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Psychometric characteristics of the Mobility Inventory in a longitudinal study of anxiety disorders: Replicating and exploring a three component solution

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Abstract

Psychometric characteristics of the Mobility Inventory (MI) were examined in 216 outpatients diagnosed with panic disorder with agoraphobia participating in a longitudinal study of anxiety disorders. An exploratory principal components analysis replicated a three-component solution for the MI reported in prior studies, with components corresponding to avoidance of public spaces, avoidance of enclosed spaces, and avoidance of open spaces. Correlational analyses suggested that the components tap unique but related areas of avoidance that were remarkably stable across periods of 1, 3, and 5 years between administrations. Implications of these results for future studies of agoraphobia are discussed.

Keywords

Agoraphobia; Panic disorder; Mobility inventory; Factor analysis

Since its publication nearly two decades ago, the Mobility Inventory (MI; Chambless, Caputo, Jasin, Gracely, & Williams, 1985) has become one of the gold-standard measures for assessing severity of agoraphobic avoidance behaviors. The empirically derived instrument lists 26 situations commonly avoided by agoraphobic individuals that are each rated on five-point Likert scales as to the degree they are avoided “when alone” and “when accompanied.” Initial psychometric analyses by Chambless et al. (1985) indicated good reliability and validity for the MI, while Craske, Rachman, and Tallman (1986) demonstrated the MI’s ability to discriminate agoraphobic patients from those with other anxiety disorders. Given its popularity among clinicians and researchers, however, it is surprising that relatively few studies have independently examined the psychometric properties of the MI, in particular its factor structure.

To date, only three published studies have explored the underlying factor structure of the MI with inconsistent results. In a sample of 124 patients diagnosed panic disorder with agoraphobia (PDA), Kwon, Evans, and Oei (1990) employed exploratory principal components analysis (PCA) to identify a two component solution for the MI corresponding to avoidance of public, crowded, or social situations and avoidance of enclosed or riding situations. On the other hand, Cox, Swinson, Kuch, and Reichman (1993) used PCA to identify a three component solution

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for the MI in a sample of 177 Canadian outpatients with panic disorder with agoraphobia (PDA) or agoraphobia without panic disorder (AWOPD), corresponding to avoidance of public places, avoidance of open spaces, and avoidance of enclosed spaces. The three-component solution for the MI was later replicated in a sample of 213 Dutch anxiety patients by Arrindell, Cox, Van der Ende, and Kwee (1995). However, results of this latter study are questionable, in that the sample consisted of patients identified as “having an anxiety disorder” but did not necessarily carry a formal diagnosis of PDA or AWOPD. This distinction is important since the MI was specifically designed to assess agoraphobic avoidance behavior and may not be appropriate for use with anxiety patients who do not have agoraphobia. Thus, in truth, only two published factor analytic studies that employ agoraphobic samples exist in the literature, each resulting in disparate structures.

Developing a clear understanding of the dimensions underlying the MI is necessary for several reasons. From the psychometric perspective, whether or not the MI measures a single psychological construct representing general agoraphobic avoidance, or several distinct constructs defining different areas of agoraphobic avoidance has implications for the scale's reliability and validity, as well as how results of prior and future studies employing the MI are interpreted. Additionally, a multidimensional structure for the MI could make the measure a richer and potentially more useful assessment instrument for both clinicians and researchers that would permit a finer-grained analysis of individual differences in specific domains of agoraphobic avoidance.

It should also be noted that agoraphobia itself is a heterogeneous clinical syndrome (Marks, 1987). To have the diagnosis, an individual need only persistently avoid one situation from which escape may be difficult in the event of a panic attack (see DSM-IV diagnostic criteria; American Psychiatric Association, 1994), although individuals with agoraphobia typically report multiple avoided situations. Surprisingly, there has been a dearth of empirical or theoretical research on addressing similarities and relationships amongst situations avoided by agoraphobic individuals, or on individual differences in avoidance between people with agoraphobia. Therefore, understanding the factor structure of the MI may be an important first step towards furthering our understanding of the nature of agoraphobic avoidance.

The present study examined the psychometric properties and underlying component structure of the MI in a large sample of patients diagnosed with PDA enrolled in the Harvard/Brown Anxiety Disorders Research Program (HARP), a prospective, naturalistic, longitudinal study of anxiety disorders in psychiatric outpatients. HARP is currently in its 16th year of follow-up and the MI became a standard part of the yearly assessment battery in year two. Thus, HARP is in a unique position to examine not only the factor structure of the MI, but also the stability of these MI factors across multiple administrations over an extended period of time. Using exploratory principal components analysis, the present study replicates the three-component solution of the MI initially reported by Cox et al. (1993) and replicated in Arrindell et al. (1995). We then present data on the intercorrelation of these components as a way to better understand the potential relationships among different domains of agoraphobic avoidance. Finally, we intend to capitalize on the longitudinal nature of HARP and expand the MI literature by providing 1-, 3-, and 5-year correlations for both the ME total scores, and the identified underlying components of the MI in PDA patients. These correlational analyses provide information on the general stability of different areas of agoraphobic avoidance that are tapped by the MI.

1. Method

1.1. Participants and procedure

The present study was conducted as part of the larger Harvard/Brown Anxiety Disorders Research Program (HARP), a prospective, naturalistic, longitudinal study of the course of anxiety disorders in psychiatric outpatients. The study began in 1989 and recruited participants from 11 psychiatric practices and clinics affiliated with Harvard Medical School, University of Massachusetts Medical School, and Brown University Medical School. At the time of study intake, all participants met Diagnostic and Statistical Manual of Mental Disorders 3rd ed., revised (DSM-III-R; American Psychiatric Association, 1987) diagnostic criteria for one or more of the following index anxiety disorders: panic disorder with or without agoraphobia (PD or PDA), agoraphobia without a history of panic disorder (AWOPD), generalized anxiety disorder (GAD) or social phobia (SP). Other anxiety disorders that were diagnosed and followed longitudinally in HARP but are not among those disorders designated for initial inclusion in the study were posttraumatic stress disorder (PTSD), obsessive compulsive disorder (OCD), simple phobia (SIM), and anxiety disorder not otherwise specified (ADNOS). All diagnoses were established using a structured clinical interview that included sections of the Structured Clinical Interview for DSM-III-R - Patient Version (SCID-P; Spitzer, Williams, Gibbon, & First, 1988) and the Research Diagnostic Criteria Schedule of Affective Disorders - Lifetime (SADS-L; Endicott & Spitzer, 1978) combined to produce the SCAL-UP (Keller et al., 1987, available upon request). Interviews were conducted by trained research assistants, who were at least college graduates with degrees in psychology or a related discipline. Diagnostic decisions of the interviewers were reviewed and approved by senior research personnel that included doctoral-level psychologists and psychiatrists. DSM-III-R diagnostic decision rules were strictly adhered to during intake and follow-up procedures. More precise descriptions of participant recruitment procedures, as well as the characteristics of the original sample, can be found elsewhere (Massion, Warshaw, & Keller, 1993). Currently, participants are interviewed yearly and assessed as to their diagnostic status and symptom course using the Longitudinal Interval Follow-up Evaluation-Upjohn (LIFE-UP; Keller et al., 1987).

The administration of the MI (Chambless et al., 1985) to all HARP participants as part of the standard yearly assessment battery began in 1991. The present study focuses on the 216 individuals who completed at least one administration of the MI while currently meeting DSM-III-R criteria for PDA at the time of the MI administration. This is a subset (61%) of the 357 participants with PDA who were originally enrolled in HARP. The present study's sample included 154 (71%) females with a mean age of 50.2 years (S.D. = 11.8) at the time of MI administration. Most (210/216; 97%) of participants were Caucasian. Thirty-seven percent (80/216) had completed college, 54% (116/216) had completed high school, and 9% (20/216) did not have a high school diploma. Of the study participants at the time of MI administration, 23% (50/216) also had comorbid GAD, 18% (39/216) SP, 8% (18/216) PTSD, 12% (26/216) OCD, and 59% (128/216) major depression (MDD).

1.2. Assessment measures

1.2.1. Longitudinal Interval Follow-up Evaluation-Upjohn—The LIFE-UP (Keller et al., 1987) is an interviewer-administered assessment that collects detailed information on the course of anxiety disorder symptoms, psychosocial functioning, and treatment status. The LIFE-UP employs a six-point psychiatric status rating (PSR) scale to indicate the severity of psychiatric pathology. A PSR of 5 or 6 indicates the participant meets full DSM-III-R diagnostic criteria for the given disorder with low to moderate and severe functional impairment, respectively. A PSR of 2, 3, or 4 indicates the participant does not meet full DSM-III-R diagnostic criteria for the disorder, but still exhibits some symptoms to a minimal, mild, or moderate degree, respectively. A PSR of 1 indicates the participant is without symptoms of

the disorder. The LIFE-UP employs a “change point” method to anchor participant reports of symptom levels to relevant life events such as birthdays, holidays, and family vacations, resulting in weekly ratings of psychiatric symptom severity. Three sub-studies have been conducted analyzing the reliability and validity of the LIFE-UP and are described in Warshaw, Keller, and Stout (1994). These studies found interrater reliability and long-term test-retest reliability for the LIFE-UP diagnostic ratings to be good to excellent for all index anxiety disorders and MDD.

1.2.2. Mobility Inventory for Agoraphobia—The MI (Chambless et al., 1985) is a 26-item self-report questionnaire designed to assess the severity of avoidance of common agoraphobic situations. Each situation is rated on a five-point Likert scale ranging from 0 (never avoids) to 4 (always avoids). Each situation is rated twice to reflect the degree that the situation is avoided by the agoraphobic participant when he or she is alone, and when he or she is accompanied. Participants may skip items that are irrelevant to their lifestyles; however, Chambless et al. (1985) recommend that the scale be considered invalid for individuals who skip more than five items (20%). This scoring rule was employed in the current study to identify invalid cases. The MI is scored by calculating the average avoidance rating across all situations for the Avoidance Alone and Avoidance Accompanied scales. In the initial validation of the MI, Chambless et al. (1985) reported the measure to have good internal consistency, reliability, validity, and sensitivity to symptom change.

1.3. Statistical analyses

Data were analyzed using SAS Version 8.0 (SAS Institute, 1999), employing the PROC CALIS and PROC CORR analysis procedures. To determine the factor structure of the MI, an initial exploratory principal components analysis was conducted with a Varimax-rotated matrices of factor loadings, which is the best-known method of factorial invariance (Arrindell et al., 1995). Following Brand-Koolen (1972), the following qualifications were used for interpreting the magnitudes of factor loadings: <.20, “low”; .20-.40, “moderate”; .40-.70, “high” and >.70, “very high”. To determine the temporal stability of MI scores, two-tailed correlational analyses were conducted between MI scores over time. To examine test-retest reliability independent of fluctuations in PDA participants eligible for this analysis where those who continued to meet diagnostic criteria for PDA at subsequent yearly MI administrations. For the purposes of interpretation, Cohen (1988) considers $r = .10$ “small”, $r = .30$ “medium”, and $r = .50$ “large”.

2. Results

2.1. Component structure of MI

In order to replicate the Mobility Inventory component structure reported previously, we replicated the methodology employed by Cox et al. (1993) and Arrindell et al. (1995) and conducted an exploratory principal components analysis with a Varimax rotation. The Avoidance Alone and Avoidance Accompanied subscales were analyzed separately. For both scales, changes in eigen values were minimal after the first three components (less than .5 change), indicating that additional components are not prognostically important. Thus, the results suggest that a three-component solution was the best fit for the data in both cases. For the Avoidance Alone scale, the size of the resulting eigen values, in descending order, were 11.10, 1.96, 1.35, 1.23, 1.04, .94, .89, .81, .70, .63, .59, .55, .54, .49, .45, .41, .33, .32, .29, .26, .25, .22, .20, .17, .16, and .11. The rotated components explained 19.6% (public places) 18.1% (enclosed places), and 17.7% (open spaces) of the total variance (55.4%). For the Avoidance Accompanied scale, the size of the eigen values, in descending order, were 11.84, 1.85, 1.20, 1.04, .97, .91, .80, .74, .64, .59, .49, .45, .42, .40, .36, .34, .31, .29, .25, .24, .22, .19, .18, .14, and .12. The rotated components explained 27.9% (public places) 16.4% (enclosed places), and 15.3% (open spaces) of the total variance (59.6%). For both the Avoidance Alone

and Avoidance Accompanied scales, the eigen values and the percentages of variance accounted for by the components are similar to those reported by Arrindell et al. (1995) and Cox et al. (1993). Using the eigen value and scree test criteria to determining the number of components to extract (Cattell, 1978), a three-component solution was found to be the most appropriate for both scales. The Comparative Fit Index (Bentler, 1989) was 0.88 for the Avoidance Accompanied scale and .85 for the Avoidance Alone.

Table 1 shows the individual MI items and their loadings on assigned components. In all cases, items were assigned to components based on their highest loadings. The items on both the avoidance alone and the avoidance accompanied scales separated into relatively distinct components tapping avoidance of public spaces (alone = 12 items; accompanied = 13 items), avoidance of enclosed spaces (alone = 8 items; accompanied = 7 items), and avoidance of open spaces (alone = 6 items; accompanied = 6 items). Only one item (“staying home alone”) failed to load greater than .50 on any single component. Employing the highest factor loading to determine component assignment, only one item (“being far from home”) loaded on different components for the avoidance alone and avoidance accompanied scales. The resulting components almost perfectly replicate those reported by Cox et al. (1993) and Arrindell et al. (1995) regarding item component assignments with similar item loadings. The noteworthy differences were the items open spaces-inside, walking on the street, and staying home alone, which Arrindell et al. (1995) chose not to assign to a component due to high loadings on multiple components for these items with their sample. Cox et al. (1993) permitted items to load on multiple components. Based on highest loadings, however, their component assignments would replicate those reported here except for one item, high places. In the Cox et al. analysis, high places would load on the enclosed places component for the When Accompanied scale and on the open places component for the When Alone scale. In the current sample, high places loads on the open places component for both scales.

Utilizing the longitudinal nature of the HARP study to address the temporal stability of the MI component structure, we repeated the principal components analysis using MI data collected at 3 and 5 years from the initial administration and compared which scales items would be assigned to. For the 3-year comparisons, two items (“driving cars anytime” and “driving cars on the highway”) switched component loadings from the open places component to the public places component for both the avoidance alone and avoidance accompanied scales. Thus, there was a 92% agreement with original item-scale assignments after 3 years. Comparing item assignments for the 5-year data, there was 100% agreement with the original item-scale assignments.

2.2. Intercorrelation of MI subscales

A series of Pearson correlations was also conducted examining the interrelationships among the different MI factors, as well as their relationship to the total MI scales (Table 2). High moderate to large correlations (Cohen, 1992) were found in all cases. The strongest correlations were found between the avoidance alone total score and the avoidance alone “public spaces” and “enclosed spaces” factors, and between the avoidance accompanied total score and the “public spaces” and “enclosed spaces” components. The MI total score for avoidance alone and the total score for avoidance accompanied correlated .78.

2.3. Temporal stability of agoraphobic avoidance as measured by MI scores

Capitalizing on the longitudinal nature of HARP, we used the MI subscales and components to examine the relative stability of different areas of agoraphobic avoidance behavior across multiple years of MI administration (Table 3). Participants who met diagnostic criteria for PDA at the time of the different MI administrations were included in these analyses. As can be seen in the table, scores for each of the components and overall avoidance alone and avoidance

accompanied scales were highly consistent across administrations. Correlations for 1 year between administrations ranged from .53 to .85. For 3 years between administrations, correlations ranged from .68 to .78. Even after 5 years had elapsed between administrations, correlations between MI avoidance alone and avoidance accompanied total scores and the various factor scores ranged from .70 to .84. These data suggests a certain degree of stability of avoidance in different areas assessed by the MI across multiple years.

3. Discussion

Over the years, the Mobility Inventory has become an increasingly popular assessment of agoraphobic avoidance behavior, but few studies have examined the instrument's psychometric characteristics. Thus, the purpose of the current study was to examine the psychometrics of the MI in a large sample of outpatients diagnosed with PDA participating in an ongoing longitudinal study of anxiety disorders. Consistent with previous reports (Arrindell et al., 1995; Cox et al., 1993), the results of this study confirmed that the underlying structure of the MI is best described by a three-component solution corresponding to avoidance of public spaces, avoidance of open spaces, and avoidance of enclosed spaces. Although a more ideal model fit is a CFI score of .90 or greater, results indicate an acceptable fit for both the alone and avoidance scales. The convergence of these results with those of previous studies (Arrindell et al., 1995; Cox et al., 1993) suggests that the MI component structure is stable across samples. Additionally, the stability of the component structure across multiple yearly administrations suggests the structure of agoraphobic avoidance as measured by the MI is temporally stable. These data should permit future researchers to feel more confident employing the MI as a multidimensional assessment of agoraphobic avoidance behavior.

Inter-correlation analyses were also conducted between the MI main subscales and component scores. Although the inter-correlations were high, particularly between the avoidance alone components and main scale, the pattern of correlations suggest the three components tap related but not identical areas of agoraphobic avoidance. This is particularly apparent when examining the intercorrelations of the three components between the MI avoidance alone and avoidance accompanied main scales.

Considering these findings, an intriguing speculation emerges: all agoraphobic avoidance might not be the same and there may be different typologies of agoraphobic avoiders. Such avenues of research have not been adequately explored to date and may be important for future researchers to consider. If different subtypes of agoraphobia exist and can be reliably identified, it may have important implications for diagnostic assessment and classification, the development of improved treatment strategies, and for the field's understanding of the nature of agoraphobic avoidance in general. Researchers conducting studies of agoraphobia may therefore wish to include the MI in their research plans in order to pursue such avenues of investigation.

The temporal stability of MI total and subscale scores deserves particular mention. For participants who met diagnostic criteria for agoraphobia, scores on both the avoidance alone and avoidance accompanied scales, and their three factors showed very high correlations across time. Indeed, even after 5 years had elapsed between administrations, MI scale and factor scores were found to correlate .7 or better. These are the first longitudinal data available demonstrating the stability of the MI and its factors across multiple yearly administrations. Moreover, these results speak not only to the psychometrics of the MI per se, but also to the general nature of agoraphobic avoidance. This data would seem to suggest that individuals who experience agoraphobic avoidance over a period of years are fairly consistent in the situations that they avoid and in the degree those situations are avoided. Thus, these results provide additional

evidence of the chronic nature of agoraphobia reported elsewhere (e.g., Keller et al., 1994; Yonkers et al., 1998).

Some limitations of the present study should be noted. First, the HARP sample is overwhelmingly Caucasian and female. Thus, it is unclear how well the identified principal components and patterns of intercorrelation would replicate in more ethnically or gender diverse samples. This limitation is mitigated somewhat given that the two prior studies that identified a three-component solution for the MI were conducted on Canadian (Cox et al., 1993) and Dutch (Arrindell et al., 1995) samples. Nevertheless, future studies attempting to replicate this three-component structure for the MI in mixed-gender, ethnically diverse samples are necessary. An additional consideration with the HARP data used in this study is that all participants were recruited from outpatient psychiatry clinics and were therefore necessarily treatment-seeking. A common finding in psychiatric research is that patients who seek and/or are engaged in treatment often have more severe symptoms, have had these symptoms for a longer period of time, and suffer greater functional impairment than patients not engaged in treatment (i.e., "Berkson's Bias"; Berkson, 1946). It is therefore uncertain if our component structure and pattern of intercorrelation would generalize to a less severe sample of individuals with agoraphobia, such as a non-treatment seeking or an untreated sample.

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Table 1

Component-relevant item loadings and indication of subscale assignment

Location/situation	Avoidance alone		Avoidance accompanied	
	Component-relevant loading	Scale assigned to	Component-relevant loading	Scale assigned to
Theaters	.70	Public	.82	Public
Supermarkets	.79	Public	.79	Public
Classrooms	.66	Public	.65	Public
Department stores	.85	Public	.90	Public
Restaurants	.75	Public	.81	Public
Museums	.75	Public	.79	Public
Elevators	.66	Enclosed	.64	Enclosed
Auditoriums/stadiums	.67	Public	.75	Public
Garages	.54	Open	.64	Open
High places	.40	Open	.81	Open
Enclosed places	.65	Enclosed	.61	Enclosed
Open spaces (outside)	.65	Open	.59	Open
Open spaces (inside)	.76	Public	.75	Public
Riding in buses	.65	Enclosed	.82	Enclosed
Riding in trains	.68	Enclosed	.88	Enclosed
Riding in subways	.68	Enclosed	.84	Enclosed
Riding in airplanes	.68	Enclosed	.71	Enclosed
Riding in boats	.76	Enclosed	.80	Enclosed
Driving/riding in Cars (anytime)	.62	Open	.59	Open
Driving/riding in cars (on highways)	.71	Open	.58	Open
Standing in lines	.47	Public	.77	Public
Crossing bridges	.66	Open	.66	Open
Parties or social gatherings	.72	Public	.73	Public
Walking on the street	.70	Public	.67	Public
Staying home alone	.45	Public	-	Public
Being far from home	.64	Enclosed	.67	Public

Table 2
Correlations among Mobility Inventory total and subscale scores

	Avoidance alone				Avoidance accompanied			
	Public places	Enclosed spaces	Open spaces	Total scale	Public places	Enclosed spaces	Open spaces	Total scale
Avoidance alone								
Public places	-	.69	.66	.90	.73	.54	.54	.69
Enclosed spaces		-	.72	.90	.54	.79	.57	.70
Open spaces			-	.85	.52	.58	.78	.66
Total scale				-	.70	.72	.69	.78
Avoidance accompanied								
Public places					-	.72	.72	.92
Enclosed spaces						-	.72	.90
Open spaces							-	.86
Total scale								-
Scale mean	2.32	2.69	2.16	2.32	1.85	2.22	1.83	1.92
S.D.	1.11	1.22	.97	.95	.92	1.15	.85	.86

Note. All correlations are statistically significant $p < .05$.

Table 3

Correlations between Mobility Inventory scale scores across multiple administrations

	Years between administrations		
	1 year (<i>n</i> = 42)	3 years (<i>n</i> = 69)	5 years (<i>n</i> = 61)
Avoidance alone			
Public places	.70	.73	.82
Enclosed spaces	.85	.74	.70
Open spaces	.78	.70	.84
Total scale	.82	.74	.83
Avoidance accompanied			
Public places	.60	.76	.74
Enclosed spaces	.83	.73	.71
Open spaces	.53	.68	.77
Total scale	.70	.78	.76

Note. All correlations are statistically significant $p < .05$.