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Pedestrian Anxiety Questionnaire for Psychological Assessments of Persons Injured in Traffic Accidents

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Abstract

Background*: Pedestrians injured by motorists and even some motorists injured in car accidents may subsequently develop anxiety when they are pedestrians in urban settings next to roadways with busy traffic. The present study introduces a questionnaire for assessment of such pedestrian anxiety and describes its validation.*

Method*: A 23 item questionnaire was developed. Its first 13 items evaluate situational anxiety, i.e., the severity of anxiety associated with various urban situations when the pedestrian is near vehicular traffic. The next 4 items (Items 14 to 17) assess other related emotions and also physical reactions. The last 6 items (Items 18 to 23) assess the avoidance of proximity to busy vehicular traffic. Responses of 21 patients with post-accident pedestrian anxiety (8 men and 13 women, aged 15 to 79 years, with the average of 43.2 years, SD=18.1) were compared to responses of 33 normal controls (17 men and 16 women, ages 20 to 78 years, with the average of 49.0 years, SD=17.9).*

Results*: The patients differed significantly from normal controls (Pearson r=.95) in their scores on the questionnaire, thus indicating good criterion validity. Convergent validity was indicated by its significant correlations with measures of post-accident symptoms in the whiplash spectrum (r=.73), insomnia (r=.72), post-concussive symptoms (r=.52), generalized anxiety (r=.50), depression (r=.38), and pain (r=.37).*

Discussion and Conclusions*: The Pedestrian Anxiety Questionnaire is meant for use with patients in urban settings with lifestyles near busy roadways. The questionnaire is to provide a standardized assessment tool for behavior therapists.*

Keywords: *pedestrian anxiety, phobia, psychological assessment, accidents*

Introduction

Persons injured in collisions with motor vehicles may develop a specific phobia involving situations in which they are in the proximity of vehicular traffic, e.g., as pedestrians on sidewalks next to a busy street, or as pedestrians having to cross streets on foot. In some cases, even persons injured in vehicular collision in which they were the drivers or passengers (i.e., not pedestrians) may develop pedestrian anxiety after their motor vehicle accident (MVA).

There is a paucity of psychological studies on pedestrian anxiety experienced by the survivors of such accidents, whether or not the injured person in the MVA was a pedestrian, driver, or passenger.

An interesting psychological study of pedestrian behavior by French authors, see Granié et al. (2013), focused on pedestrians' transgressions of traffic rules or on their unduly risky behaviours, in order to promote accident prevention. The pedestrian questionnaire prepared by Granié's team included items such as "*I cross the street even though the pedestrian light is red*," or "*I cross diagonally to save time*," "*I forget to look before crossing because I am thinking about something else*," "*I cross between vehicles stopped on the roadway in traffic jams*," and "*I get angry with a driver and hit his vehicle*."

Rather than focusing on excessive risk-taking behaviours of pedestrians, which can be fault-finding that appears to be victim blaming, the present study focuses on the aftermath of MVAs in terms of intense pedestrian anxiety. Injured pedestrians or injured motorists who subsequently develop phobic fears as pedestrians could usually benefit from psychological therapy as part of their recovery to return to their life functions.

The goal of the present study is the development and validation of an assessment questionnaire to evaluate the scope and intensity of post-accident phobic fear of pedestrians in various situations on city streets. The purpose of the questionnaire is to facilitate clinical assessments of various facets of the pedestrian anxiety, by the psychotherapists.

Method

Following numerous interviews with injured pedestrians, a 23 item questionnaire was developed, see Table 1. Its first 13 items evaluate situational anxiety, i.e., the severity of anxiety associated with various urban situations when the pedestrian is near vehicular traffic. The next 4 items (Items 14 to 17) assess other related emotions and also physical reactions. The last 6 items (Items 18 to 23) assess the avoidance of proximity to busy vehicular traffic on urban streets.

The responses for the first 17 items were coded as follows: *No anxiety (symptom absent)*=0, *mild*=1, *moderate*=2, *severe*=3.

The responses for the last 6 items (measure of avoidance) were coded as follows: *No, not true*=0, *at times*=1, *often*=2, *always*=3.

The responses to this questionnaire were available from 21 patients who still experienced pain and pain related insomnia due to injuries sustained in their vehicular accident. Seventeen of these patients were pedestrians hit by a car in situations such as while crossing a street via pedestrian crossing on the WALK signal for pedestrians, or while walking in a parking lot, or while walking on a sidewalk. Two of the 21 patients were injured in an MVA in which they were present as drivers and another two as passengers. These four patients were injured while in a car, not as pedestrians, but they subsequently developed both anxiety while traveling in cars and anxiety as pedestrians when near vehicular traffic. All 21 reported intense anxiety, since their MVA, as pedestrians on city streets.

Their age ranged from 15 to 79 years, with the average at 43.2 years (SD=18.1). The sample consisted of 8 men and 13 women.

Their accident happened 22 to 146 weeks ago (mean = 73.4 weeks, SD=39.5).

Seventeen of the 21 patients had no record of previous motor vehicle accidents (MVAs) sustaining serious injuries. Three patients (14.3%) had one previous MVA and one patient had two previous MVAs.

The patients were administered the Brief Pain Inventory (Cleeland, 2009), Insomnia Severity Index (Morin, 2011), Rivermead Post-Concussion Symptoms scale (Eyres et al., 2005), the Post-MVA Neurological Symptoms scale (Cernovsky et al., 2019), and Items 10 to 12 of the Whiplash Disability Index (i.e., items to rate depression, anxiety, and anger on a scale from 0=*no symptom* to 10=*symptom always present*, see Pinfold, 2004).

Responses to Pedestrian Anxiety Questionnaire were also available from 33 persons who had no serious MVA with substantial injuries. These persons served as normal controls. Their age ranges from 20 to 78 years with the average of 49.0 years (SD=17.9). This normal sample consisted of 17 men and 16 women.

The sample of normal controls has not significantly differed from the one of patients with respect to gender ratio (phi=.13, p>.05, 2 tailed) and with respect to age (r=.16, p>.05, 2-tailed).

Table1. *Pedestrian Anxiety Questionnaire*

Please rate your anxiety in the situations listed below. Use a check mark to indicate if, in the given situation, the anxiety is absent, mild, moderate, or severe.				
SITUATIONAL ANXIETY:	**No anxiety**	**Mild**	**Moderate**	**Severe**
1. Walking on sidewalk next to street with busy car and truck traffic				
2. Crossing streets via pedestrian crossing				
3. Walking through a full parking lot				
4. Using public transportation (street car)				
5. Using public transportation (a bus)				
6. Hearing sudden sound of car engine from the street while I'm on sidewalk				
7. Hearing sudden sound of car engine from the street while I'm on a pedestrian crossing				
8. Hearing sudden honking of a car while I'm on sidewalk				
9. Hearing sudden honking of a car while I'm on a pedestrian crossing				
10. Crossing the street via pedestrian crossing at intersection on the *WALK* signal				
11. Walking on sidewalk while transport trucks drive near me on the roadway				
12. Waiting for WALK signal at pedestrian crossing of an intersection				
13. Boarding public transportation (bus or street car)				
OTHER EMOTIONS:	**No**	**Mild**	**Moderate**	**Severe**
14. Feeling tense and uneasy on city streets				
15. Feeling that drivers are not driving safely				
16. Feeling angry at drivers				
17. Intense physical reactions (sweat or heart beat) while on sidewalk close to roadway traffic				
AVOIDANCE:	**No, not true**	**at times**	**often**	**always**
18. I avoid crossing busy streets even when absolutely necessary				
19. I avoid crossing busy streets even when pedestrian crossings are available				
20. I avoid crossing busy streets even when I have to drive a car around a block or further to get to the other side of the street (Please leave blank if you do not drive at all)				
21. I avoid trips when they involve crossing a street				
22. I walk through side streets even when the trip through a more busy street is much shorter				
23. I avoid walking on sidewalks that are immediately next to a busy roadway				

Results

Criterion Validity

Criterion validity of a test is the extent to which the test does what it is purported to do, i.e., in this case, differentiate patients with pedestrian anxiety from normal controls.

The mean values and SDs of the patients and controls for the scale's total score and for its three subscales are listed in Table 2. The correlation coefficients calculated between group membership (patients versus controls) are all very high and significant, both the Pearson's and Spearman's, thus supporting the criterion validity of the questionnaire and of its subscales.

Table2. *Mean scores and SDs on Pedestrian Anxiety Questionnaire*

Pedestrian Anxiety Questionnaire:	Patients (N=21):	Normal controls (N=33):	Pearson point biserial coefficient	Spearman rho coefficient
Total score	45.8 (10.2)	3.5 (4.5)	.95	.85
Subscale of situational anxiety	26.7 (5.5)	2.6 (3.5)	.94	.85
Subscale of other emotions	8.7 (1.9)	0.8 (1.2)	.93	.88
Subscale of avoidance	10.4 (3.9)	0.2 (0.5)	.90	.92

Legend: all correlation coefficients are significant at p<.001, 2-tailed.

Another way of examining criterion validity of the questionnaire is examining the extent of overlap between the scores of patients with those of normal controls. The only overlap in scores between the patients and normal controls is on the avoidance subscale, at the score of 2 points, see Table 3. One patient (4.8%) and two controls (6.1%) obtained the score of 2. Some controls might have reasons other than anxiety of being hit by a car to avoid proximity to busy vehicular traffic, reasons such as polluted air from engine exhausts or dust, construction barricades and delays etc..

Table3. *Overlap of minimum and maximum scores among the patients and controls*

Pedestrian Anxiety Questionnaire:	Patients (N=21):		Normal controls (N=33):	
	Minimum	Maximum	Minimum	Maximum
Total score	31	63	0	18
Subscale of situational anxiety	19	36	0	13
Subscale of other emotions	6	11	0	4
Subscale of avoidance	2	18	0	2

Convergent Validity

Convergent validity is the extent of correlations of a test with theoretically related constructs. Thus, it is reasonable to assume that pedestrian anxiety is generally higher in persons who suffer from more painful injuries from their accident, experience more sleep disruptions as a consequence, more post-concussion and whiplash symptoms, and more intense post-accident depression and generalized anxiety.

Furthermore, a good test of pedestrian anxiety should not be confounded by correlations with gender or age, within the reasonable adult age range.

The Pearson correlations of scores on the Pedestrian Anxiety to relevant variables are listed in Table 4.

The scores for pedestrian anxiety were unrelated to age, gender, and number of weeks since the MVA (all patients still suffered from acute post-MVA symptoms).

Pedestrian anxiety was significantly related to post-MVA whiplash symptoms as measured by the PMNS scale, insomnia, post-concussive symptoms as measured by Rivermead scale, the level of generalized anxiety, of depression, and to the ratings of worst pain on the Brief Pain Inventory (p<.001, 1-tailed).

The correlation should also be expected with PTSD, however, extreme groups were used in this study. As a consequence, all patients met DSM5 criteria for PTSD, but none of the normal controls. This would mean a perfect correlation.

Some correlations in Table 4 are underestimates of the relationships because the clinical measures were available only on patients, not on the controls. For example, the majority of normal controls could be expected to have very low scores on the Rivermead, on PMNS, on the Brief Pain Inventory, and on the Insomnia scale. Since scores of no normal controls on these measures were available, the size of correlation coefficients is lower due to the phenomenon of restricted range, see statistical explanations in Downie and Heath (1983), page 101-103, or also in Whetstone et al. (2020), page 31-32.

Table4. *Correlations of Pedestrian Anxiety Questionnaire to relevant variables*

	Pedestrian Anxiety Questionnaire	P values, 1-tailed
Age in years, N=54	r=-.10	p=.239
Gender (1=male, 2=female), N=54	phi=.12	p=.191
N of weeks since MVA, N=21	r=-.05	p=.408
Ratings on Items 3 to 5 of the Brief Pain Inventory, N=21: *Worst pain* *Least pain* *Average pain*	 r=.37 r=.08 r=.11	 p=.048 p=.359 p=.318
Insomnia Severity Index, N=20	r=.72	p<.001
Rivermead Post-Concussion Symptoms Questionnaire, N=20	r=.52	p=.010
Post-MVA Neurological Symptoms (PMNS) scale, N=20	r=.73	p<.001
Ratings on Items 10 to 12 on the Whiplash Disability Questionnaire, N=20 *Depression* *Anger* *Generalized Anxiety*	 r=.38 r=.18 r=.50	 p=.050 p=.229 p=.012

Psychometric Properties of Subscales and of Individual Items

The intercorrelations of the subscales were all very high and significant (p<.001), see Table 5.

Table5. *Intercorrelations of subscales of the Pedestrian Anxiety Questionnaire*

	Total score	Situational anxiety	Other emotions and physiological reactions	Avoidance
Total score		r=.99	r=.97	r=.97
Situational anxiety	r=.99		r=.95	r=.94
Other emotions and physiological reactions	r=.97	r=.95		r=.93
Avoidance	r=.97	r=.94	r=.93	

Cronbach alpha coefficients of internal consistency for the questionnaire and its subscales are listed in Table 6. They are all very satisfactory.

Table6. *Cronbach alpha coefficients of internal consistency*

Scale:	Cronbach alpha:	Range of corrected Item-Total correlations (lowest and highest rs)
All 23 items	.99	.67 (Item 4) to .95 (Item 14)
Situational anxiety (items 1 to 13)	.98	.67 (Item 4) to .95 (Item 1)
Other emotions or physiological reactions	.94	.83 (Item 16) to .90 (Item 1)
Avoidance	.95	.64 (Item 20) to .91 (Item 22)

Endorsement of Individual Items

The proportions of patients and of normal controls experiencing the 23 symptoms are listed in Table 7. The table also lists mean item scores for the two groups and the corresponding point biserial correlations. All correlations are significant at p<.001, 2-tailed, and are in the expected direction. This suggests that all 23 items contribute meaningfully to the clinical concept of pedestrian anxiety.

Table7. *Item endorsement frequencies and mean values*

	Patients (N=21):		Normal controls (N=33):		
	Mild to severe symptom (% of patients)	Mean score (SD)	*Mild to severe* symptom (% of normal controls)	Mean score (SD)	Point biserial correlation
1. Walking on sidewalk next to street with busy car and truck traffic	100%	2.3 (0.7)	12.1%	0.1 (0.3)	.92
2. Crossing streets via pedestrian crossing	100%	2.5 (0.7)	6.1%	0.1 (0.2)	.93
3. Walking through a full parking lot	95.2%	2.0 (0.9)	6.1%	0.1 (0.2)	.85
4. Using public transportation (street car)	61.9%	1.0 (0.9)	6.1%	0.1 (0.2)	.61
5. Using public transportation (a bus)	66.7%	1.0 (0.9)	6.1%	0.1 (0.2)	.65
6. Hearing sudden sound of car engine from the street while I'm on sidewalk	100%	2.4 (0.6)	24.2%	0.3 (0.5)	.89
7. Hearing sudden sound of car engine from the street while I'm on a pedestrian crossing	100%	2.6 (0.6)	42.4%	0.5 (0.7)	.85
8. Hearing sudden honking of a car while I'm on sidewalk	100%	2.6 (0.7)	42.4%	0. 5 (0.6)	.87
9. Hearing sudden honking of a car while I'm on a pedestrian crossing	100%	2. 7 (0.6)	48.5%	0.6 (0.7)	.86
10. Crossing the street via pedestrian crossing at intersection on the *WALK* signal	100%	2.4 (0.6)	9.1%	0.1 (0.3)	.94
11. Walking on sidewalk while transport trucks drive near me on the roadway	95.2%	2.3 (0.9)	18.2%	0.2 (0.5)	.84
12. Waiting for WALK signal at pedestrian crossing of an intersection	100%	1.9 (0.8)	9.1%	0.1 (0.3)	.86
13. Boarding public transportation (bus or street car)	66.7%	1.0 (0.8)	3.0%	0.0 (0.2)	.67
14. Feeling tense and uneasy on city streets	100%	2.4 (0.6)	6.1%	0.1 (0.2)	.94
15. Feeling that drivers are not driving safely	100%	2.6 (0.6)	30.3%	0.4 (0.7)	.85
16. Feeling angry at drivers	95.2%	1.9 (0.9)	27.3%	0.3 (0.5)	.76
17. Intense physical reactions (sweat or heart beat) while on sidewalk close to roadway traffic	95.2%	1.9 (0.8)	3.0%	0.0 (0.2)	.87
	at times to always	Mean score (SD)	*at times to always*	Mean score (SD)	
18. I avoid crossing busy streets even when absolutely necessary	95.2%	2.0 (0.9)	3.0%	0.0 (0.2)	.85
19. I avoid crossing busy streets even when pedestrian crossings are available	95.2%	1.8 (0.9)	0%	0.0 (0.0)	.85
20. I avoid crossing busy streets even when I have to drive a car around a block or further to get to the other side of the street (*Please leave blank if you do not drive at all*)	66.7%	1.3 (1.1)	0%	0.0 (0.0)	.70
21. I avoid trips when they involve crossing a street	71.4%	1.3 (1.1)	0%	0.0 (0.0)	.70
22. I walk through side streets even when the trip through a more busy street is much shorter	95.2%	2.0 (0.8)	9.1%	0.1 (0.3)	.86
23. I avoid walking on sidewalks that are immediately next to a busy roadway	95.2%	2.1 (1.0)	6.1%	0.1 (0.3)	.86

Legend: all correlation coefficients are significant at p<.001, 2-tailed.

Discussion

The questionnaire shows good criterion and convergent validity. All of its items contribute meaningfully to the construct of pedestrian anxiety.

The questionnaire is useful with people living in urban areas with busy traffic and where public transit is also available. The danger to pedestrians may vary depending on the section of the city. Certain parts of large cities have higher risks for pedestrians. Factors such as the spacing of protected crosswalks, lighting of the roadways, speed limits on various streets and roads, all make a difference to behaviors of drivers and pedestrians.

Many injuries and fatal accidents of pedestrians occur at evening and night time, especially in outlying areas away from the city's main centre, i.e., perhaps in areas where pedestrians are less expected and easily missed on the streets, the cross walks and traffic lights are further spaced, or no sidewalks are available at all. Even when sidewalks are available, drivers tend to speed up in those areas away from city centre, so car collisions into pedestrians occur at pedestrian crossings as well.

The size of the city also makes a difference, due to the speed limits, driving culture characteristics, and the availability of transit or transit routes as travel options other than being on foot.

Our questionnaire was validated almost exclusively on patients from the Greater Toronto area, i.e., city dwellers for whom public transportation such as streetcars is available. Boarding a street car or a bus in similar urban settings is obviously associated with some risk of being injured by inattentive or inebriated motorists.

Somewhat lower scores on our questionnaire can be expected in patients from urban centers where no streetcar is available or in patients who never use public transit except perhaps the subway or suburban commuter trains. We included items dealing with streetcars or buses only because the responses of patients using that mode of transport may provide additional insight to clinicians specialized in behavior therapy with in vivo exposure.

The weakness of this study is the small size of our sample of patients with post-accident pedestrian anxiety. Larger samples are very difficult to obtain, but hopefully replication studies from other urban centers would soon become available.

The key contribution of the present study is providing a standardized questionnaire for clinicians to facilitate the assessment of pedestrian anxiety. The questionnaire is available in its German, Spanish, Russian, Czech, and Arabic translations.

Conclusions

The Pedestrian Anxiety Questionnaire has good criterion and convergent validity. It is meant for use with patients in urban settings with lifestyles near busy roadways. The questionnaire is to provide a standard assessment tool for behavior therapists.

References

[1] Cernovsky ZZ, Istasy PVF, Hernández-Aguilar ME, Mateos-Moreno A, Bureau Y, and Chiu S. Quantifying Post-Accident Neurological Symptoms Other than Concussion. *Archives of Psychiatry and Behavioral Sciences*. 2019; 2(1): 50-54.

[2] Cleeland CS. *The Brief Pain Inventory - User Guide*. Houston, TX: The University of Texas - M. D. Anderson Cancer Center, 2009.

[3] Downie NM, Heath RW. *Basic Statistical Methods*. New York, NY: Harper & Row, 1983.

[4] Eyres S, Carey A, Gilworth G, Neumann V, Tennant A. Construct validity and reliability of the Rivermead Post-Concussion Symptoms Questionnaire. *Clinical Rehabilitation*. 2005; 19: 878-87.

[5] Granié M-A, Pannetier M, Gueho L. Developing a self-reporting method to measure pedestrian behaviors at all ages. *Accident Analysis and Prevention*. 2013; 50(1):830-839. ff10.1016/j.aap.2012.07.009ff. ffhal-00849098f

[6] Morin CM, Belleville G, Bélanger L, and Ivers H. The insomnia severity index: psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep*. 2011; 34:601-608.

[7] Pinfold M, Niere KR, O'Leary EF, Hoving JL, Green S and Buchbinder R. Validity and internal consistency of a Whiplash-Specific disability measure. *Spine*. 2004; 29(3): 263-268.

[8] Whetstone JP, Cernovsky Z, Tenenbaum S, Poggi G, Sidhu A, Istasy M, Dreer M. Validation of James Whetstone's Measure of Amaxophobia. *Archives of Psychiatry and Behavioral Sciences*. 2020; 3(1): 23-33.

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