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Evaluating Nighttime Observational Measures of Neighborhood Disorder: Validity of the Nighttime NIfETy Assessment

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Abstract

While there are a growing number of observational instruments to assess the built and social dimensions of the neighborhood environment, there are few reliable and validated instruments; there are no instruments that assess the neighborhood environment during nighttime hours, a potential peak period of health and safety risk. The purpose of this investigation is to establish the metric properties of Neighborhood Inventory for Environmental Typology (NIfETy) Instrument nighttime ratings. Reliability of the scale was measured by internal consistency reliability and test re-test correlation. Validity was evaluated through correlation with the daytime NIfETy rating and regression models with local violent crime data. The nighttime items had good internal consistency (α = .81–82) for the total scale and acceptable internal consistency for a seven-item nighttime disorder scale (α = .66–.71). Future investigations will examine the nighttime NIfETy and its association with specific risk behaviors to evaluate changes in neighborhood environment.

Keywords

Neighborhood; Disorder; Systematic Social Observation

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1. Introduction

Neighborhood disorder is the term used to describe communities with visibly high levels of illegal, deviant, or otherwise undesirable behavior (e.g., sex work, drug selling, multiple forms of interpersonal violence, social incivilities, and drug use) and physical disarray or blight (e.g., vandalism, graffiti, rodents, lack of cleanliness, and abandoned buildings)(Ross & Mirowsky, 1999). The former is often referred to as "social disorder," whereas the latter is referred to as "physical disorder" (Kubrin, 2008; Ross & Mirowsky, 1999). Neighborhood disorder is likely a source of stress for residents, and broken windows theory suggests that it sends a message that no one is "in charge," which increases fear among residents, weakens informal social control, contributes to emigration and disinvestment in the neighborhood, and invites further criminal behavior and incivilities (Sampson & Raudenbush, 2004; Sampson et al., 2002; Wilson & Kelling, 1982). Because high levels of neighborhood disorder are associated with physical and mental health problems, unhealthy behaviors, and risk behaviors (Browning et al., 2013; Cohen et al., 2000; Franzini et al., 2009; Lambert et al., 2004; Ross & Mirowsky, 1999; Sampson et al., 2002), investigating the mechanisms by which neighborhood disorder may impact behavior is an important field of inquiry.

To examine how neighborhood disorder influences health and behavior, it is necessary to have valid and reliable assessment tools. Unfortunately, measurement of neighborhood disorder has been historically underdeveloped (Kubrin, 2008; Ross & Mirowsky, 1999). One concern about much of the existing work on neighborhood disorder is that measures of neighborhood-level concentrated poverty and structural factors (e.g., race and SES composition of neighborhoods), usually from the U.S. Census of other administrative data, are described as indicators of disorder. Because such information does not reflect social institutional or interactional processes, or indicators of blight, they are not appropriate measures of neighborhood disorder (Sampson et al., 2002).

There are three additional notable limitations to existing assessment tools for neighborhood disorder: 1) a reliance on residents' perceptions through self-report, 2) limited standardization, and 3) insufficient operationalization of "neighborhood." Regarding the first limitation, most studies measuring neighborhood disorder rely on respondents' perceptions, typically through survey research methods such as brief, multi-item questionnaires. This has been noted by Sampson and Raudenbush (2004), and others (Elo et al., 2009; Ross & Mirowsky, 1999; Sampson et al., 2002). Although measures of perceived neighborhood disorder have value because perceptions are proximal to individual cognition and behavior, they are subjective and suffer from "same-source bias," meaning that respondents may answer differently based on their own behavior. For example, people who engaged in violence—either as victims or perpetrators—may perceive their neighborhoods to be more dangerous than those who are not (Brandt et al., 2005; Mair et al., 2008; Raudenbush & Sampson, 1999). Measures of perceived neighborhood disorder may also be biased because of the stigma associated with low-income, urban neighborhoods with high proportions of Black residents; people may be more inclined to evaluate such neighborhoods as having high levels of disorder regardless of actual levels of disorder (Sampson et al., 2002).

Second, the focus of instruments to assess perceived neighborhood disorder varies widely, and there is no single instrument that is considered a “gold standard.” The various instruments emphasize different domains: Some inquire about specific instances of witnessed violence (Brandt et al., 2005; Cooley et al., 1995), others focus only on perceived safety or social disorder more globally, and still others solely focus on physical disorder (Ross & Mirowsky, 1999). Variation across instruments makes it difficult to compare results across studies, limiting our ability to summarize knowledge about associations between neighborhood disorder and health problems (Ross & Mirowsky, 1999). The third limitation relates to how neighborhood is defined. In most surveys of perceived neighborhood disorder, respondents are instructed to answer questions about their neighborhood, without being given a definition of what “neighborhood” means (Ross & Mirowsky, 1999). Thus, responses likely vary based on what geographic area respondents perceive as their neighborhood (Coulton et al., 2001).

Systematic social observation (SSO) represents an alternative strategy to assess neighborhood disorder that overcomes the limitations described above (Raudenbush & Sampson, 1999; Sampson et al., 2002). It is defined as a standardized approach for directly observing the physical, social, and economic characteristics of neighborhoods (Sampson & Raudenbush, 1999; Schaefer-McDaniel et al., 2010). Rather than relying on residents’ perceptions, trained researchers record indicators of neighborhood order and disorder using a standardized assessment tool. SSO also addresses the neighborhood definition problem because the specific geographic locations where observations take place can be documented, and the SSO data can then be linked to human data based on location of residence (Nickelson et al., 2013). Therefore, it is possible to examine the association between objectively-measured neighborhood disorder and health or social phenomena.

The use of SSO tools to assess neighborhood context has grown substantially over the past decade. Much of this work was initiated by Douglas D. Perkins (e.g. (Perkins & Taylor, 1996; Perkins et al., 1992, 1993)), and there are several systematic reviews that document the evolution of the field (Nickelson et al., 2013; Schaefer-McDaniel et al., 2010). As this review notes, much of the SSO neighborhood research has focused on neighborhood context broadly, rather than neighborhood disorder in particular. Additionally, with notable exceptions (Caughy et al., 2001; Furr-Holden et al., 2010), many SSO tools examining neighborhood context emphasize assessment of physical disorder aspects of the physical or built environment that facilitate walking, bicycling, and other activities relevant to healthy weight management or physical activity (Nickelson et al., 2013; Schaefer-McDaniel et al., 2010). Because these tools were developed to inform chronic disease prevention strategies, they tend to exclude indicators of social disorder (Nickelson et al., 2013).

SSO tools that emphasize assessment of physical and social disorder are needed to lay a foundation for investigating how disorder leads to involvement in risk behaviors (e.g., substance use, violence) and mental health problems. One such tool is the Neighborhood Inventory for Environmental Typology (NIfETy) Instrument (Furr-Holden et al., 2008). The NIfETy Instrument is reliable and valid (Furr-Holden et al., 2010), takes about 20–30 minutes to complete (depending on the block features), and includes domains to assess key indicators of physical and social disorder. Neighborhood disorder, as assessed using the

NIfETy, has been shown to be strongly associated with youth-reported exposure to alcohol, tobacco and other drugs (ATOD) (Furr-Holden et al., 2015; Milam et al., 2012).

In addition to the NIfETy described above, our team also conducted assessments during the nighttime hours on a subset of items from the daytime assessment primarily focused on social disorder, which has never been done. This is a critical step in assessment, as key indicators of neighborhood social disorder—such as soliciting sex work, public drunkenness, drug selling and drug use, loitering, and violence—may be more likely to happen after dark; whereas physical attributes of the environment tend to be more static. The purpose of the present study is to examine the reliability and validity of the nighttime version of the NIfETy. Because there are no other SSO tools to assess neighborhood physical and social disorder during nighttime hours (Nickelson et al., 2013; Schaefer-McDaniel et al., 2010), the present study fills an important gap in the literature and, more broadly, in public health and public policy.

2. METHODS

2.1. Sample and Procedures

NIfETy assessments were conducted on 446 randomly selected blocks from the 242 residential Neighborhood Statistical Areas (NSAs) in Baltimore City (see Furr-Holden et al., 2008 for more information). NSAs were deemed residential if there were at least 100 residents within the NSA. The first wave of data collection was assessed from June to October 2005 (Wave 1); the same 446 blocks were assessed from June to September 2006 (Wave 3) (Wave 2 was collected during the winter months). The average time between ratings was 11.4 months (range 9–14 months; SD=1.01 month).

The procedures for the nighttime NIfETy ratings are discussed in Furr-Holden et al. (2008). Each block was assessed once between the hours of 10 p.m. to 2 a.m. on Thursday, Friday, Saturday, and Sunday nights using the 19-item nighttime NIfETy Instrument. One of the two daytime raters was assigned to complete a “drive-by” nighttime rating, while the other rater drove the vehicle 5–10 mph. The nighttime assessments were conducted without the rater leaving their personal vehicle. The driver traveled the block face at least 2 times, and additional times as necessary to capture any of the items missed on the first and second pass. Block faces were defined as the unit block (e.g., 600–699 block of Monument Street) and include both the even and odd sides of the street and the spaces in between (e.g., the roadway, curb, and sidewalks). The assigned rater entered data in real-time using an electronic handheld device, inputting the night ratings for the activity and social disorder/ order domains. Nighttime ratings were completed within the same week and no more than 7 days from the corresponding daytime rating. The nighttime NIfETy instrument included 19 items focused on adult and youth activity (e.g. adults in loitering, youth in transit, obvious signs of drug selling). The nighttime assessment is a subset of the longer daytime assessment, which consisted of 75 items organized into seven theoretical domains: (a) physical layout; (b) types of dwellings; (c) adult activity; (d) youth activity; (e) physical order and disorder; (f) social order and disorder; and (g) violence and ATOD indicators (Furr-Holden et al., 2010). The items are included in Table 1.

2.2. Statistical Analysis

2.2.1. Factor Analysis—Mplus v7 was used to identify factors from the 19 items assessed during the nighttime NIfETy ratings. The nighttime assessment included count, categorical, and binary items. Due to the low prevalence of many items, all the items were dichotomized (presence versus absence of item). Seven items consistently loaded together and were used to create a nighttime disorder scale: number of adults present, children in transit, noise level of the block, people yelling, people loitering, intoxicated people in the street, and people swearing. Longitudinal measurement invariance was assessed by constraining the factor loadings and indicator thresholds for Wave 1 and Wave 3.

2.2.2. Reliability Analysis—The investigation used internal consistency and test re-test correlation as measures of reliability. Although the ratings were conducted in pairs, one person drove and the second rater entered the assessment data, so we are unable to assess inter-rater reliability. Inter-rater reliability estimates for the same items assessed during the daytime are available in Furr-Holden, et al. (2010). Comparing inter-rater reliability for these items (based on the ICCs) with identical items from the daytime assessment, which always included two assessors, revealed estimates in the acceptable to substantial range (ICCs ranged from 0.57 to 0.87). Cronbach's alpha was used to measure internal consistency of the entire nighttime assessment (19 items) and the single disorder scale extracted through EFA. Cronbach's alpha ranges from 0 to 1, with higher values indicating a more reliable scale (Cortina, 1993). Test re-test correlation (Wave 1 compared to Wave 3) estimates were computed for each of the nighttime items, as well as the nighttime disorder scale.

2.2.3. Validity Analyses—Internal and external construct validity were assessed using the daytime NIfETy ratings and local crime data. For internal construct validity, we assessed the correlation between the daytime NIfETy disorder score (Furr-Holden et al., 2011) and the nighttime disorder score for Wave 1 and Wave 3. The 11-item daytime disorder scale includes indicators of physical and social disorder (e.g. structures with broken windows, unboarded abandoned buildings, presence of broken bottles, public alcohol consumption, and drug paraphernalia). The disorder scores were created by multiplying the factor loadings by one if the indicator was present and summing the score for each NIfETy block face (Furr-Holden et al., 2011)

External construct validity was assessed by estimating the association between the nighttime disorder scale (Wave 3; collected in 2006) and violent crime incident data around the NIfETy block. Violent crime data includes aggravated assault, homicide, rape, and robbery. Violent crime data were obtained from the Baltimore City Police Department for the 2006 calendar year; the data included the geographic location of the incident and incident description. The NIfETy blocks and the violent crime data were geocoded in ArcMap. 500-foot buffers (the approximate length of a residential block in Baltimore City) (Rossen et al., 2011; Salbach et al., 2015) were placed around the NIfETy blocks using straight-line buffers. The count of violent crimes within the buffer was determined using the spatial join tool (a tool used to append data from one map layer to another map layer using geographic location) in ArcGIS. We examined the relationship between nighttime disorder and count of violent crimes within each buffer using negative binominal regression models. Robust standard errors were used to account for clustering by neighborhood (Neighborhood Statistical Areas; Furr-Holden et al., 2008). Incident rate ratios (IRR) were calculated to convey the strength of association, and significant findings were reported for alpha levels below 0.05. All analyses for external and internal construct validity were conducted in Stata 13.1 (StataCorp, 2013).

3. RESULTS

3.1. Descriptive Analyses

Descriptive statistics for both waves of nighttime ratings are presented in Table 1. The majority of the nighttime ratings were conducted between 10 p.m. and midnight (67.2%), 18% were conducted between midnight and 1 a.m., and the remaining 15% were conducted after 1 a.m.. The prevalence of items ranged from 0.4% to 38.4% in Wave 1. Illegal activities —such as prostitution and drug selling—were less common than other activities (0.4–2.9%).

3.2. Reliability Analyses

The constrained factor analysis model was compared to the unconstrained model (loadings and thresholds were allowed to vary by wave) using the chi-square test for difference testing. A significant chi-square difference value suggests that the constrained model (i.e. the nested model) had a worse fit compared to the unconstrained model (i.e. measurement non-invariance). The tetrachoric correlations for the seven items are included in Table 2. Results of the factor analysis are presented in Table 3. The unconstrained multi-group confirmatory factor analysis (comparing Wave 1 and Wave 3) (Choi et al., 2006) included seven indicators and had good fit indices: $\chi^2[76] = 89.58$, $p = .14$, comparative fit index (CFI) of 0.989 and root mean square error of approximation (RMSEA) of 0.02. The standardized factor loadings ranged from 0.62–.97 across waves 1 and 3. The constrained model also had good fit indices: $\chi^2[88] = 100.00$, $p = .18$, comparative fit index (CFI) of 0.990 and root mean square error of approximation (RMSEA) of 0.02. The standardized factor loadings ranged from 0.70–.98. The chi-square test for difference testing was not statistically significant ($\Delta\chi^2[12] = 11.22$, $p = .51$) indicating that there was not a significant difference between the fit of the unconstrained model and the constrained model (nested model). A nighttime disorder score was created by multiplying the factor loadings by one if the indicator was present and summing the score for each NIfETy block face. The nighttime disorder score ranged from 0.00 to 4.94 (Mean = 0.57) for Wave 1 and 0.00 to 4.85 (Mean = 0.52) for Wave 3.

The internal consistency for the entire nighttime scale (all 19 items) was strong for Wave 1 and Wave 3 ($\alpha = 0.82$ and $\alpha = 0.81$, respectively), and the internal consistency for the nighttime disorder scale was acceptable for Wave 1 ($\alpha = 0.70$) and Wave 3 ($\alpha = 0.66$). Test retest for the nighttime items was assessed using tetrachoric correlation; six of the 19 items had statistically significant tetrachoric correlations from Wave 1 to Wave 3 (see Table 1). Spearman correlation was used to obtain test re-test estimates for the nighttime disorder score from Wave 1 to Wave 3; the estimate was 0.61 ($p < 0.01$).

3.3. Validity Analyses

Internal construct validity was assessed by examining the Spearman correlation between the daytime NIfETy neighborhood disorder score and the nighttime disorder score. There was a positive and significant correlation between the daytime (items include structures with broken windows, unboarded abandoned buildings, unmaintained property, trash in open spaces, broken bottles, graffiti, noise, people yelling, public alcohol consumption, drug paraphernalia and discarded alcohol bottles) and nighttime disorder scores for Wave 1 (ρ = .32, $p < 0.001$) and Wave 3 (ρ = .41, $p < 0.001$). Negative binominal regression was used to assess the relationship between the Wave 3 nighttime disorder score and the count of violent crime within 500 feet of the block face. Additional models were run to determine if the nighttime disorder scale improved the fit for the violent crime model over and above what is available from just the daytime disorder scale. There was a statistically significant relationship between nighttime disorder and violent crime, namely for each unit increase in the nighttime disorder score, the rate of violent crime within 500 feet of the block increased by 42% (IRR = 1.42, CI: 1.31, 1.55; $p < 0.001$). Similarly, for each unit increase in the daytime disorder score, the rate of violent crime within 500 feet of the block increased by 24% (IRR = 1.24, CI: 1.19, 1.29; $p < 0.001$). The nighttime disorder scale was added to the model with the daytime disorder scale; both scales were significantly associated with violent crime (Nighttime scale IRR = 1.21 CI: 1.11, 1.31, $p < 0.001$; Daytime scale IRR = 1.21, CI: 1.16, 1.26, $p < 0.001$) and the addition of the nighttime disorder scale improved the fit of the model (Bayesian Information Criterion difference of 7.69) (Long, 1997; Raftery, 1995).

4. DISCUSSION

This study provides preliminary support for a valid and reliable nighttime method to assess neighborhood disorder. The nighttime NIfETy had good to exemplary metrics on all tests, with the exception of test re-test reliability. Only six of 19 items had significant test re-test reliability, this can be due to actual changes in neighborhoods over time (Furr-Holden et al., 2011) or the tendency for disorder to breed more disorder (Sampson & Raudenbush, 1999; Wilson & Kelling, 1982). Validation of this assessment represents an important first step in a growing body of research that uses observational measures to categorize the neighborhood environment. It's plausible that nighttime neighborhood assessments are more informative to social phenomenon than daytime measures, and they may provide a better or complementary way to characterize high-risk neighborhoods. Nighttime assessments are also cheaper and less burdensome to administer, despite the additional risk to raters cruising through these neighborhoods during peak periods of crime and violence. Results from validity analyses revealed that nighttime assessments improved the fit for the violent crime model over and above what is available from just the daytime assessments. This highlights the importance of the nighttime measure to best characterize the neighborhood environment and, consequently, justifies the additional risk to raters and slight increase to research costs versus conducting daytime assessments alone.

Several limitations of this research merit discussion. First, while the brevity of the nighttime assessment is a strength of this study, in that it provides a relatively quick assessment of the neighborhood environment, there are other potentially important measures that were not included (e.g., lighting). Future assessments will include additional items that may improve the overall assessment and metric properties. Additionally, there are limitations in the assessors' ability to capture the actual, lived social behavior and climate of the block at night. While one rater drove at 5–10 miles per hour and the other rater entered data, our ability to adequately capture nighttime community disorder was limited. This was tempered by our intention to not inject our presence in the community artificially by cruising the block on foot, which could be construed in some neighborhoods as an unwelcomed presence and pose excess risk to assessors. Similarly, to maximize the data obtained, multiple passes were made on each block. Further development of these nighttime assessment methods will explore alternative approaches to best capture the nighttime neighborhood experience. We were also unable to assess inter-rater reliability as generally only one person completed the assessment. Future nighttime assessments will include a sample of block faces with two raters so inter-rater reliability can be fully established. Lastly, our predictive validity estimates were based on crime counts within a 500-foot straight-line buffer around the centerline segment of the block (i.e., an imaginary line that goes through the center of the block face and includes the even and odd sides of the street). It is possible that there was some slight overestimation of violence within these buffers as the counts were not specific to just our sample block and potentially picked up violence from neighboring block faces. Results from exploratory analyses revealed that the negative binomial regression model with the 500-foot straight-line buffer (IRR = 1.42, $p < .001$) were similar to results with a walking distance buffer (i.e., a quarter mile or 1320 feet) that has been used in previous investigations (IRR = 1.50, $p < .001$; e.g., Milam et al. (2014)). Using the smaller and more block-specific 500-foot straight line buffer minimized potential overestimation and is conceptually a more sound approach. Despite these limitations, this novel assessment reflects the first validated nighttime observational neighborhood assessment tool. Further, one of the major strengths of this study is that it was done on 446 blocks over multiple waves. When we examined measurement invariance for Wave 1 and Wave 3, the model constraining factor loadings and thresholds to be equal across waves had good fit indices demonstrating test-retest reliability at the latent construct level.

Future investigations will examine seasonal variation in nighttime assessments, as well as correlate nighttime measures with self-report data, including self-reported neighborhood perception. We will also focus on malleable features of the built and social environment that are theoretically linked to violence, alcohol, tobacco and other drug exposure with the goal of providing practical structural targets for policy-based preventive interventions. Our goal in this investigation was to assess the ecometric properties of a systematic social observation tool to measure neighborhood disorder. This tool will enable us to assess the association between disorder and subsequent problems (e.g., risk behaviors and mental health problems), and will also allow us to tease apart the independent, joint, and interactive contributions of structural factors such as neighborhood demographics, poverty and disorder on subsequent health and behavioral problems. There is also the need to examine zoning laws and land use regulations to better understand how these important structural factors are linked to neighborhood incivilities. Linking block level observational measures, self-report data, and structural variables often measured in larger geographic units such as block groups, census tracts or neighborhood statistical areas, will require innovative GIS and multi-level statistical approaches that merit further research. In addition, to improve the sensitivity and specificity of our estimates, future research will link daytime incivilities to daytime crime, and nighttime incivilities to nighttime crime to improve the precision of our estimates and also to clarify the relative contributions of daytime and nighttime disorder on overall rates of violence and other public health problems.

4.1. Conclusions

The implications of this work are three fold. First, we have identified a valid and reliable nighttime assessment tool that can better characterize the built and social neighborhood environment for risk of violence, alcohol, and other drug problems. The nighttime assessment and subsequent factor reported were not a subset of the daytime assessment as different items were deemed more salient at night and as such is distinct from the daytime assessment, strengthening the case for assessment methods that span different times of day. Second, this tool may also have potential utility across a broader range of health concerns that will greatly augment the tools of public health practitioners, researchers, and policy advocates. Lastly, we have identified important future directions for research to better explicate and assess methodologically the relative contributions of the neighborhood environment, during the daytime and the nighttime, which may pose temporal variations in risk.

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Research Highlights

- This study identified a valid and reliable nighttime neighborhood assessment
- Nighttime neighborhood assessments are feasible and informative
- Nighttime assessments may be more sensitive to social phenomenon and disorder

Table 1

Prevalence of Nighttime NIfETy Items and Tetrachoric Correlations

	Wave 1 (%)	Wave 3 (%))	r_ϕ
Number of Adults Present	38.4	33.3	.30 *
Sitting on Steps/Loitering	20.0	14.3	.20 *
Monitoring Youth	5.2	4.3	.42 *
Positive Human Interaction	15.5	7.2	.33 *
Number of Youth/Unsupervised Youth	10.8	12.1	.07
Youth Playing	4.5	2.7	.14
Youth In Transit	7.2	4.5	−.08
Sitting in Group	5.8	4.5	−.03
Noisy	15.3	13.4	.20
Homeless People	0.9	0.7	−1.00
People Yelling	6.7	4.7	.24
People Swearing	4.3	2.0	−1.00
People in Physical Fights	0.4	0.0	--
People Loitering	4.5	4.0	.05
Intoxicated People In Streets	2.0	2.5	−1.00
Evidence of Prostitution	0.7	0.4	−1.00
People Consuming Alcohol	3.6	4.0	−1.00
People Using Drugs	1.8	0.0	--
Obvious Signs of Drug Selling	2.9	0.7	−1.00

* $p < 0.05$ for tetrachoric correlation assessing test re-test reliability

-- indicates no variance for Wave 1 and/or Wave 3

Table 2

Wave 1 Nighttime Disorder: Tetrachoric Correlations

	1	2	3	4	5	6
1. Number of Adults						
2. In Transit	.67					
3. Noisy	.75	.69				
4. People Yelling	.76	.64	.89			
5. People Loitering	.66	.19	.53	.68		
6. Intoxicated People In Streets	.57	.06	.50	.76	.78	
7. People Swearing	.62	.65	.74	.61	.49	.49

Table 3

Constrained Factor Analysis Loadings for Waves 1 & 3

Items in CFA	Wave 1	Wave 3
Number of Adults	0.829	0.810
In Transit	0.740	0.723
Noisy	0.867	0.847
People Yelling	0.983	0.961
People Loitering	0.714	0.698
Intoxicated People In Streets	0.807	0.788
People Swearing	0.734	0.717

Unconstrained: CFI/TFI = 0.989/.987; RMSEA = 0.020; WRMR = 0.897

Constrained: CFI/TFI = .990/0.990; RMSEA = 0.017; WRMR = 0.956

α = 0.698 for Wave 3 α = 0.657.