Original Article

Measuring the Psychometric Properties of Adolescent Pedestrian Behavior Questionnaire

Forouzan Rezapur-Shahkolai[1,2,3], Shahnaz Maleki[1], Majid Barati[1,3], Leili Tapak[4,5], Mohammadreza Shokouhi[6]

Departments of [1]Public Health and [4]Biostatistics, School of Public Health, Hamadan University of Medical Sciences, [2]Research Center for Health Sciences, Hamadan University of Medical Sciences, [3]Social Determinants of Health Research Center, Hamadan University of Medical Sciences, [5]Modeling of Non-Communicable Diseases Research Center, Hamadan University of Medical Sciences, [6]Department of Emergency Medical Services, School of Nursing and Midwifery, Hamadan University of Medical Sciences, Hamadan, Iran

ORCID:

Forouzan Rezapur-Shahkolai: https://orcid.org/0000-0001-5049-1109
Shahnaz Maleki: https://orcid.org/0000-0003-2935-7735
Majid Barati: https://orcid.org/0000-0002-5152-1928
Leili Tapak: https://orcid.org/0000-0002-4378-3143
Mohammadreza Shokouhi: https://orcid.org/0000-0002-8338-266X

Abstract

Background: Road traffic injuries are among the main causes of mortality in adolescents. The aim of this study was to determine the psychometric properties of an adjusted adolescent pedestrian behavior questionnaire (APBQ). **Materials and Methods:** Using the 29-item self-report pedestrian behavior questionnaire designed by Sadeghi-Bazargani *et al.* for all age groups as the framework, some of the items were removed depending on the type of behaviors among adolescents and some new questions were added. Eventually, the primary questionnaire was developed with 26 items, including 19 questions from Sadeghi-Bazargani *et al*.'s questionnaire and seven new questions. The tool was adjusted for adolescents and the psychometric properties were determined among a randomly selected group of 300 Junior high school students in Rasht City, Iran. After determining face validity, content validity and construct validity of the tool by experts, the reliability of the tool was examined based on explorative factor analysis (EFA) with Promax rotation and confirmatory factor analysis in AMOS. Eventually, a self-report questionnaire with 14 items was developed to assess the self-report behavior of adolescent pedestrians. **Results:** The mean age of the participants was 13.59 (±0.92) years. The Kasier-Meyer-Olkin value was 0.828, which confirmed the EFA. The analysis by the maximum likelihood method with Promax rotation identified four factors with eigenvalues >1 and factor loading ≥0.5. Therefore, pedestrian behaviors were categorized into four groups (unsafe road crossing behavior, distraction, positive behavior, and playing on the road). **Conclusion:** The APBQ can be a proper tool for self-reporting adolescent pedestrians' behaviors. It can also be used for studies on safe behaviors in adolescent pedestrians.

Keywords: Distraction, positive behavior, unsafe road crossing behavior, validity

Introduction

Road traffic injuries (RTIs) are the most common cause of unintentional injuries in all age groups.[1] Every year, 1. 3 million individuals are killed due to RTIs and more than 50 million sustain serious problems caused by RTIs.[2] Without efficient measures, RTIs will be the main cause of mortality by 2030.[3] Among road users, pedestrians are the most vulnerable group.[4]

According to the World Health Organization, mortality rates of pedestrians in the world and Iran are 23% and 22%, respectively, and in 2016, 15932 deaths due to RTIs were recorded in Iran.[5] RTIs among pedestrians have a variety of causes and among human-related causes, in addition to careless drivers, are unsafe behaviors and unsafe road decisions by pedestrians as a key factors.[6] Using mobile phones and

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Address for correspondence: Dr. Shahnaz Maleki, Department of Public Health, School of Public Health, Hamadan University of Medical Sciences, Hamadan, Iran.
E-mail: shahnaz_maleki91@yahoo.com

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other electronic gadgets is very common in today's societies, and it affects the way pedestrians behave. Several studies have highlighted the relationship of pedestrian's distraction and using mobile phones with RTIs.[7-11] The RTIs are one of the main causes of death in adolescents.[12] Among the reasons for this is the higher level of curiosity and activity in adolescents.[13] They are among the pedestrians that, even with a good knowledge about safety regulation, rarely obey road safety regulations. The rate of risky behaviors such as adventuring, unsafe road crossing, using hazardous spots, and not using the designated spots on the roads for pedestrians is high in adolescents.[14] Gitelman *et al*. and Granié argued that there was a relationship between the increase in risky behaviors and crossing roads unsafely in adolescents and their age.[15-17] Another study showed that unsafe and cautious expressions of peers affect adolescent pedestrians' decision.[18]

Several studies in different countries have been carried out about developing a proper tool to measure road traffic behavior of pedestrian in different age groups.[19-34] In addition, several studies on adolescents have shown that unsafe road crossing behaviors increase with age, and adolescents barely demonstrate safe behaviors. Moreover, male adolescents place themselves at a higher risk by using roads as a playground.[22,26,30,31,35] There have been a few works on developing proper tools to measure pedestrians' behaviors in the adolescence age range. Nabipour *et al*. in Tehran used a 42-item questionnaire of adolescents road users, and after translating and determining the psychometric properties, a 21-item short form of adolescents' behavior was introduced for high school students (junior and senior) in 13–18 years age range (7th to 12th graders). Using the short form of the tool, he determined three reliable factors (Planned protective behavior, unsafe crossing behavior, and dangerous play on the road) in pedestrians' behavior[26] Nabipur's *et al*. adolescents' road behaviors questionnaire for road users included pedestrians and users of the bicycle. In the present study, the focus of the tool is only on adolescent pedestrians in the 12–15 years age group (junior high school, 7th–9th graders) in Rasht City.

Sadeghi-Bazargani *et al*. developed a self-report pedestrian behavior tool in Iran and, after determining its psychometric properties, introduced it as a proper tool to measure the self-reported behavior of pedestrians.[20] Since this tool is designed for all age groups, there is a need for a specially designed tool for adolescents to introduce efficient interventions to prevent the damages caused by RTIs in this age group.

To this end, the 29-item questionnaire of pedestrian's behavior (Sadeghi-Bazargani *et al*.) was used as a framework. Taking into account the results of some studies,[21,23,26,36] an adjusted questionnaire for adolescents was designed, and the psychometrics properties were measured in this study.

Materials and Methods

Procedure and participants

This cross-sectional study was conducted on 300 junior high school students of the 12–15 age range (7th, 8th, and 9th graders) in public and private schools of Rasht City, north of Iran. The participants were selected through multi-stage random sampling from November 25, 2020 to December 20, 2020.

Step 1: Preliminary questionnaire and evaluation of content and face validity

Preliminary questionnaire

After receiving the permissions, the 29-item self-report pedestrian behavior questionnaire was used as a framework. Sadeghi-Bazargani *et al*. measured the validity and reliability of the/tool.[20] Given that the questionnaire is designed for all age ranges, some of the items (10 items) were removed. In addition, a literature review was performed by the authors, to receive other tools for measuring pedestrians' behaviors and check the items in them about adolescents.[22,35,36] Afterward, based on the type of behaviors in the adolescent's age group and the results of pertinent studies, the tool was further modified by the research team, who are experts in the field of behavior studies, safety improvement, and injury prevention. Through this, seven items were added to the questionnaire based on the specifications of the age group (12–15 years) under study. Based on the literature review and assessments by the research team, a primary pedestrian adolescent's behavior tool with 26 items based on Likert's 5-point scale was developed.[26,31]

After codifying the primary version of the tool, validity (face, content, and construct validity) and reliability of the tool were measured and improved, and the tool was finalized.

Evaluation of content and face validity

Content validity

Content validity refers to the extent to which the items measure the specification under study.[37] Content validity was examined by a panel of experts, including five experts in health education, five experts in road traffic, and two experts of the Road Traffic Police Department. The relevance of the items was determined using the Likert's four-point scale (1 = irrelevant, 2 = somehow relevant, 3 = completely relevant, 4 = highly relevant). To make sure of readability and clarity, the research team used a Likert's four-point scale (1 = unclear, 2 = relatively clear, 3 = clear, 4 = completely clear). To calculate content validity index (CVI), the number of experts who marked 3 and 4 was divided by the total number of experts and values higher than 0.7 were considered acceptable.[38] To compute content validity ratio (CVR), the expert team was asked to examine the necessity of each item. The necessity of the items was assessed based on a Likert's three-point scale (1 = not necessary, 2 = useful but not necessary, 3 = necessary). Given that 12 experts participated in the study, CVR = 0.56 was considered acceptable.[39]

Face validity

Face validity refers to the subjective assessment of researchers of the presentation and relationship of the tool and if the items are logical, clear, and without ambiguity.[40] Validity assessment is made in qualitative and quantitative ways. Using a convenient sampling method, 50 students of junior

high schools (boys and girls) who were not part of the main group of participants were selected. To examine face validity through quantitative way, the participants were asked to assess the importance of each item based on a Likert's five-point scale (1 = not important, 2 = a little important, 3 = moderately important, 4 = to some extent important, and 5 = completely important). Effect scores higher than 1.5 would be considered as acceptability of an item. As to qualitative face validity assessment, the participants were asked to express their idea about the ambiguity, complicacy, and relevance of each item.[41]

Step 2: Evaluation of construct validity and reliability

Construct validity

After validity and reliability assessment and finalizing the tool, construct validity was examined using explorative factor analysis (EFA) with Promax rotation through the maximum likelihood method. To this end, 300 students in 12–15 years age range (152 boys and 148 girls) were selected through a cluster random sampling. Inclusion criteria were boy and girl students in Junior high schools (7th, 8th, and 9th graders) in Rasht City. Since the study was carried out during the COVID-19 pandemic and school classes were held online, an electronic version of the questionnaire was administered. Filling out the questionnaire would take 15–20 min. To determine the adequacy of sampling, Kasier-Meyer-Olkin (KMO) and Bartlett's tests were used. As to the relevance of the tool for measuring pedestrians' behaviors, the confirmatory factor analysis (CFA) was used in AMOS (v. 23).

Reliability

After conducting a construct validity assessment, 14 items remained in the tool, and reliability was measured for these 14 items through internal consistency (Cronbach's alpha) and test–retest methods (Intraclass Correlation Index). To this end, the questionnaire was filled out by 50 junior high school students living in Rasht City (not part of the main study group) twice at 3 weeks interval.

Data analysis

All data analyses were performed using SPSS software Ver. 16.0 (SPSS Inc., Chicago, IL, USA) And AMOS, Ver. 23.0 (IBM Corp., Armonk, NY, USA).

Ethical approval

This study was approved by the Ethics Committee of Hamedan University of Medical Sciences (Code: IR.UMSHA.REC.1398.1046). In addition, a permission was secured from Sadeghi-Bazargani *et al*. for using their tool as the base framework in the study. Furthermore, written informed consent was obtained from all parents of students participating in the study.

Results

The data used in the study was collected from 300 boy and girl junior high school students in the 12–15 years age range (13.59 ± 0.92). As listed in Table 1, 50.7% (152) of students were boys and 49.3% (148) were girls; 43.7% (131) were 13 years old and 9% (27) were 12 years old. In addition, 78.3% (235) of the students were in public schools, 39.7% (119) were 7th graders, and 28.7% (86) would use school transportation services. The distance from home to school in 41% (123) of them was between 11 and 20 min. Moreover, 71% (213) reported that there were traffic police on their way to school, 80.3% (241) reported that there were crosswalks on their way to school, and 70.7% (212) reported that there were traffic lights on their way to school. Totally, 62% (186)

Table 1: Demographic characteristics of the participants (*n*=300)

Characteristics	*n* (%)
Sex	
Boys	152 (50.7)
Girls	148 (49.3)
Age (years)	
12	27 (9)
13	131 (43.7)
14	79 (26.3)
15	63 (21)
School	
Public	235 (78.3)
Private	65 (21.7)
Grade	
7	119 (39.7)
8	84 (28)
9	97 (32.3)
How the student travels between home and school?	
Walk alone	59 (19.7)
Walk with friends	26 (8.7)
Walk with adults	24 (8)
With school transportation services	86 (28.7)
By car of a family member	58 (19.3)
By bus	16 (5.3)
By taxi	31 (10.3)
Home to school distance (min)	
<10	66 (22)
11-20	123 (41)
>20	111 (37)
Traffic equipment on the way from home to school	
Crosswalk	
Yes	241 (80.3)
No	59 (19.7)
Traffic police	
Yes	213 (71)
No	87 (29)
Traffic light	
Yes	212 (70.7)
No	88 (29.3)
Pedestrian bridge	
Yes	114 (38)
No	186 (62)
Pedestrian underpass	
Yes	65 (21.7)
No	235 (78.3)

reported that there were no pedestrian bridges and 78.3% (235) reported that there were no pedestrian underpasses on their way to school.

The adolescent pedestrian's behavior self-report questionnaire that was developed in the first phase based on the results of similar studies contained 26 items, out of which nine were removed throughout content and face validity assessment, and 17 items remained in the study. By construct validity, including EFA and CFA, a final questionnaire with 14 items was achieved. Removal of the items throughout the study is explained in the following sections.

Step1: Evaluation of content and face validity

Content validity

Two items had CVI < 0.7 and seven items had CVR < 0.56 in the content validity assessment. After modifying these items, the CVI and CVR were increased to an acceptable level. Seven items were also found "unnecessary" by the team of experts and removed; and two items were combined due to similar meanings. Therefore, only 17 items remained out of 26 items at the end of this phase [Table 2].

Face validity

Afterward, the participating adolescents (n = 50) assessed the tool in terms of ambiguity, complicacy, and relevance. Throughout this phase, four items were modified.

Step 2: Evaluation of construct validity and reliability

Construct validity

Explorative factor analysis

As the results showed, the value of KMO was 0.828, and Bartlett's test result was 1441.757 (P < 0.001), which indicated the adequacy of sampling. Table 3 shows the results of Principal component analysis with Promax rotation, four factors with an eigenvalue higher than 1 and factor loading equal to or higher than 0.50, which explains 42.294% of the total variance.

Table 2: Mean and standard deviation and content validity (content validity index and content validity ratio)

Item	Mean±SD	CVR	CVI
Q1	4.35±0.858	0.83	0.92
Q2	2.92±1.567	0.67	0.92
Q3	4.27±1.077	0.83	0.97
Q4	4.51±0.871	0.83	0.92
Q5	2.80±1.501	0.83	0.83
Q6	4.55±0.968	0.82	0.89
Q7	4.45±1.018	0.83	0.81
Q8	4.32±0.905	0.83	0.92
Q9	4.29±1.134	0.67	0.86
Q10	4.46±1.012	0.83	0.92
Q11	4.51±0.959	0.67	0.94
Q12	4.33±1.055	0.67	0.89
Q13	4.50±0.966	0.83	0.94
Q14	4.77±0.651	0.67	0.94
Q15	4.84±0.549	0.82	0.89
Q16	4.44±0.881	0.67	0.92
Q17	4.64±0.783	0.67	0.89

SD: Standard deviation, CVI: Content validity index, CVR: Content validity ratio

Factor loads included (a) factor 1: Unsafe road crossing behavior with five items (6, 9, 10–12); (b) factor 2: Distraction with three items (13, 16, 17); (c) factor 3: Positive behavior with four items (1, 3, 4, 8); and (d) factor 4: Playing on the road with two items (14, 15). Three items were removed based on factor loading <0.5 in EFA.

Confirmatory factor analysis

The results of the CFA of the general model with 14 items in four subscales showed that the model was accepted in its current form (Chi-square = 129.290, df = 71, χ^2/df = 1.82, P < 0.001; RMSEA = 0.05 > 0.08, (95% CI = 0.050–0.064); CFI = 0.949 > 0.9; IFI = 0.95 > 0.9; TLI = 0.935 > 0.9; GFI = 0.932 > 0.9; AGFI = 0.918).

Therefore, CFA results supported the adequacy of the model and relevance of the structural model for the population under study [Figure 1].

CFA was performed with AMOS software. To evaluate the reliability, two criteria of combined reliability (CR) and average variance extracted (AVE) were calculated. The reliability of the present questionnaire was confirmed since the results were found CR > 0.7, AVE > 0.5, and CR > AVE [Table 4].[42]

Reliability

The results of assessing the reliability through internal consistency methods (Cronbach's alpha) and test-retest methods (Intraclass Correlation Index) on 50 participants with 3 weeks interval showed that Cronbach's alpha of the tool adolescent pedestrian behavior questionnaire (APBQ) and test–retest score were 0.86 and 0.94 (confidence interval: 0.9–0.97), respectively.

The Cronbach's alpha coefficients for the subscale of unsafe road crossing behavior, distraction, positive behavior, and playing on the road were 0.78, 0.75, 0.71, and 0.85, respectively. The test–retest score for the subscale of unsafe road crossing behavior was 0.97 (0.96–0.98), distraction was 0.97 (0.94–0.98), and Positive behavior was 0.95 (0.91–0.97), and playing on the road was 0.72 (0.52–0.84).

Discussion

The APBQ (self-report) with 14 items was designed, and the psychometric properties were determined. Pedestrian's behavior was categorized into four factors, including unsafe road crossing behavior (factor 1), distraction (factor 2), positive behavior (factor 3), and playing on the road (factor 4).

The tool developed by Sadeghi-Bazargani *et al*. with 29 items was designed for all pedestrians in all age groups. They used EFA, and Varimax rotation for construct validity assessment, and their factors (positive behavior, violations, distraction, and aggressive) were consistent with the present study only in terms

Table 3: Factor structure of the 14 item adolescent pedestrian behavior questionnaire

Questions	Unsafe road crossing behavior (factor 1)	Distraction (factor 2)	Positive behavior (factor 3)	Playing on the road (factor 4)	Variance
Q6. When I want to go somewhere, I do not use sidewalk and use the street instead	0.587				16.934
Q9. To cross the street, I suddenly step on street and cross it fast	0.630				
Q10. In alleys and narrow streets, I walk through shrubs and bushes on the sidewalk and step on the street	0.581				
Q11. If in haste, I jump over the guardrail and road barrier in the middle of the road	0.687				
Q12. When I cross the street, I move spirally between vehicles	0.631				
Q13. I use hands-free device to listen to music and audio files or to call while I am walking on sidewalk		0.544			13.118
Q16. I cross street while I am talking on my phone		0.782			
Q17. I cross street while I am texting or reading a text message		0.761			
Q1. If there is a pedestrian crosswalk; I use it to cross the street			0.633		7.456
Q3. If there is a pedestrian bridge, I use it to cross street			0.501		
Q4. Before crossing intersection, I wait for cars to stop and then cross the street when pedestrian light is green			0.718		
Q8. I use bright-colored or reflective clothes, when there is not enough light (during early morning, sunset, and night)			0.510		
Q14. I cross streets playing and running with my friends				0.722	4.786
Q15. While crossing a street, I might push my friend for fun				0.999	
Q2. When the truck or bus stops, I will pass through behind for my own safety	Omitted				
Q5. If there is no suitable pavement, I try to walk in the direction of the vehicles	Omitted				
Q7. I will cross the intersection after estimating the time of the vehicle arrival and the condition safety	Omitted				

Table 4: Construct reliability, convergent, and discriminant validity for the measurement model

Construct	Mean±SD	Score range	CR[b] (>0.7) [a]	AVE[c] (>0.5) [a]	MSV	ASV
Unsafe road crossing behavior	22.14±3.96	5-25	0.834	0.503	0.411	0.253
Distraction	13.58±2.22	3-15	0.804	0.581	0.364	0.280
Positive behavior	17.44±2.99	4-20	0.830	0.554	0.230	0.151
Playing on the road	9.61±1.58	2-10	0.844	0.730	0.411	0.299

For discriminant validity, both MSV and ASV should be less than AVE (MSV <AVE, ASV <AVE), whereas, the CR should be greater than AVE to support convergent validity (CR >AVE).[42] [a]Indicates an acceptable level of reliability or validity, [b]CR: Construct Validity (λΣ) 2/(λΣ) 2+(Σδ), [c]AVE (λΣ) 2/n. AVE: Average variance extracted, MSV: Maximum shared squared variance, ASV: Average shared squared variance, CR: Combined reliability, SD: Standard deviation

of distraction and Positive behavior and inconsistent in terms of violations and aggression.[20] These differences can reflect the differences between different age groups to some extent.

Nabipour *et al*. used a short version (21 items) of pedestrian's behavior questionnaire under principle axis factoring with Varimax rotation, and three factors were named (planned protective behavior, unsafe crossing behavior, and dangerous play on the road) for the high school adolescent age group (13–18 years).[26] Their results were consistent with the results of the present study based on one of the age groups (12–15 years) and two factors (Dangerous play on the road and unsafe crossing behavior). The tool developed by Nabipour *et al*. was designed for adolescent bicycle riders and pedestrians in the 13–18 years age range (7th–12th graders), including junior and senior high school students. On the other hand, the tool designed here was only for the age group 12–18 years and junior high school students (7th, 8th, and 9th graders). This is the differentiating feature of these two studies.

Despite these differences, it is notable that the studies on adolescent pedestrians' behaviors in different countries by Elliott, Sullman, Wang, and Nabipour were almost in the same age group as of this work. In these studies, adolescent pedestrians' behaviors were categorized into three factors: dangerous playing on the road, planned protective behavior, and Unsafe road crossing behavior,[22,26,31,36] and only two (Unsafe road crossing behavior and Dangerous playing

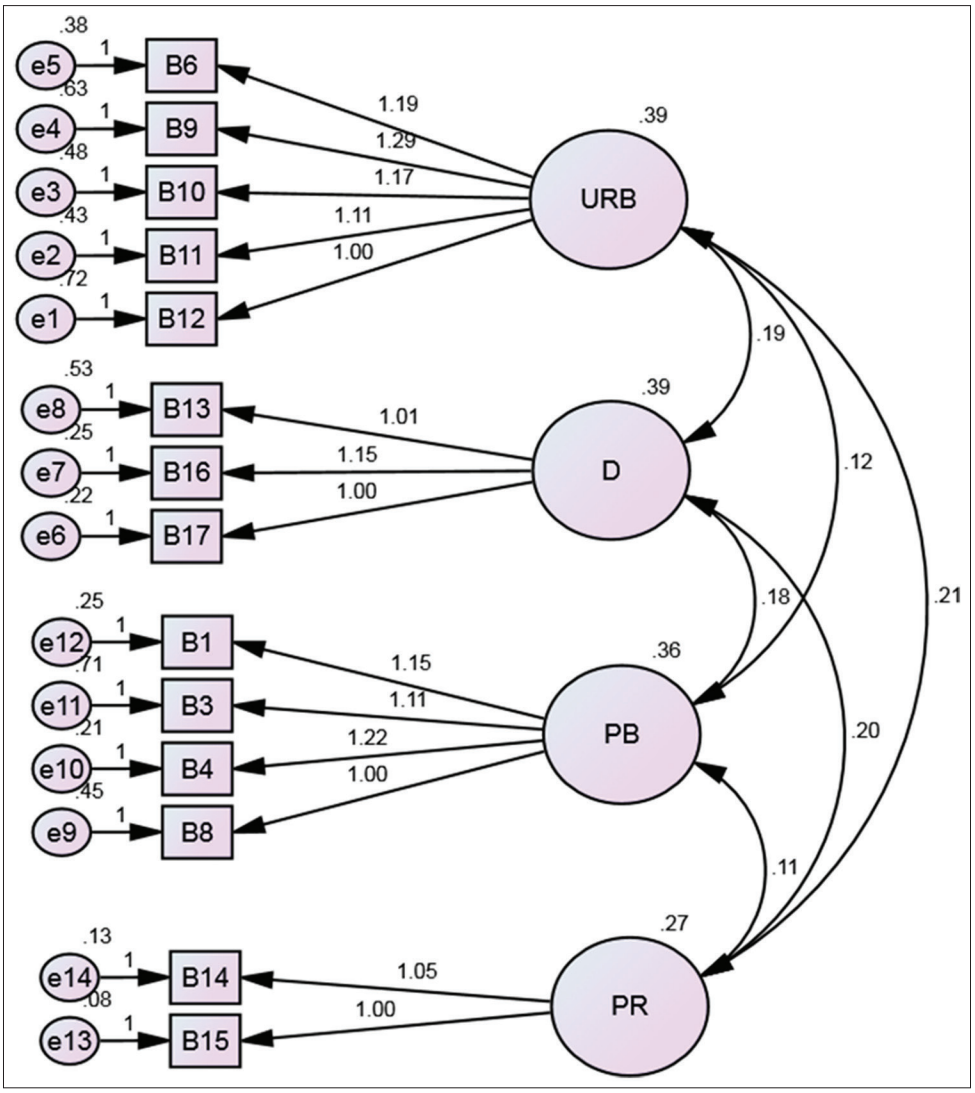

Figure 1: CFA of the Adolescent Pedestrian Behavior Questionnaire with four sub-scales. URB: Unsafe road crossing behavior, D: Distraction, PB: Positive behavior, PR: Playing on the road, CFA: Confirmatory factor analysis

on the road) of them were common with the present study. Elliot in the UK used a tool with 43 items and developed a short-form tool with 21 items for adolescent pedestrians' behaviors (11–16 years), including boys and girls. In that study, 52% were boys and 48% were girls, so that there are two similar factors (Dangerous play on the road and Unsafe crossing behavior) between these two studies in terms of the age group.[22] Sullman and Mann studied the age group of 13–18 years in New Zealand, and two factors (Unsafe road crossing behavior and Playing on the road) in their study were similar to the present study.[31] In addition, in China, Wang studied adolescents' road behaviors in age groups (<11 and higher than 15 years) and two factors (Unsafe road crossing behavior and Playing on the road); the results of this study were similar to the present study.[36]

In addition, some studies on developing tools have categorized pedestrians' behaviors into several factors, such as Useche *et al*. who categorized behavior into three factors (Violations, Errors, and Positive behaviors.[32] In addition, Granié *et al*. who developed a 20-item tool out of 40 primary items with 343 participants in a 15–78 years age group and introduced four factors (Transgression, Lapses, Aggressive behavior and Positive behavior) for categorizing pedestrian's behaviors based on Varimax rotation.[23] McIlroy *et al*. validated a short version of a 20-item questionnaire of pedestrians' behavior in older than the 18 years age group in six countries (Bangladesh, China, Kenya, Thailand, Vietnam, and UK) with different cultural and economic conditions. At first, five factors (Positive behaviors, Errors, Violations, Aggressive and Lapses) were examined in six countries, and eventually, a short version with 12 items and three factors (Errors, Violations, and Lapses) was introduced for the countries under study.[25]

Twisk *et al*. studied the same age group as the present study, while their examination of pedestrians' behavior was not consistent with the present study. They examined four risky behaviors (Violations, Errors, Lack of protective behavior, and

Dangerous play) in two age groups 12–13 and 14–16 years. In the case of the younger group, error, dangerous play, and lack of protective behavior were correlated with an increase in the rate of car crashes. In the older group, only Errors predicted car crashes, which was not the case with violations and Lack of protective Behavior. In the younger age group, risk awareness appeared as a function of age, and in the older age group, the sense of responsibility for one's action directly affected the rate of car crashes.[35]

Deb *et al*. developed and validated a self-report tool for pedestrians' behavior in the age range 18–71 using two questionnaires, one as a long tool (36 items) and another as a short tool (20 items). The CFA of pedestrian's behavior in the short and long versions was categorized into five factors (Positive behaviors, Errors, Violations, Aggressive, and Lapses).[21] Their tool was similar to the tool in this study only in terms of positive behavior, and there was no similarity in terms of age group.

O'Hern *et al*. examined a 128-item questionnaire of pedestrian' behavior, on 968 Australian participants, in the 18–65 years age group. The participants filled out the tool online. Based on EFA and CFA, the tool was confirmed with 32 items. Because of COVID-19 limitations, the participants in this study also filled out the tool online. Still, our study was different from O'Hern *et al*.'s study in terms of age group as they examined four types of pedestrian's behavior (errors, violations, aggression, and technology) in the age group 18–65.[27]

Only positive behavior factor in the studies mentioned was consistent with the present study, and as to the rest of the factors, our study was different from other studies. One reason for the difference can be the age group of the participants. Here, the participants were in the 12–15 years age range, while the majority of studies under study focused on age groups between 18 and higher than 71 years.[20,21,23,27]

In the present study, construct validity, EFA with Promax rotation using the maximum likelihood method, and CFA in AMOS 23 were used. Some of the mentioned studies used EFA and CFA in AMOS as well, while they used a different rotation type.[20,21,24,26,27,32]

The tool introduced in this paper contained 14 items so filling the tool is not burdensome and time-consuming for adolescents. This makes the tool more suitable for this age group, which is one of the main advantages of the tool. The study was limited to students living in urban areas. Given the fact that there is a different condition in rural areas in terms of road traffics (lack of crosswalk, Traffic light, etc.), some of the items of the questionnaire are not applicable for students in rural areas.

Conclusion

Taking into account that risky behaviors and unsafe road crossing are more prevalent in adolescents and the rate of RTIs is higher in this age group, there is a need to introduce solutions to reduce the rate of RTIs in adolescents. In this regard, validated tools are essential to program and evaluate efficient interventions to increase the safety of adolescent pedestrians. A short tool with 14 items was designed, and its psychometric properties were determined. The behavior of adolescent pedestrians was categorized into four categories, each of which was examined and confirmed.

As the results showed, APBQ was a valid and reliable tool for the adolescent age group. Therefore, there is the possibility to apply and investigate this questionnaire in other countries.

Given the necessity of measuring and recognizing adolescents' behavior before developing interventional programs to improve the safety of adolescent pedestrians, the developed tool in this study can be very useful and beneficial.

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Conflicts of interest

There are no conflicts of interest.

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