The prediction of seat belt use behavior among adolescents by theory of planned behavior (TPB) and extended TPB

Abstract

Aims: The rate of seat belt use among adolescent's as passenger age group is lower than adult's age group. There is limited study on wearing seat belt behavior among adolescents. **The aim** of present study was comparing the predictability of wearing seat belts behavior among adolescents by theory of planned behavior (TPB) and the extended TPB.

Materials & Methods: This cross-sectional study was conducted among 952 adolescent students as car occupant. A researcher-made questionnaire was used for collection of data. In extended TPB, constructs of appraisal threat added to TPB. The constructs of appraisal threat were perceived severity, perceived rewards, and perceived sensitivity. Structural Equation Modeling (SEM) was used to specify which theory better fits in prediction of seat belt use behavior.

Findings: Result showed that the mean score for seat belt use among adolescence students were unfavorable. The SEM confirmed the validity of TPB and extended TPB in prediction of seat belt use behavior among adolescents. In the extended TPB, the added constructs of threat assessment such as perceived reward, perceived severity, and perceived sensitivity had not statistically significant relationship with behavioral intention. The adding dimension of threat assessment to the TPB had no effect on the prediction of the behavior of wearing a seat belt.

Conclusion: The rate of seat belt use among adolescent students was unfavorable. The TPB is suitable theory for prediction of seat belt use among adolescence students. Prevention measures need to improve seat belt use among adolescent students.

Keywords: Prediction, seat belt use, Students, adolescence, Theory of Planned Behavior

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Introduction

Road traffic injuries (RTIs) are considered as a one of the main reason for death and disabilities worldwide [1]. Based on statistics of the World Health Organization (WHO) in 2015, the number of victims due to road accidents were 1.25 million people worldwide [2] and this amount was reported 1.35 million people in December 2018, which indicates an increase on road accidents in recent years [1]. The RTIs are predictable and preventable events and considered as one of the most important health problems in the world, especially in developing countries [3]. Based on the Iranian Legal Medicine Organization (ILMO) report, 16778 and 317120 people died and were injured due to RTIs in 2021, respectively [4].

Non-use of seat belt is one of the main causes of injury and death caused by RTIs among young car occupants [5]. The seat belt wearing prevents the person from being thrown out of the car, it spreads the force over a wide area of the body. It slows falling down and prevents serious injuries to the head and spinal column. Using a seat belt as a driver or passenger

reduces the risk of death and severe injuries by 50% [6]. The percentage of wearing seat belt use adolescent as car occupant is at low level [7]. A number of studies have reported that adolescents are at potential risk of death and injury on the roads. One reason for this potential risk is that adolescents engage in a variety of unsafe and potentially risky road behaviors that increase their risk of death and injury on the roads [8-13].

The theory of planned behavior (TPB) is used to predict behavior, this theory predicts a person's intention to perform a behavior. Based on TPB, the main factor that determine a person's behavior is the person's intention, which is influenced by three constructs of attitude, mental norms, and perceived behavioral control [14]. Among the theories that have been used to investigate the factors affecting the individual's motivation and behavior is the protection motivation theory [15]. The protection motivation theory (PMT) was suggested by Rogers in 1975, based on the value expectation model, to elucidate the influence of fear on health related attitudes and behaviors. According to this theory, when people encounter fear messages, two types of cognitive evaluations are involved: threat assessment and coping assessment [16]. Threat assessment assesses maladaptive behaviors and includes rewards for misbehavior and threat perception (severity and sensitivity). Rewarding wrong behaviors enhance the probability of selecting maladaptive responses, while threats diminish the probability of selecting maladaptive responses [17]. According to the subject of the study and by reviewing the studies conducted in the past in the field of promoting the behavior of wearing seat belts among adolescences, the TPB has been extended, the constructs of threat assessment has been added to TPB from the PMT.

As can be understand, the percentage of seat belt use among adolescent's as passenger age group is lower than adult's age group. There is limited study on wearing seat belt behavior among adolescents. Due to lack of emotional and cognitive maturity in adolescents age group, promoting the belief and towards the usefulness of using seat belts in decreasing the severity of RTIs could be helpful. An educational model plays an important role in identifying and meeting educational needs.

Objectives: The aim of present study was comparing the predictability of wearing seat belts behavior among adolescent's by TPB and the extended TPB.

Materials & Methods

Study setting

This is a cross-sectional study that conducted from 30 November 2019 to 5 January 2020 among 952 adolescent students in Tabriz, Iran.

Study Participants and sampling

Based on sample size, 952 students were randomly selected for this study, 10 participants did not answer the questionnaire and 942 students participated in the study. Inclusion criteria were studying in junior high schools in the 7, 8, and 9 grades, were inclining to participate in the study, their parent's agreement for their children's participation. The self- reporting method was used to collect of data.

Data collection tool

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For collection of data, a researcher-made questionnaire that validated in our previous study was used, the content validity index (CVI) and content validity ratio (CVR) for all the constructs of the questionnaire were greater than 0.9 and 0.8 respectively [18]. The questionnaire consisted of 76 questions on constructs of the TPB and 96 questions of extended TPB to specify the determining factor of seat belt wearing among students. Based on constructs of TPB, the constructs of questionnaire were subjective norms, attitude, perceived behavior control, behavioral intention, and behavior of wearing seat belt. A 5-point Likert scale was used, ranging from 5 (strongly agree) to 1 (strongly disagree) were used for constructs of subjective norms, attitude, perceived behavioral control, and behavioral intention. Attitude toward seat belt use was measured by two dimensions of behavioral beliefs with seven items (e.g., "Wearing a seat belt protects my health.") and assessment of behavioral outcomes with seven items (e.g., " It is important to me to protect my health by wearing a seat belt."). On the construct of subjective norms measured by two dimensions of normative beliefs with eight items (e.g.," My father insists that I wear a seat belt whenever I get in the car.") and motivation to comply with eight items (e.g., "My father's emphasis on wearing seat belts is important to me."). The construct of perceived behavior control measured with two dimensions of control opinions with nine items (e.g.," Wearing a seat belt makes me feel restricted in my movements.") and perceived power with nine items (e.g., "Restricting movement in the car when wearing a seat belt causes me to not wear it."). The construct of intentions measured with four items (e.g., "I intend to wear a seat belt as a rear-seat occupant of a car outside the city"). The construct of behaviors measured with four items (e.g., " When I sit in the rear seat of the car as an occupants outside the city I wear my seat belt "). A 5-point Likert scale were used for questions of intention and behavior, ranging from5 (always), 4 (most of the times), 3 (sometimes), 2 (seldom), and 1 (never).

In extended TPB, construct of appraisal threat added to TPB. The construct of appraisal threat composed of perceived severity, perceived rewards, and perceived sensitivity. A 5-point Likert scale ranging was used, ranging from 1 (strongly agree) to 5 (strongly disagree). The questions on perceived severity consisted of four questions (e.g., " If I have an accident, I may be injured.") and perceived severity with nine questions (e.g., As a result of the damage caused by the traffic accident (accident), my health may be in danger."), and perceived reward with six questions (e.g., "As a passenger, I feel more comfortable when I wear a seat belt").

Statistical analysis

Structural Equation Modeling (SEM) was conducted using AMOS software to verify which models better fits in prediction of seat belt use behavior. The following criteria were adopted to verify the adequacy of the model: X2 / df, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI) Tucker Lewis Index (TLI) or (Non) Normed Fit Index (NNFI), Normed Fit Index (NFI), Goodness of Fit Index (GFI) Goodness of Fit Index (AGFI), Parsimonious fit indices include (PGFI). The statistical significant was considered for P value lower than 0.05.

Findings

The mean standard deviation (SD) of age of student was 13.42 ± 1.01, with at least 12 years old and at most 15 years old and 52.3% of students were female and 46.8% were male.

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Table 1 shows the mean and SD for the constructs of the based TPB and extended TPB among the participants of the study. Among the constructs of the studied model, the perceived behavioral control has the lowest mean of the maximum obtainable score. The maximum obtainable score for seat belt use behavior among adolescence students was 55.88 percent, that means the rate seat belt use among adolescence students were unfavorable.

Table 1. Mean and SD for the constructs of the TPB and the extended TPB.

Fitting structural equations model

Fitting the TPB and extended TPB were assessed based on SEM. Figure 1 shows a standardized coefficient of path derived from the analysis of structural equations of the TPB.

Construct	Mean±SD	Achievable score range	The mean percentage of the maximum obtainable score
Attitude	115±29.43	7-175	64.86
Subjective norms	119.87 ± 47.1	8-200	58.27
Perceived behavioral control	109.77 ± 56.16	9-225	46.65
Behavioral intention	15.42 ± 4.02	4-20	71.38
Perceived sensitivity	18.49 ± 3.88	5-25	67.45
Perceived severity	35.97±7.90	9-45	74.92
Perceived reward	21.13 ± 6.38	6-30	63.04
Behavior	12.94± 4.46	4-20	55.88

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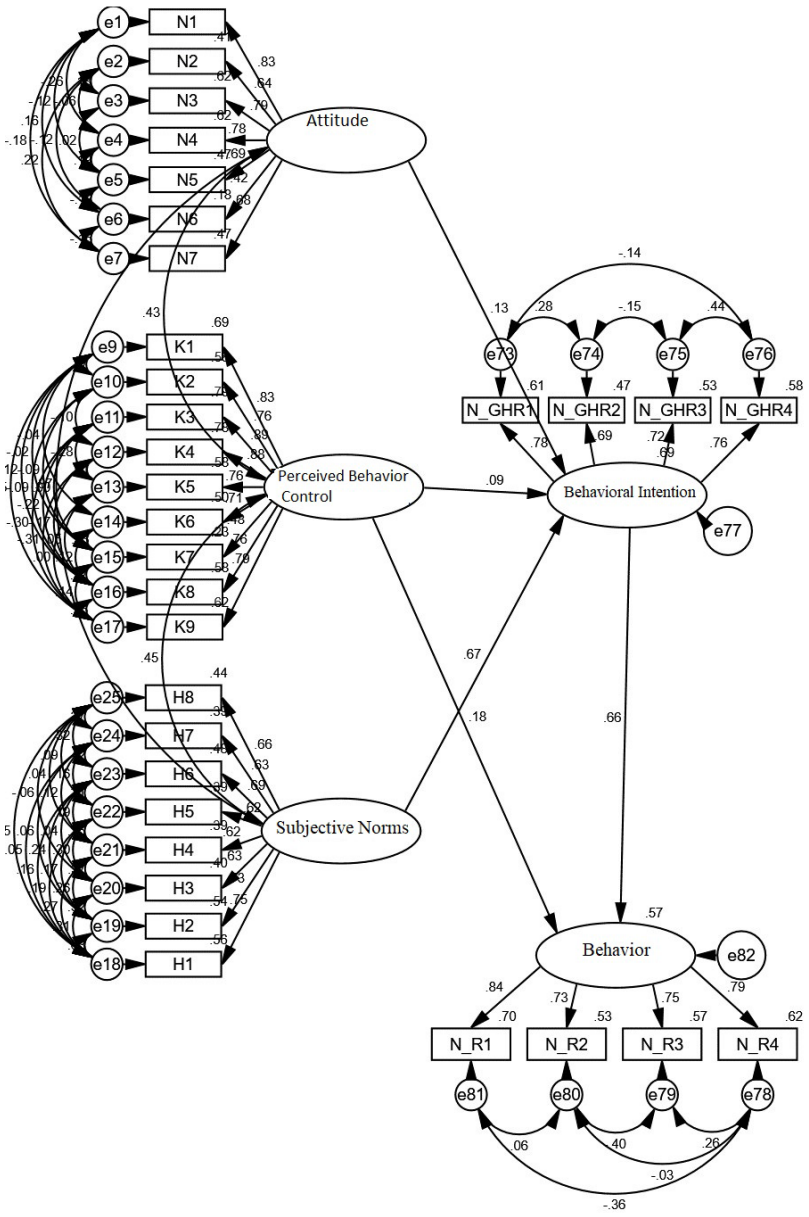

Figure 1. The paths analyzed developed by the TPB and seat belt use behavior.

Table 2 shows the goodness-of-fit indices of the SEM related to the TPB. The CFI index is a comparative fit index, the closer its value is to one, the better the fit of the model is considered. In the model compiled in the present study, its value is 0.921.

Table 2. The goodness-of-fit indices of the structural equation model related to the TPB.

Types of indicators	Ideal score	Obtained score
The ratio between Chi-square and degrees of freedom (χ2 / df)	<5	3.282
GFI	>0.9	0.921
PGFI	>0.9	0.678
AGFI	>0.9	0.893
RAMSEA	<0.08	0.049
CFI	<0.9	0.957
NFI	<0.9	0.939
TLI or NNFI	>0.9	0.945

TLI index or Tucker-Lewis index or un normalized fit index. The optimal value of this index is between 0-1. In this pattern, the value of 0.945 indicates its acceptability. The RMSEA index is the root mean square of the estimation error. Values lower than 0.05 are considered as acceptable fit and values higher than 0.1 are considered as poor model. In the present study, the value of RMSEA is equal to 0.049, which indicates the appropriate fit of the model. According to the values of the indices estimated for the model (Table 2), it is observed that two important indices of fit are the ratio between Chi-square and degree of freedom (χ2 / df = 28.3, $p < 0.001$) and the root mean square of the approximation error (RAMSEA = 0.049) for the model was less than 5 and 0.08 respectively, which confirmed the fit of the model. Also, the values of the indicators (GFI, AGFI, CFI, NFI, TLI) confirmed the validity of the model. Based on results, one-way relationships between the constructs of perceived behavioral control - intention ($P < 0.001$) and intention - behavior ($P < 0.001$) and perceived behavioral control - behavior ($P < 0.001$) was significant (Table 3).

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Table 3. Path coefficients related to fitting SEM to determine one-way relationships between constructs of TPB

Relation			Estimation	Standard deviation	C.R.	P
Attitude	---->	Behavioral intention	0.027	0.022	1.216	0.224
Subjective norms	---->	Behavioral intention	0.014	0.005	2.766	0.006
Perceived Behavioral Control	---->	Behavioral intention	0.115	0.021	5.512	<0.001
Behavioral intention	---->	Behavior	0.801	0.050	15.954	<0.001
Perceived Behavioral Control	---->	Behavior	0.033	0.006	5.950	<0.001

Relationship between extended TPB constructs and seat belt use behavior based on SEM

According to the values of estimated indicators for the models, it is observed that the two important fitness indicators of the ratio of Chi-square and degrees of freedom (χ2/df) and square root mean approximate error (RAMSEA) for model confirmed the fit of the model. Also, the values of indicators (GFI, AGFI, CFI, NFI, TLI) confirmed the validity of the model (Table 4).

Table 4. The goodness-of-fit indices of the structural equation model related to the TPB.

Types of indicators	Ideal score	Obtained score
The ratio between Chi-square and degrees of freedom (χ2 / df)	<5	2.754
GFI	>0.9	0.881
PGFI	>0.9	733/0
AGFI	>0.9	0.733
RAMSEA	<0.08	0.043
CFI	<0.9	o.939
NFI	<0.9	0.908
TLI or NNFI	>0.9	0.930

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Figure 2 shows the standardized coefficients of the path obtained from the analysis of structural equations of the extended TPB and seat belt use behavior.

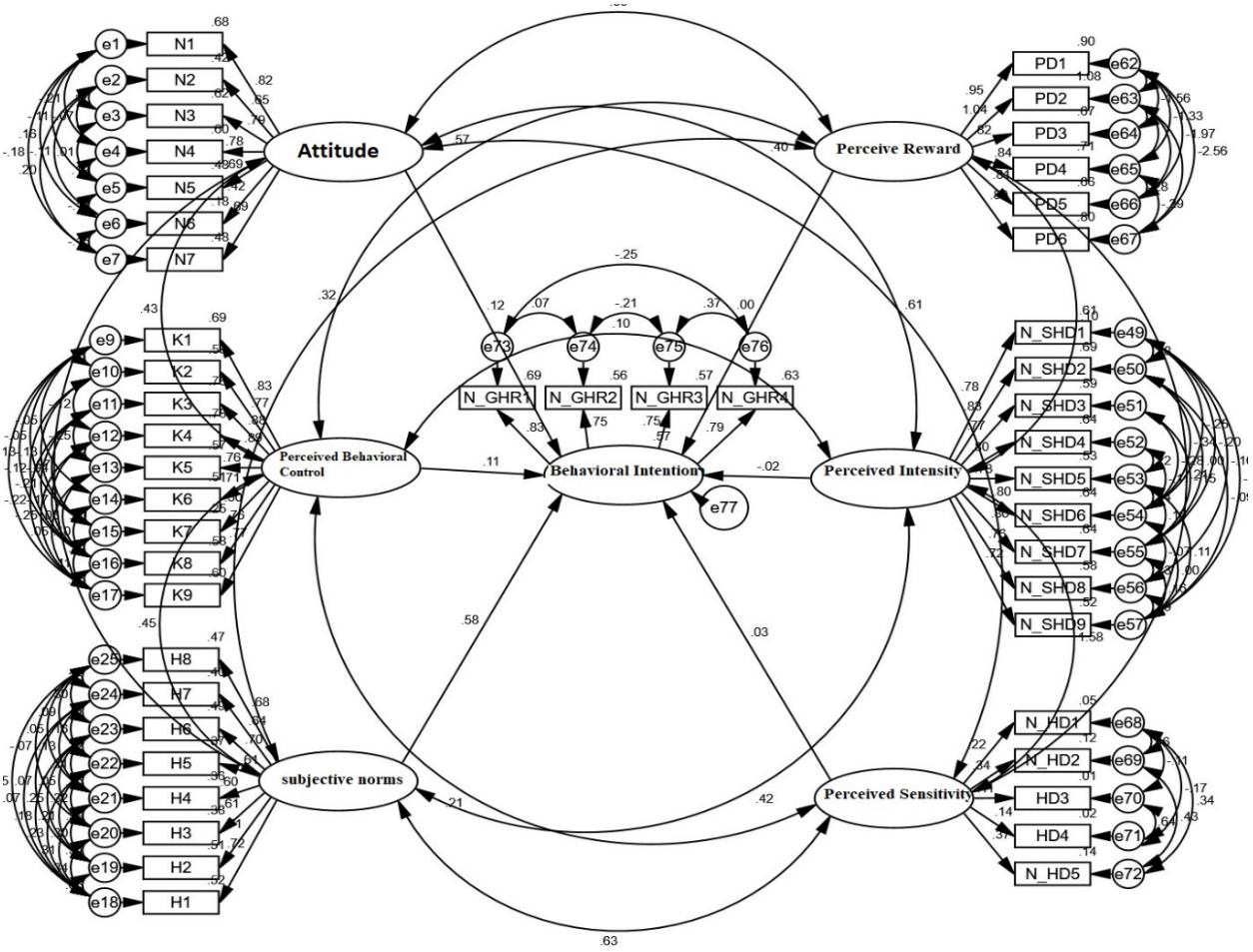

Figure 2. The path analyzed by the extended TPB and seat belt use behavior

According to the results, one-way relationships between subjective norms - behavioral intention (P>0.001), behavioral intention - behavior (P>0.001), and perceived behavioral control - behavior (P>0.001) were significant (Table 5).

Table 5. Path coefficients related to fitting structural equations model to determine one-way relationships between the main constructs of extended TPB and behavior

Relation			Estimation	Standard deviation	C.R.	P
Attitude	---->	Behavioral intention	0.025	0.023	1.103	0.270
Perceived Behavioral Control	---->	Behavioral intention	0.013	0.006	2.185	<0.029
Subjective norms	---->	Behavioral intention	0.120	0.023	5.294	< 0.001
Perceived reward	---->	Behavioral intention	0.005	0.018	0.250	0.803
Perceived severity	---->	Behavioral intention	-0.092	0.068	-1.344	0.179
Perceived sensitivity	---->	Behavioral intention	0.105	0.094	1.116	0. 264
Behavioral intention	---->	Behavior	0.788	0.050	15.836	<0.001
Perceived Behavioral Control	---->	Behavior	0.035	0.006	5.832	<0.001

Coefficient of determination (R^2) resulting from fitting structural equation models for behavioral intention and behavior of TPB model were 0.69 and 0.57, respectively, and for behavioral intention and behavior of extended TPB model were 0.68 and 0.56, respectively. According to the results, the TPB and the extended TPB predicted similar level of seat belt wearing behavior variable.

Discussion

In the present study, the relationship among construct of TPB and intention of seat belt use behavior among adolescence students base on SEM was assessed. The indices of TLI, NFI, CFI, AGFI, and GFI confirmed the validity of model. Based on TPB, the relationship between structures of perceived behavioral control and behavioral intention, behavioral intention and behavior, and perceived behavioral control and behavior were significant. In line with results of present study, some studies reported that perceived behavioral control predict the intention and behavior of wearing seat belts [19-21]. Consistent with results of current study,

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previous studies reported the prediction of seat belt use behavior by subjective norms [20-23]. Also, the relationship among structures of extended TPB and intention of seat belt use behavior and behavior among adolescence students base on SEM was assessed. The indices of TLI, NFI, CFI, AGFI, and GFI confirmed the validity of model. Based on extended TPB, the relationship between structures of perceived reward and behavioral intention, perceived severity and behavioral intention, perceived sensitivity and behavior were not statistically significant. According to the obtained results, TPB and the extended TPB predicted a similar level of the behavior variable of wearing a seat belt among adolescence students. In other words, adding the dimension of threat assessment to the TPB had no effect on the prediction of the behavior of wearing a seat belt. Results of Sarah and et al. showed that the inclusion of habit, past behavior and moral to TPB accounted for an extra amount of variance, over and above the TPB variables [24]. Another study reported that the added TPB constructs of habit, moral norm, and predicted regret were not significant predictors of seatbelt wearing behavior [23]. A study by Ali et al., (2011) demonstrated that the standard TPB constructs significantly predict behavioral intention to seatbelt use [25]. Tavafian and et al.,(2011) demonstrated that contrary to results of present study, perceived benefit and perceived barriers significantly predicted the seat belt use behavior, but in line with result of present study, perceived severity did not significantly predict seat belt use behavior[20]. Gras et al., (2007) demonstrated that perception of more benefits did not predict wearing seat belt. In current study, adolescents as car occupants were studied population, but in previous studies, adults as drivers were studied population, perceived benefit and perceived barriers may be being not important for adolescents [26]. Previous studies reported that discomfort and limited movement are barriers for wearing seat belt and were negative and immediate consequences of nonwearing of seat belts [27]. Tavafian and et al. showed, both TPB and health belief theory (HBM) have a good predictive value, but TPB shoved slightly more predictive power than the HBM (20). Mehri et al., (2012) showed that both TPB (perceived behavioral control, subjective norms, and attitude) and HBM (perceived susceptibility and severity, benefits and barriers, and cues to action) constructs significantly predict intention of wearing seat belt [21]. Liu and Liu used an extended TPB for prediction of seat belt use, results showed descriptive norms, attitude, and law enforcement have a significant impact on' intention of seat belt use in the rear seat of car, perceived behavioral control and subjective norms [28]. In another study, Guo and et al. found that inclusion of susceptibility, severity, perceived benefit and perceive law enforcement on TPB improved TPP model's capacity in prediction of rear seat belt behavioral intention among older adults, Subjective norms, attitude, perceived behavioral control, severity, susceptibility, and law enforcement have significant effect on behavioral intention[29]. A review and meta-analysis study reported the strength of TPB in the prediction of aberrant driving intention and its usefulness in planning for interventions for changing aberrant driving behaviors[30].

Conclusions

This study indicated that the rate of seat belt use among adolescence students was unfavorable. The constructs of TPB such as attitude, subjective norms, perceived behavioral control, and behavioral intention were good predictor of seat belt use behavior among

adolescence students. In the extended TPB, the constructs of perceived severity, perceive reward, and perceived sensitivity were not predictor of seat belt use behavior. Therefore, the TPB is suitable theory for prediction of seat belt use among adolescence students.

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