributed door-to-door with a stamped envelope so that participants could complete the survey at their leisure and mail it in when they were finished. Attempts were made to distribute questionnaires to every third house across the neighborhoods of Kahala, Kaimuki, Kailua, Kapahulu, Laie, Lanikai, Manoa, and Mo'ili'ili. These neighborhoods were chosen for their varying proximity to major tourism areas on the island and diverse demographic characteristics. Distribution of questionnaires varied temporally (e.g. various times on varying days of the week, including weekends and evenings) to ensure that those who worked during the day were included in the sample. At the conclusion of the data collection period, a total of 300 surveys of the original 1205 distributed were returned, for a response rate of 25%.

Results

Psychological Empowerment Scale

Results of the exploratory factor analyses for the Psychological Empowerment Scale show evidence of reverse item bias and problems from the inclusion of reversed polarity items. The first sign of reverse item bias is that the two reversed polarity (in this case, negatively-worded) items of the Psychological Empowerment Scale load on separate factors even though they were initially designed to measure the same dimension. The factor loadings from the varimax rotation also demonstrate that the negatively-worded items are problematic given low factor loadings on the positive factor (Factor 1) and high loadings on Factor 2. However, when these reversed polarity items are deleted from the analysis, the scale becomes unidimensional, and the explained variance increases from 58 to 71% (Table 1). The factor loadings are also above the 0.50 threshold suggested by Hair et al. (2010).

The confirmatory factor analysis also provides evidence of reverse-item biases (Table 2). When the reversed polarity items are included in the confirmatory factor analysis, standard regression coefficients are below the 0.50 threshold for the two reversed polarity items, average variance extracted (AVE) hovers just over the 50 percent threshold, and model fit is marginal (CFI=0.863, TLI=0.786; RMSEA=0.162). Upon removing the reversed polarity items, the average variance extracted rises to 63%, standard regression coefficients all exceed 0.70, and model fit statistics improve significantly (CFI=0.973, TLI=0.918 RMSEA=0.124). It is clear that the reversed polarity questions on "Embarrasses me" and "Makes me want to hide the fact that I live in ____ County" have different response patterns than the positively-worded items.

Table 1: Exploratory Factor Analysis of the Psychological Empowerment Scale

	Factor Loading	Eigen Value	Variance	Cron. Alpha
<i>Psychological Empowerment Scale w/ Reverse Polarity Items</i>		4.1/1.1	57.9/15.8	0.90/0.73
<i>Tourism in Floyd/Franklin/Botetourt County...</i>	<i>Factor 1</i>	<i>Factor 2</i>		
...makes me proud to be a ____ County Resident	.691	.305		
(-) Embarrasses me*	.282	.563		
Makes me feel special because people travel to see my county's unique features	.797	.193		
Makes me want to tell others about what we have to offer in ____ County	.795	.288		
(-) Makes me want to hide the fact that I live in ____ County*	.169	.985		
Reminds me that I have a unique culture to share with visitors	.774	.183		
Makes me want to work to keep ____ special	.757	.195		
<i>Psychological Empowerment Scale w/o Reverse Polarity Items</i>		3.5	70.7	.90
<i>Tourism in Floyd/Franklin/Botetourt County...</i>				
Makes me proud to be a ____ County resident	.747			
Makes me feel special because people travel to see my county's unique features	.822			
Makes me want to tell others about what we have to offer in ____ County	.847			
Reminds me that I have a unique culture to share with visitors	.788			
Makes me want to work to keep ____ County special	.775			

*Recoded before analysis

Table 2: Confirmatory Factor Analysis of the Psychological Empowerment Scale

	B	AVE	Construct Reliability
<i>Psychological Empowerment Scale w/ Reverse Polarity Items</i>		50.6 %	0.87
<i>Tourism in Floyd/Franklin/Botetourt County...</i>			
...makes me proud to be a ____ County Resident	.758		
(-) Embarrasses me*	.431		
Makes me feel special because people travel to see my county's unique features	.803		
Makes me want to tell others about what we have to offer in ____ County	.847		
(-) Makes me want to hide the fact that I live in ____ County*	.461		
Reminds me that I have a unique culture to share with visitors	.782		
Makes me want to work to keep ____ special	.770		
* CFI = .893; TLI = .786; RMSEA .162			
<i>Psychological Empowerment Scale w/o Reverse Polarity Items</i>		63.3%	0.89
<i>Tourism in Floyd/Franklin/Botetourt County...</i>			
...makes me proud to be a ____ County Resident	.747		
Makes me feel special because people travel to see my county's unique features	.810		
Makes me want to tell others about what we have to offer in ____ County	.846		
Reminds me that I have a unique culture to share with visitors	.790		
Makes me want to work to keep ____ special	.776		
* CFI = .973; TLI = .918; RMSEA .124			

*Recoded before analysis

3.2 Perceived Stress Scale

Results show that in the exploratory factor analysis, the four reversed polarity (in this case, positively-worded) items in the modified Perceived Stress Scale load on a uniquely separate factor than the other six items (Table 3). Factor loadings from the varimax rotation of scale items also indicate that reversed polarity items loaded poorly on the negatively-worded item factor (factor 1) and high loadings on the positively worded factor (factor 2). Similar to previous scales, when the reversed polarity items are deleted from the analysis, the scale becomes unidimensional and the variance explained increases from 49% to 74%. All factor loadings also increase to the minimum of 0.50 recommended by Hair et al. (2010).

The confirmatory factor analysis also provides evidence for reverse-item bias (Table 8). When the reversed polarity items are included in the confirmatory factor analysis, several standard regression coefficients are below the 0.50 threshold (suggested by Hair et al., 2010), average variance extracted is less than 50%, and model fit is poor (CFI = 0.736; TLI = 0.660; RMSEA = 0.227). Removing the reversed polarity items results in all items with standard regression coefficients near or above 0.70, an increase in the average variance extracted to 60%, and greatly improved model fit statistics (CFI = 0.949; TLI = 0.914; RMSEA = 0.169). Similar to the Psychological Empowerment Scale, the modified Perceived Stress Scale appears to suffer greatly from the inclusion of reversed polarity items.

Table 7: Exploratory Factor Analysis of the Perceived Stress Scale

	Factor Loading	Eigen Value	Variance	Cron. Alpha
<i>Perceived Stress Scale w/ Reverse Polarity Items</i>		4.8/2.3	48.5/23.2	0.93/0.80
	<i>Factor 1</i>	<i>Factor 2</i>		
Been upset because of tourism in your community?	.889	.046		
Felt that you were unable to control the important things in your life because of tourism in your community?	.858	.124		
Felt stressed about tourism in your community?	.925	.028		
(-)Felt confident about your ability to cope with tourism-related problems in your community?*	.021	.732		
(-)Felt that tourism affected you positively?*	.257	.576		
Felt that you could not cope with the impacts of tourism in your community?	.672	.121		
(-)Been able to control irritations caused by tourism in your community?*	-.098	.751		
(-)Felt that you had adjusted well to tourism in your community?*	.287	.849		
Been angry because of tourism your community?	.879	.095		
Felt difficulties with tourism were piling up so high that you could not deal with them?	.710	.188		
<i>Perceived Stress Scale w/o Reverse Polarity Items</i>		4.5	74.3	.93
Been upset because of tourism in your community?	.890			
Felt that you were unable to control the important things in your life because of tourism in your community?	.854			
Felt stressed about tourism in your community?	.919			
Felt that you could not cope with the impacts of tourism in your community?	.686			
Been angry because of tourism your community?	.889			
Felt difficulties with tourism were piling up so high that you could not deal with them?	.723			

*Recoded before analysis

Table 8: Confirmatory Factor Analysis of the Perceived Stress Scale

	B	AVE	Construct Reliability
<i>Perceived Stress Scale w/ Reverse Polarity Items</i>		.45	.88
Been upset because of tourism in your community?	.771		
Felt that you were unable to control the important things in your life because of tourism in your community?	.848		
Felt stressed about tourism in your community?	.806		
(-)Felt confident about your ability to cope with tourism-related problems in your community?*	.693		
(-)Felt that tourism affected you positively?*	.829		
Felt that you could not cope with the impacts of tourism in your community?	.769		
(-)Been able to control irritations caused by tourism in your community?*	.241		
(-)Felt that you had adjusted well to tourism in your community?*	.497		
Been angry because of tourism your community?	.248		
Felt difficulties with tourism were piling up so high that you could not deal with them?	.640		
* CFI = .736; TLI = .660; RMSEA = .227			
<i>Perceived Stress Scale w/ Reverse Polarity Items</i>		.61	.90
Been upset because of tourism in your community?	.766		
Felt that you were unable to control the important things in your life because of tourism in your community?	.832		
Felt stressed about tourism in your community?	.825		
Felt that you could not cope with the impacts of tourism in your community?	.684		
Been angry because of tourism your community?	.826		
Felt difficulties with tourism were piling up so high that you could not deal with them?	.740		
* CFI = .949; TLI = .914; RMSEA = .169			

*Recoded before analysis

Conclusion and Discussion

Problems associated with reversed polarity items create a dilemma for quantitative tourism researchers. On one hand, researchers often feel the need to slow down respondents and reduce acquiescence bias; on the other, psychometric literature and our analyses demonstrate how reversed polarity items can reduce reliability and validity estimates. While no silver bullet exists to solve various measurement concerns of quantitative survey research, we believe it is important to raise awareness of the pros/cons of utilizing scales with reversed polarity items. Future research should build off the work of authors such as Weijters et al. (2009) and Swain et al. (2008) who have systematically examined reverse-item bias within marketing measures. We encourage tourism scholars to be critical of the measurement tools they use, and to continue to utilize all of the psychometric tools at their disposal to determine best practices for the measurement of social and psychological phenomena. After all, the theoretical backbone of a significant portion of research published in the tourism literature is that we are able to accurately measure latent constructs by asking batteries of questions about them.

In summary, there is no panacea to solve all measurement issues, but tourism researchers should no longer simply accept reversed polarity items as best practice. Real benefits and costs exist in using reversed polarity items in scale development, and researchers should be well versed in each so that they can be best informed and cognizant of potential limitations with their work.

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