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Validity of a United Kingdom instrument in the United States: Assessing the transferability of theory of planned behavior measures

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Study Overview

- Purpose:
  - Examine the transferability of a United Kingdom questionnaire to an American population
    - The original questionnaire assessed determinants of healthy eating in the U. K. via theory of planned behavior constructs
      - attitudes
      - subjective norms
      - perceived behavioral control
      - behavioral intention
    - We asked about eating the recommended amount of fruit and vegetables in an American population

Research Design

- Research Design
  - Quantitative, cross-sectional survey (English and Spanish)
  - Telephone
  - Mid February to end of April 2006
  - Multiple MSAs across the country
  - Adults ages 18-74
  - N = 1,588

Location	Percent (%)
Miami, FL	2.65
Los Angeles, CA	4.35
Johnstown, PA	5.23
St. Louis, MO	6.39
Rochester, NY	6.93
Indianapolis, IN	7.12
Philadelphia, PA	7.18
Albuquerque, NM	8.38
Cincinnati, OH	8.76
San Francisco, CA	9.07
Spokane, WA	9.07
Provo, UT	10.14
Laredo/Mission, TX	14.20

Survey Design

- Used Conner, Norman, & Bell (2002) questionnaire on healthy eating to measure TPB constructs
  - Modified items to say "*eat 5 servings of fruit and vegetables a day*" in place of "*eat a healthy diet*"
  - Modified response scale for telephone administration
    - Changed 7-point scales to 4-point scales
  - Added two additional items to the subjective norm subscale

Survey Design

- Attitude (Att)
  - Measured by 6 semantic differential items
    - My eating 5 servings of fruit and vegetables a day would be/is…
      - *bad—good*
      - *harmful—beneficial*
      - *unpleasant—pleasant*
      - *unenjoyable—enjoyable*
      - *foolish—wise*
      - *unnecessary—necessary*

Survey Design

- Subjective Norm (SN)
  - Measured by 3 Likert-type items (4 pt. scale, *unlikely – likely*)
    - People who are important to me think I should eat 5 servings of fruit and vegetables a day
  - Added:
    - My family members think I should eat 5 servings of fruit and vegetables a day
    - My friends think I should eat 5 servings of fruit and vegetables a day

Survey Design

- Perceived Behavioral Control (PBC)
  - Measured by 6 Likert-type items
    - 4 on a 4 pt. scale (*disagree – agree*)
      - I am confident that if I ate 5 servings of fruit and vegetables a day I could keep to it
      - Whether I do or do not eat 5 servings of fruit and vegetables a day in the future is entirely up to me
      - I am confident that I could eat 5 servings of fruit and vegetables a day if I wanted to
      - I would like to eat 5 servings of fruit and vegetables a day, but don't really know if I can
    - 2 on a 4 pt. scale (*no control – complete control; difficult – easy*)
      - How much control do you feel you have over eating 5 servings of fruit and vegetables a day in the future
      - For me to eat 5 servings of fruit and vegetables a day in the future is

Survey Design

- Behavioral Intention (BI)
  - Measured by five Likert-type items
    - 3 on a 4 pt. scale (unlikely – likely)
      - I expect to eat 5 servings of fruit and vegetables a day in the future
      - I will try to eat 5 servings of fruit and vegetables a day in the future
      - How likely is it that you will eat 5 servings of fruit and vegetables a day in the future
    - 2 on a 4 pt. scale (*definitely don't – definitely do; disagree – agree*)
      - I intend to eat 5 servings of fruit and vegetables a day in the future
      - I want to eat 5 servings of fruit and vegetables a day in the future

Analyses

1. Bivariate Correlation Matrix
   - Initial assessment of factor structure validity
2. Confirmatory Factor Analyses
   - Test assumptions of discriminant validity
3. Measurement Invariance across lifestyle groups
   - Test factor configuration and factor loading invariance across different lifestyle-based groups
4. Internal consistency analyses
   - Assess reliability

Results

- Bivariate Correlation Matrix
  - Att, SN, and PBC exhibited low associations with eating F&Vs
  - Att, SN, and PBC had a higher association with BI
    - Suggests that behavioral intention mediated Att, SN, PBC relationships

	Servings of F&V	Behavioral Intention	Perceived Behavioral Control	Subjective Norms	Attitudes
Servings of F&V	1				
Behavioral Intention	.404**	1			
Perceived Behavioral Control	.384**	.575**	1		
Subjective Norms	.206**	.508**	.308**	1	
Attitudes	.265**	.590**	.419**	.387**	1

Results

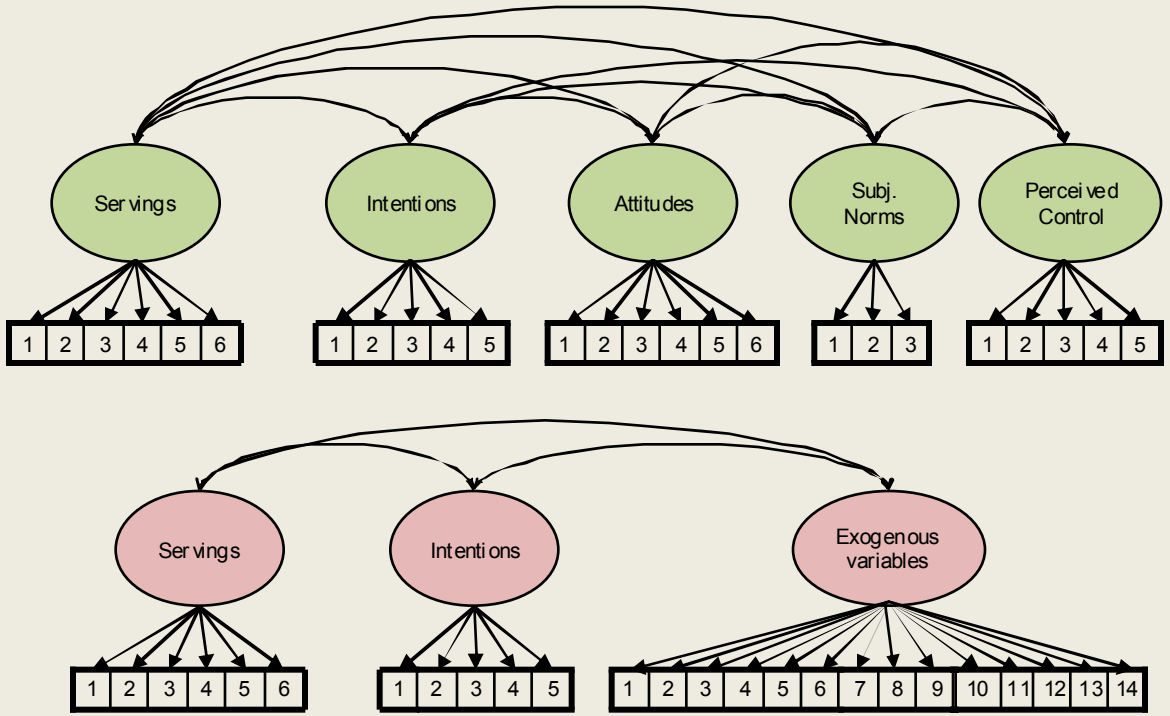
- Confirmatory Factor Analyses
  - First, ran the hypothesized 5-factor model and assessed model fit

df	χ^2	RMSEA	TLI	CFI
1100	3340.03**	.09	.93	.94

  - Moderate model fit
    - Chi-square statistically significant (but impacted by large sample)
    - Practical fit indices above .90 but less than the current .95 recommendation

Results

- Confirmatory Factor Analyses
  - Next, compared hypothesized 5-factor model with a 3, 2, and 1-factor model to test discriminant validity
  - e.g.,



Results

- CFA Comparisons
  - 5-factor model was the "target" model used in comparisons
    - Simpler models fit data sig. worse than the more complex target model
    - 5-factor model fit our data the best = discriminant validity established

Model	df	χ^2	RMSEA	TLI	CFI	$\Delta\chi^2$	Δdf	$\Delta\chi^2$ Compared to Target
3-factor	1135	6056	.14	.85	.87	2716	35	Sig. worse than target
2-factor	1145	6869	.15	.83	.84	3529	45	Sig. worse than target
1-factor	1150	7057	.15	.82	.84	3717	50	Sig. worse than target

Results

- CFA comparisons across lifestyle groups
  - Step 1: Test of same factor configuration across groups
    - Configural invariance
    - Specified the same pattern of fixed and free factor loadings for each group
  - Step 2: Test of same factor loadings across groups
    - Metric invariance
    - Tests the assumption that the factor loadings are invariant across groups
    - If invariance, then able to make valid comparisons across groups

Results

- CFA comparisons across lifestyle groups
  - Step 1: The configural model held
  - Step 2: The $\Delta\chi^2$ value between the configural and metric models was statistically significant
    - At least one factor loading was non-invariant across groups

Nested Invariance Model	*df*	χ^2	RMSEA (CI)	TLI	CFI	Δdf	ΔX^2	Sig? (p<.05)
Configural Model	1100	3340.03	.094 (.091,.098)	.93	.94			
Metric Model	1172	3579.29	.094 (.091,.097)	.93	.93	72	239.26	Yes

Results

- Which item(s) was loading differently across groups?
  - Working through an approach suggested by Rensvold & Cheung (2001), we compared item factor loadings across groups
  - We found that two attitude items were a problem
    - My eating 5 servings of fruit and vegetables per day would be…
      - *Unpleasant* --- *pleasant*
      - *Unenjoyable* --- *enjoyable*

Results

- Possible issue with attitude items:
  - May have been interpreted as simply asking about the experience of consuming fruit and vegetables (is it enjoyable or pleasant?)
  - Other attitude items interpreted more literally:
    - Virtue of eating 5 servings of fruit and vegetables per day
      - good/bad?
      - harmful/beneficial?
      - necessary/unnecessary?
      - foolish/wise?

Results

- After:
  - Deleting the two problem attitude items
  - Allowing PBC factor loadings for two items to vary across groups (i.e., could only establish partial metric invariance)
    - *"I am confident that I could eat 5 servings of fruit and vegetables a day if I wanted to"*
    - *"I am confident that if I ate 5 servings of fruit and vegetables a day I could keep to it"*
- We found:
  - All relative fit indices for the metric model mirrored those for the configural model
  - The ΔX^2 test between the configural model and the partial metric invariance model was not statistically significant at the $p<.001$ level

Results

- Internal Consistency
  - Most subscales were at or above acceptable levels of internal consistency for basic research -- .80 (Nunnally, 1978)
  - Decrease in reliability after the two attitude items were removed

Construct	Conner, Norman & Bell's α	Our Initial Cronbach's α	Our Final Cronbach's α
Attitudes	.84	.84	.79
Subjective Norms	.38	.89	No change
PBC	.74	.71	No change
Behavioral Intentions	.94	.94	No change

Conclusions

1. Model exhibited construct and discriminant validity among factors
   - Only 2 attitude items were identified as poor measures of attitudes
2. Factor structure held across several diverse lifestyle groups in the U.S.
3. Factor loadings were consistent across several diverse lifestyle groups
   - Only 2 perceived behavioral control items did not load evenly across different American lifestyle groups
4. Only the perceived behavioral control measure did not meet acceptable levels of internal consistency according to Nunnally's (1978) guidelines for internal consistency

Conclusions

- We concluded:
  - Modifying the Conner, Norman, and Bell (2002) TPB subscales to address F&V consumption, and applying these subscales to an American population, is feasible

- We recommend:
  - Deleting two items from the original 6-item attitude subscale
    - Omit questions about pleasure and enjoyment
  - Adding two items to the original 1-item subjective norms subscale
    - Ask questions about beliefs about family members and friends' opinions

Limitations

1. Sampling was not a true probability sample
   - Telephone records sampled from listed numbers in specific MSAs
   - Some lifestyle groups had lower response rates than others

2. Used 6-item self-report measure of fruit and vegetable consumption from 2005 BRFSS
   - Only deemed to have moderate reliability and validity in most population groups
     - Nelson, Holtzman, Bolen, Stanwyck, Mack (2001)

Implications for Future Research

1. Explore why 2 of the 6 attitude items failed to load consistently on the attitude factor
   - Did questions ask about two different attitudes (e.g., "experience" versus "virtue")?

2. Explore why the factor loadings varied across lifestyle group for two PBC items
   - *"I am confident that I could eat 5 servings of fruit and vegetables a day if I wanted to"*
   - *"I am confident that if I ate 5 servings of fruit and vegetables a day I could keep to it"*

3. Explore ways in which the internal consistency of the PBC subscale could be enhanced

Questions?

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