



Gender perspective on the factors predicting recycling behavior: Implications from the theory of planned behavior



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ABSTRACT

This study aimed to assess the role of some socio-psychological attributes in explaining recycling behavior of Turkish university community from a gender perspective within the context of the theory of planned behavior with an additional variable (past experience). The recycling behavior of whole sample, females and males, has been examined in 3 sessions -depending on the arguments that explain gendered pattern of private and public environmental behavior and sticking to the fact why females' stronger environmental values, beliefs, and attitudes do not translate consistently into greater engagement in public behavior. As a result of model runs, different variables shaping intention for behavior have been found, namely perceived behavior control for females and past behavior for males. Due to the low percent of the variance in explaining recycling behavior of females, they have been identified as the ones who do not carry out intentions (non-recyclers). Since intentions alone are capable of identifying recyclers accurately but not non-recyclers, there may be other factors to be considered to understand the reason for females not carrying out the intentions. The results of descriptive statistics supported the identification by attitudes toward recycling. Female attitudes were innate (recycling is good, necessary, useful and sensitive), whereas those of males were learnt (recycling is healthy, valuable and correct). Thus, it has been concluded that males' intention for recycling is shaped by their past behavior and the conclusion is supported by males having learnt attitude toward recycling whereas females' lack of intention for recycling is shaped by their perceived behavior control and is supported by their innate attitude for recycling. All in all, the results of the present study provide further support for the utility of the TPB as a model of behavioral prediction and concur with other studies examining the utility of the TPB in the context of recycling.

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1. Introduction

Educators agree that most of the environmental problems faced today mainly result from individuals' daily behavior, including consumption, waste disposal, travel, and energy use (e.g., Boldero, 1995; Guerrero et al., 2013; Nordlung and Garvil, 2002; Ojala, 2008; Klöckner and Oppedal, 2011; Marshall and Farahbakhsh, 2013; Oskamp, 2000; Swami et al., 2011). Reducing quantity of the solid waste deposited in landfills is one of the issues to manage and improve the quality of the environment (Hopper and Nielsen, 1991; Izagirre-Olaizola et al., 2014; Vining et al., 1992). Within this context, recycling has emerged as a promising approach for solid waste management (Rhodes et al., 2015;

Vining and Ebreo, 1992). Due to landfill problems, recycling contributes handling environmental problems (Castro et al., 2009; Vining and Ebreo, 1991; Vining and Ebreo, 1992; Hopper and Nielsen, 1991). However, extensive research has repeatedly reported residents' unwillingness to recycle household waste. For example, earlier studies have shown that individuals perceive recycling costly, inconvenient, and messy as well as time-consuming. Furthermore, individuals think that it requires considerable amount of effort to prepare, separate, store and transport recyclable items to a recycling center (Ebreo et al., 1999; Ramayah et al., 2012). According to Boldero (1995) such properties make recycling *unique* and distinguish it from other types of behavior due to its repetitive nature. Therefore, it is plausible to assume that separating glass, metals, papers, plastics and other recyclable items from household waste may possess different precursors compared to other kinds of pro-environmental behavior (Oskamp et al., 1991). In fact, the identification of what determines recycling behavior is a growing area of research in the domain of

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both environmental psychology and environmental education. Some scholars have identified factors influencing the elements of the waste management systems (see Dahlén and Lagerkvist, 2010; Klöckner and Oppedal, 2011; Swami et al., 2011). As Guerrero et al. (2013) reported the generation of waste is influenced by family size, their educational level and monthly income. In addition, as the authors reported, certain aspects like gender, peer influence, land size, household location and environmental organization membership explain the household waste utilization and separation behavior.

Within this context, the theory of planned behavior (TPB; Ajzen, 1991) among others, offers a theoretical framework to identify determinants of the recycling behavior (Armitage and Conner, 2001; Bagozzi and Dabholkar, 1994; Chen and Tung, 2010; Boldero, 1995; Cheung et al., 1999; Greaves et al., 2013; White and Hyde, 2012; Taylor and Todd, 1995, 1997) and appears to provide a good theoretical starting point to understand recycling behavior. Accordingly, current research has investigated adults' recycling behavior within the framework of theory of planned behavior.

1.1. Theoretical framework

The theory of planned behavior, as an extension of the Theory of Reasoned Action (TRA; Ajzen and Fishbein, 1980; Ajzen and Madden, 1986), is accepted as one of the most effective socio-psychological theories that explain behavior. The theory puts a person's intention to perform a given behavior at center. In other words, the behavior of an individual depends on his or her behavior intention which is under the influence of three conceptually independent antecedents: *attitude towards behavior* (i.e. evaluation of a behavior as good or bad by the individual who is going to perform that behavior), *subjective norm* (refers the social pressure an individual perceives in relation to behaving in a certain way), and *perceived behavioral control*, (indicates how easy or difficult one finds to perform certain behavior) (Ajzen, 1991).

Since its introduction, the TPB has been applied to a wide range of behavior with significant success (Ajzen, 1991), including food waste (Graham-Rowe et al., 2015; Stefan et al., 2013; Visschers et al., 2016), healthy eating (Conner et al., 2002; McEachan et al., 2011), waste management and composting (Taylor and Todd, 1995, 1997), and recycling behavior (Aguilar-Luzón et al., 2012; Greaves et al., 2013; Ramayah et al., 2012; Rhodes et al., 2015; Stancu et al., 2016; Tonglet et al., 2004; White and Hyde, 2012). The overall findings, in general, provide evidence for the predictive power of the attitudinal factors, normative factors, and perceived behavioral control in predicting behavioral intention and behavior (Ajzen, 1987, 1991). For example, as a result of their study related to meta-analysis, of 185 independent studies on the TPB, Armitage and Conner (2001) reported that the theory accounted for 27% of the variance in behavior and 39% of the variance in intention. The perceived behavioral control was also found to explain a significant amount of variance in intention and behavior. Moreover, the relation between intention and behavior was reported as $r = 0.47$. With respect to the influence of the subjective norm on intentions, on the other hand, a relatively weak association was reported (Armitage and Conner, 2001).

Although studies reported the TPB's success in predicting intentions and behavior, the addition of some other variables have also been suggested by researchers in order to increase the explanatory power of the original model, (see Conner and Armitage, 1998); such as past experience (Ouellette and Wood, 1998; Klöckner and Matthies, 2011; Rise et al., 2010; Terry et al., 1999; White and Hyde, 2011), self-identity (Conner and Armitage, 1998; Nigbur et al., 2010; Rise et al., 2003, 2010; White and Hyde, 2012; Whitmarsh and O'Neill, 2010, 2010), moral and personal

norms (Chan and Bishop, 2013; Harland et al., 1999; Vesschers et al., 2016), environmental awareness (Ramayah et al., 2012) and knowledge (Barr, 2007); ambivalent emotion (Ojala, 2008), habit (Klöckner and Oppedal, 2011; Knussen and Yule, 2008), personality (Swami et al., 2011); and the proximity of the recycling depot & planning (Rhodes et al., 2015).

In fact, Ajzen (1991, p.199) addressed this issue in his article and exactly stated that 'The theory of planned behavior is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intention or behavior after the current variables of the theory have been taken into account'. For example, among others, the exclusion of past behavior was identified as one of the shortcomings of the TPB (see Perugini and Bagozzi, 2001). Although previously assumed to have a limited explanatory value, subsequent research has highlighted the necessity of inclusion of past behavior into the model (see Ouellette and Wood, 1998). The present study, therefore, can be seen as another effort to test tendency of past behavior to predict individuals' recycling intentions and behavior in a developing country with a relatively low recycling rate. According to Ajzen (1991; p.202) the use of past behavior in the model, designed to predict any kind of behavior, offers a *means of testing the effectiveness of the theory under the assumption of stable determinant*. Although acknowledged that past behavior could be a good predictor of later action, Ajzen and his colleagues argued that past behavior did not have the same status as other predictors found in the original model which as well *cannot usually be considered a causal factor in its own right* (Ajzen, 1991, p. 203; see also Ajzen, 2005). Nevertheless, several studies reported the tendency of past behavior to predict intentions and behavior (Carrus et al., 2008; Conner et al., 2000; Conner and Armitage, 1998; Klöckner and Matthies, 2012; McEachan et al., 2011; Ouellette and Wood, 1998; Terry et al., 1999; White and Hyde, 2012).

1.2. Research on recycling behavior

As far as inquiries into recycling behavior are considered, it has been observed that the TPB is also a promising framework to uncover factors that influence an individuals' recycling intention and behavior. For example, in one of the earlier studies, Taylor and Todd (1995) found that both attitudes toward recycling and perceived behavioral control were positively associated with individuals' recycling and composting intentions. Similarly, Boldero's study (1995) indicated that intentions to recycle newspapers directly predicted actual recycling and that attitudes toward recycling predicted the recycling intentions. The study, however, failed to demonstrate the significant effect of perceived behavioral control on predicting both intention and actual behavior. From their Hong Kong undergraduates study about wastepaper recycling behavior, Cheung et al. (1999) demonstrated attitudes, norms, and perceived behavioral control as immediate predictors of behavioral intentions. Perceived difficulty, predicting behavioral intention moderated the link between intention and behavior. No statistical significant influence of perceived control was found. Past behavior while inserting a small unique effect on behavioral intention, had a substantial impact on self-reported behavior. Recently, Chen and Tung's (2010) findings have provided further evidence for the explanatory power of the TPB to determine both factors influencing the recycling intentions and the determinants of recycling behavior; as for the case of White and Hyde's (2012) study that supported the prior studies in terms of attitude and subjective norm predicted intention to recycle and intention predicted recycling behavior. In a similar vein, the study by Klöckner and Oppedal (2011) indicated small but significant influence of perceived behavioral control on recycling behavior. Predictive power

of intention and habit, on the other hand, was found to be equally strong.

Social norms, however, are an issue of debate related to their role as a predictive power shaping recycling behavior. Klöckner and Oppedal (2011), Knussen et al. (2004) and Vining et al. (1992) for example reported no relation between social norms and recycling behavior. Controversially, some of the early studies provided support for the predictive power of social norms (such as family, neighbors, peers, the block-leader) on recycling behavior (Chan, 1998; Greaves et al., 2013; Hopper and Nielsen, 1991; Oom do Valle et al., 2004; Oskamp et al., 1991; Schultz et al., 1995; Schwab et al., 2014; Vining and Ebreo, 1992).

Some researchers reported perceived behavior control and subjective norm as the strongest predictors of the TPB. For example, Mannetti et al. (2004) identified perceived behavioral control as the most important predictor of intentions whilst subjective norms emerged as the weakest. According to the authors, this result stemmed from the difficulties that individuals face during recycling such as effort, time, cost, accessibility of resources, lack of facilities and the specific weakness of agree–disagree measures, respectively. Similarly, Mahmud and Osman (2010) and Ramayah et al. (2012) reported subjective norms as the strongest contributor to recycling behavior in their studies with Malaysian school students and university students, respectively and they attributed the results to the collectivistic culture of Malaysia.

Furthermore, past behavior has been indicated as the strongest correlate of recycling behavior by several researchers. In their study with Glasgow residences, Knussen et al. (2004) tested the contribution of past recycling behavior, perceived habit of recycling, and perceived lack of recycling facilities in addition to the original the TPB constructs. As a result, stronger links were found between both the past behavior and intention for those having no perceived habit of recycling, and the attitude and intention for those who had recycled more in the past. In a separate study, Knussen and Yule (2008) demonstrated the independent significant contribution of lack of recycling habit to the variance of intention to recycle with and without the inclusion of past recycling. The impact of past behavior on individual's behavior and intention to recycle was also reported in a recent study by White and Hyde (2012). Briefly, their model showed direct influence of attitude, subjective norm, self-identity, and past behavior on intention while past behavior together with intention was found to be important predictors of behavior. Testing the efficacy of the TPB by adding self-identify and past behavior on intention to purchase carbon offsets, Whitmarsh and O'Neill (2010) showed attitude as the sole significant determinant. The impact of subjective norm and perceived behavioral control, however, was found to be insignificant. As far as the extended model was taken into consideration, past behavior contributed significantly to offsetting behavior and independently to intention.

Recently, several researchers have used the extended theory of planned behavior through adding different constructs to the original theory to better explain recycling behavior, as Largo-Wight et al. (2012) did with college students. The authors reported extended TPB as a convenient framework to examine the antecedents of recycling on a campus and reported moral obligation, attitudes, perceived behavioral control and subjective norm as the determinants of college students' recycling intention. Rhodes et al. (2015), on the other hand, added effective and instrumental attitudes and planning as extra constructs to the TPB and explored the efficiency in predicting depot specialty recycling in a community. As a result, they have found subjective norm, although small in magnitude, as a significant determinant of intention. One other construct added to the TPB was environmental behavior. Nigbur et al. (2010) used environmental behavior together with self-identity and personal norm to explore household waste recycling

behavior in the UK. However, their results did not provide evidence for the added construct as a significant determinant intention, instead they found attitudes, perceived control, and the personal norm to have predictive power on actual behavior and intention to recycle.

1.3. Gender difference in recycling behavior

Another line of the empirical research was interested in exploring the influence of demographic and psychological variables, such as gender, age, income, education, family size, consequences of recycling, residential condition, incentive and inconvenience on recycling behavior. Due to space constraint, not all of the results discussed by the research are reported here due to the unique focus of the current study, only findings regarding gender issue have been mentioned. Although identifying the gendered pattern of behavior is not a recent issue in the field of environmental research, past efforts, nonetheless, remain to be inconclusive, and thus, the topic needs further debate. Overall picture across sample and over time, with some exceptions, has demonstrated that under certain circumstances females are more environmentally concerned and engage in more pro-environmental behavior compared to their male counterparts, especially in private-household oriented activities. But, the situation is not the same as far as public (community/society-oriented) pro-environmental behavior is considered because there is little or no gender difference (Blocker and Eckberg, 1997; Dietz et al., 1998, 2002; Ebreo and Vining, 2001; Goldenhar and Connell, 1993; Hadler and Haller, 2011; Van Liere and Dunlap, 1980; Tindall et al., 2003; Xiao and Dunlap, 2007; Xiao and Hong, 2010; Xiao and McCright, 2014; Zelezny et al., 2000). For example, in one of the cross-national studies which investigated gender differences in environmental behavior across 22 nations, Hunter et al. (2004) reported females to be more engaging in private pro-environmental behavior, such as recycling, buying chemical free food, driving less, compared to males. Similar difference, however, was not reported for public behavior, such as protests and donations. They concluded that in the level of private environmental behavior, variations in gender tend to be more consistent across nations at the upper end of the wealth distribution. A recent support for gender variations comes from the studies conducted by Xiao and Hong (2010) and Xiao and McCright (2014) for China and United States, respectively. In fact, the earlier study by Tindall et al. (2003) also indicated evidence for these findings; while females reported greater participation in private pro-environmentally behavior than males no significant gender differences in the level of activism were found. In their study, the level of activism did not emerge as a significant determinant of environmentally friendly behavior among males, but it appeared to be the strongest predictor among females. In Goldenhar and Connell's (1993) study, the association between norms and intention to recycle was found to be statistically significantly greater for females than for males whereas past experience with recycling was reported to be directly linked to behavior for males. Similar gendered pattern can also be evident in many of the studies involving Turkish participants (Alp et al., 2006; Erbas et al., 2012; Onur et al., 2012; Sarigollu, 2009; Taskin, 2009). In the light of the inconclusive findings, in both national and international level, gender differences in pro-environmental behavior merit further research.

Accordingly, the purpose of the current study was to assess the role of some socio-psychological attributes in explaining recycling behavior of Turkish university community within the context of the theory of planned behavior. Furthermore, in an attempt to clarify the gender issue and to find an answer to the question of what the influencing factors are in predicting the recycling behavior of females and male, the present study, tested the proposed model for the split data with respect to gender. The understanding of gen-

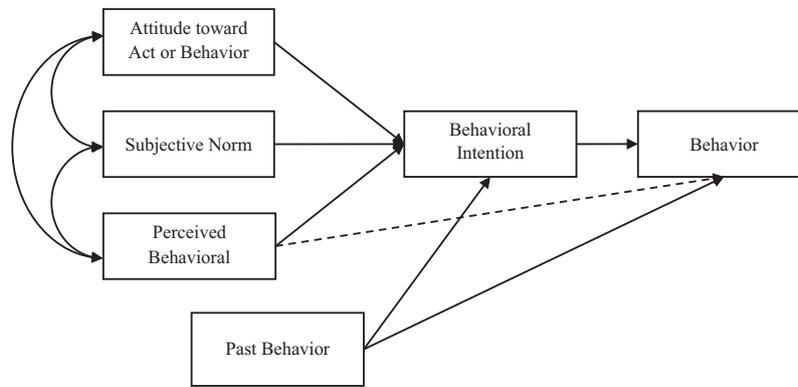


Fig. 1. Hypothesized TPB model.

der differences in recycling behavior is believed to, at least to some extent, shed light on the factors influencing females' and males' recycling intention as well as behavior. More specifically, two different models were tested for Turkish university community with regard to whole sample as well as to females and males. In hypothesizing recycling behavior models, an additional predictor (i.e., past behavior) was included to the attributes considered within the context of the TPB in order to see if past behavior can capture a significant proportion of the variance in intention or behavior after the theory's current variables have been taken into account. In line with the above outlined literature and the hypothesis of this study, the following model has been proposed and examined to determine if it fits to the TPB (Fig. 1).

In particular, it was hypothesized that (i) intention to recycle could be accounted by the linear combination of attitude toward the behavior, subjective norm, perceived behavioral control and past behavior and recycling behavior could be accounted by intention to recycle, past behavior, and perceived behavioral control, (ii) the magnitude of the explanatory power of these constructs could be different for males and females in the context of recycling behavior.

2. Method

2.1. Research design

The design of this research was based on the hypothesis that, recycling behavior of Turkish university community could be explained through different models for males and females by means of TPB attributes. Depending on the above hypothesis, a correlational research was designed since the relationship among recycling behavior and the related TPB attributes was studied without any attempt to influence them (Fraenkel and Wallen, 2006). The analysis, however, was performed in three steps, namely, conducting descriptive and inferential statistical analysis to observe if any significant difference existed among recycling behavior and the related the TPB attributes with respect to females and males, hypothesizing recycling behavior models based on the TPB to find out acceptable fits for the whole sample and for the split sample with respect to gender, and finally analyzing fitted models for the split data in terms of the predictors of recycling behavior.

2.2. Sampling sites and participants

The participants of this study were composed of totally 863 adults from two big public university campuses where recycling facilities have been available for more than 2 years. Of these

participants, 564 were students, 216 were academic staff, and 74 were nonacademic staff. 520 (60.5%) were female, and 340 (39.5%) were male. The age of the participants ranged from 16 to 67 ($M = 27.97$, $SD = 10.10$). The recycling systems in the two universities, however, were not efficient and the reported recycling rate was as not more than 10%. In general, the rate of recycling was quite low in Turkey. The reported reason was mainly not the individuals' negative attitudes but because there were no opportunities offered to do so (<http://www.dunya.com/turkiyede-geridonusum-icin-duyarlilik-var-yeterli-altyapi-152958yy.htm>). Thus, it was supposed that focusing on the people from 2 universities with recycling facilities could be promising to make evaluations about people's recycling behavior on condition that they are offered the facilities through the TPB.

2.3. Procedure

After obtaining ethics permission from the University Human Research Ethics Committee, the survey was published as an announcement on the websites of the two universities during one-year period. Participants were invited to fill out the online survey voluntarily at their convenience, and informed and assured about confidentiality of their names or other information about them.

2.4. Instruments

A self-reported 7-point Likert survey, developed by Tekkaya et al. (2011) was utilized to gather data regarding recycling behavior (Table 1). Briefly, it included the statements which represented each component of the TPB namely, recycling behavior, recycling intentions, recycling attitudes, the subjective norms, perceived behavioral control, and the related belief constructs. Internal

Table 1

Sub-scales of the TPB and summary of Cronbach Alphas as a result of reliability analysis.

		Cronbach Alpha's
Attitudes		0.86
Behavioral beliefs	Behavioral beliefs strength	0.92
	Outcome evaluation	0.91
Subjective norms		0.60
Normative beliefs	Normative beliefs strength	0.88
	Motivation to comply	0.95
Perceived behavioral control		0.75
Control beliefs	Control belief strength	0.73
	Control belief power	0.87
Intention		0.94
Behavior		0.91

reliabilities (Cronbach alpha) of each component in the survey ranged from 0.60 to 0.95. Socio-demographic information regarding the participants' gender, age, educational background and occupation, was also collected.

2.5. Data analysis

To portray the current conditions of Turkish adults from a university community with respect to recycling behavior and the related TPB attributes, descriptive statistics (means, standard deviations) was reported in terms of gender. On the other hand, independent sample *t*-test analysis was utilized to investigate gender differences in the related TPB attributes. Structural equation modeling was conducted with version 6.0 of the AMOS statistical program in order to test to what extent recycling behavior and the related attributes could be explained by using the TPB. Similarly, such analyses were also utilized to examine how modeling of recycling-related TPB attributes differed with respect to gender.

Maximum likelihood was used to estimate these models. Considering the criteria addressed by Bentler (1992), Browne and Cudeck (1989), and Jöreskog and Sörbom (1993), the indicators of overall model fit reported in this study were (a) the chi-square likelihood ratio (χ^2), (b) the root mean square error of approximation (RMSEA), (c) comparative fit index (CFI).

3. Results

The results were presented under three parts; first, the descriptive and inferential statistical analysis to examine if any significant difference existed among recycling behavior and the related TPB attributes with respect to gender was reported. Secondly, the description and results of proposed (hypothesized) recycling

behavior models based on the TPB were summarized to find out acceptable fits for the whole sample and for the split sample with respect to gender. Lastly, fitted models were compared in terms of the magnitudes of their explanatory power and the split data in terms of the predictors of recycling behavior.

3.1. Results of descriptive and inferential statistical analysis

Before constructing the recycling behavior models for the split data according to gender in line with our hypothesis, it seemed convenient to examine the gender difference for recycling behavior and the related TPB attributes. Accordingly, the gender difference was investigated through directly measurable TPB attributes (attitude, subjective norm, perceived behavioral control, intention, past and current behavior). Table 2 displays the mean values for these six attributes for females and males, and for the total sample. The most remarkable result presented in the table is that the mean values for female participants for the six variables were higher compared to those for the males.

Furthermore, as far as these attributes were concerned, the above mentioned gender difference was tested for its significance by means of independent sample *t*-test analysis (Table 3).

As a result of *t*-tests (Table 3), significant differences were found between females' and males' attitudes toward recycling ($t_{(858)} = 0.2.530, p < 0.05$) and their intentions to recycle ($t_{(858)} = 0.2.903, p < 0.01$) in favor of females. That is to say, females showed more favorable attitudes and possessed higher levels of intentions to recycle compared to males. Thus, these significant gender differences, especially reported for the intentions to recycle as the most powerful direct predictor of recycling behavior, indicated that it was worth constructing different TPB models for females and males.

Table 2
Results of the descriptive statistics with respect to gender and total sample.

	Female		Male		Total		
	M	SD	M	SD	M	SD	
Attitudes	6.52	0.516	6.35	0.579	6.46	0.547	
Subjective norms	5.74	1.233	5.49	1.296	5.64	1.264	
Perceived behavioral control	5.13	1.380	4.98	1.457	5.07	1.410	
Intention	6.24	1.067	5.93	1.355	6.11	1.204	
Behavior	Past	4.70	1.599	4.41	1.608	4.58	1.607
	Current	4.51	1.738	4.26	1.768	4.41	1.753

Table 3
Independent sample *t*-test results.

	N	M	sd	Df	t	p
Attitude						
Female	520	6.76	0.55	858	2.530	0.015*
Male	340	6.65	0.65			
Subjective norm						
Female	520	5.69	1.28	858	2.676	0.513
Male	340	5.45	1.32			
Perceived behavior control						
Female	520	4.80	1.52	858	1.299	0.955
Male	340	4.66	1.55			
Intention to recycle						
Female	520	5.95	1.41	858	2.903	0.000**
Male	340	5.64	1.65			
Past behavior						
Female	520	4.65	1.58	858	2.632	0.614
Male	340	4.36	1.57			
Current behavior						
Female	520	4.47	1.71	858	2.065	0.961
Male	340	4.23	1.72			

* 0.05 significance level.

** 0.001 significance level.

3.2. Proposed models related to recycling behavior models: trials and results

The first hypothesis to test was that the TPB model with the additional predictor (past behavior) could make a plausible contribution to explain recycling behavior of our sample. It was found as a result of testing the proposed model for both the whole sample and the split data with respect to gender. The explanatory power of the path from past behavior to present behavior (β [total sample] = 0.72; β [males] = 0.84; β [females] = 0.84) was so high that such a path hindered the power of intention (β [total sample] = 0.12; β [males] = 0.03; β [females] = 0.09) to

explain recycling behavior. Furthermore, the tests investigating the paths from intention to recycling behavior yielded insignificant results for females and males. Thus, these paths from past behavior to behavior were omitted for all three cases (the whole sample and the split data) in order to delving into the deeper aspects of predicting recycling behaviors. In other words, this result offered superior prediction of current recycling behaviors than behavioral intentions and did not let us see how cognitive variables in TPB shaped recycling behaviors. Moreover, the path from perceived behavioral control to behavior was found to be insignificant for both the whole sample and the split data so such a path was omitted from the model.

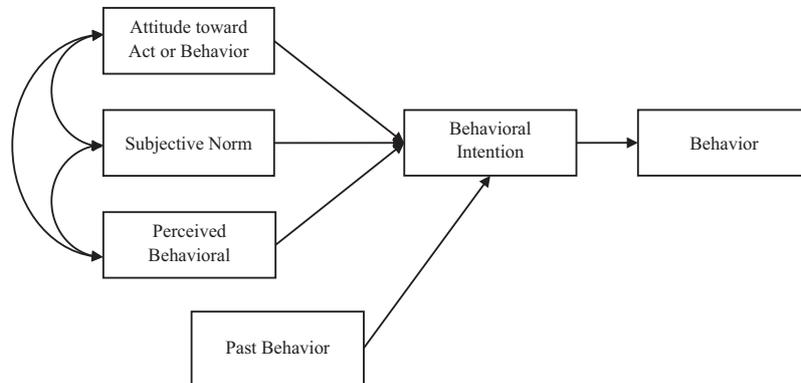


Fig. 2. Hypothesized TPB model in 2nd trial.

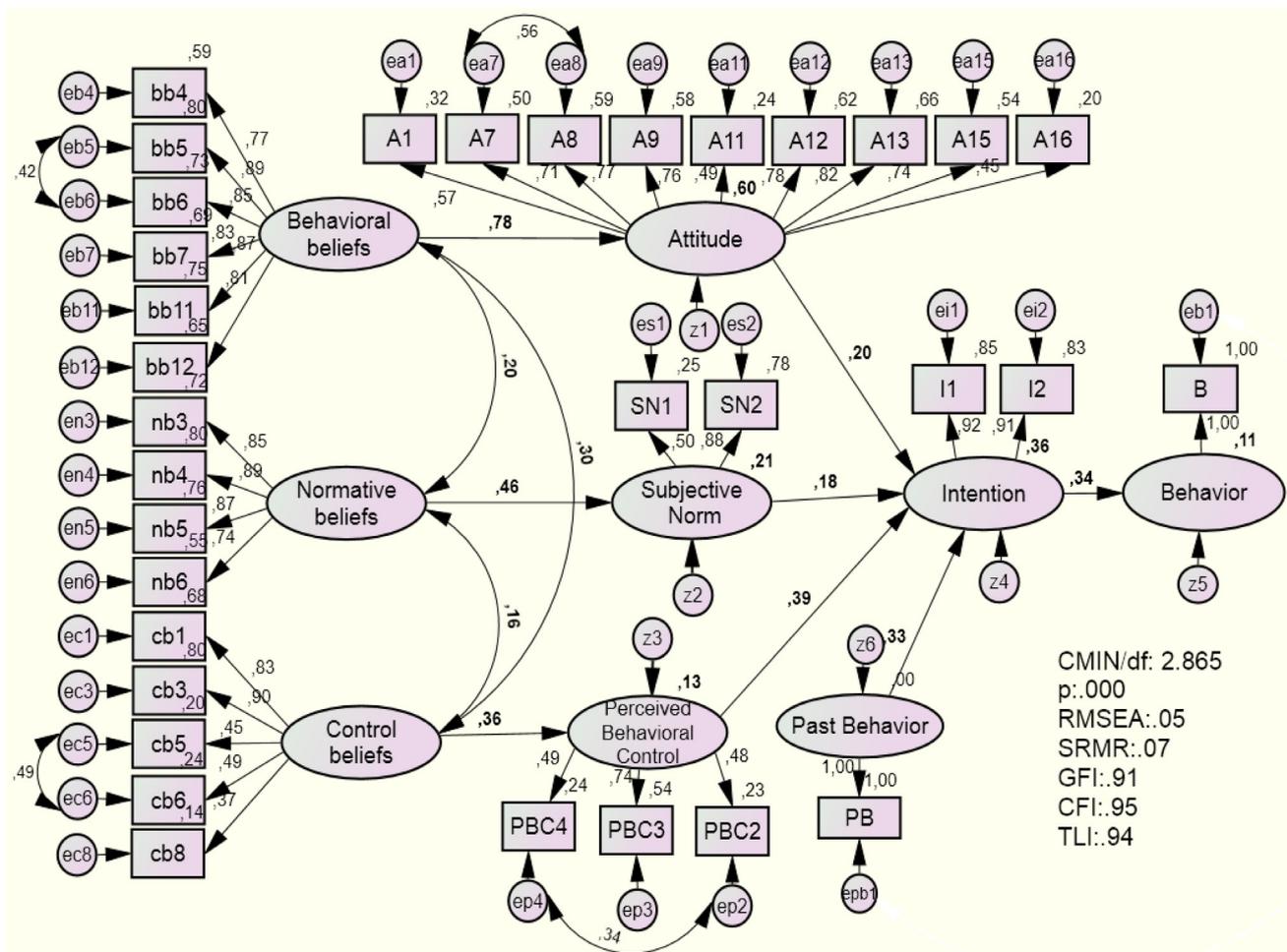


Fig. 3. Fitted TPB model of recycling behavior regarding total sample.

In this regard, the following hypotheses in second trial were tested for their statistical significance: behavioral intention could be explained by attitude, subjective norm, perceived behavioral control and past behavior and behavior could be explained by behavioral intention (Fig. 2).

3.2.1. TPB model for recycling for the total sample

The TPB model fit trials revealed that the hypothesized model presented in Fig. 2 displayed an acceptable fit to the total sample. The indicators of overall model fit were calculated as (χ^2/df) = 2.86; RMSEA = 0.05; SRMR = 0.07; TLI = 0.94; and CFI = 0.97 (Fig. 3). More specifically for the total sample, attitude toward recycling was significantly and positively related to behavioral beliefs. Similarly, subjective norm was significantly and positively linked to normative beliefs, and perceived behavioral control was significantly related to control beliefs in a positive way. Cohen in 1988 (Stevens, 2002) made some interpretation on the absolute magnitudes of standardized path coefficients. Considering Cohen's criteria, the path coefficients from Behavioral beliefs to Attitude ($\beta = 0.78$), which was above 0.50 indicated a large effect size. On the other hand, the path coefficients from Normative Beliefs to Subjective Norm ($\beta = 0.46$), from Control Beliefs to Perceived Behavioral Control ($\beta = 0.36$) revealed medium effects for these latent variables.

As for the predictors of intentions to recycle, the coefficients for four variables, namely attitude, subjective norm, perceived behavioral control, and past behavior were significantly and positively related to intentions to perform such behavior. Examining the Cohen's criteria, the path coefficients from Perceived Behavioral

Control ($\beta = 0.39$) and Past Behavior ($\beta = 0.33$) to Intentions were regarded as medium effect size in the model fitted. On the other hand, the path coefficients from Attitude ($\beta = 0.20$) and Subjective Norm ($\beta = 0.18$) to Intention which were below 0.30 indicated small effect size. Thus, it could be inferred that perceived behavior control made the largest contribution to explain intention to recycle for the total sample. The results also reflected that 36% of the variance in intentions to recycle could be explained by the combination of these predictor variables; perceived behavioral control, past behavior, attitude, and subjective norm (Fig. 3). As hypothesized, recycling behavior of the total sample was significantly associated with intention to recycle in a positive way with a medium effect ($\beta = 0.34$). More specifically, intention to recycle accounted for 11% variance of recycling behavior.

3.3. TPB model for recycling according to gender

The data was split with respect to gender in order to see how recycling-related TPB attributes could be modelled for females and males separately. More specifically, we hypothesized that TPB attributes might have different links and power to predict recycling behaviors for females and males. The overall model fit indices suggested that the predicted model for males was a good fit of the data, (χ^2/df) = 1.91; RMSEA = 0.05; SRMR = 0.08; TLI = 0.92; and CFI = 0.93 (Fig. 4). Similarly, the fit indices indicated that the overall fit for females' recycling models was satisfactory, (χ^2/df) = 2.55; RMSEA = 0.05; SRMR = 0.08; TLI = 0.93; and CFI = 0.94 (Fig. 5).

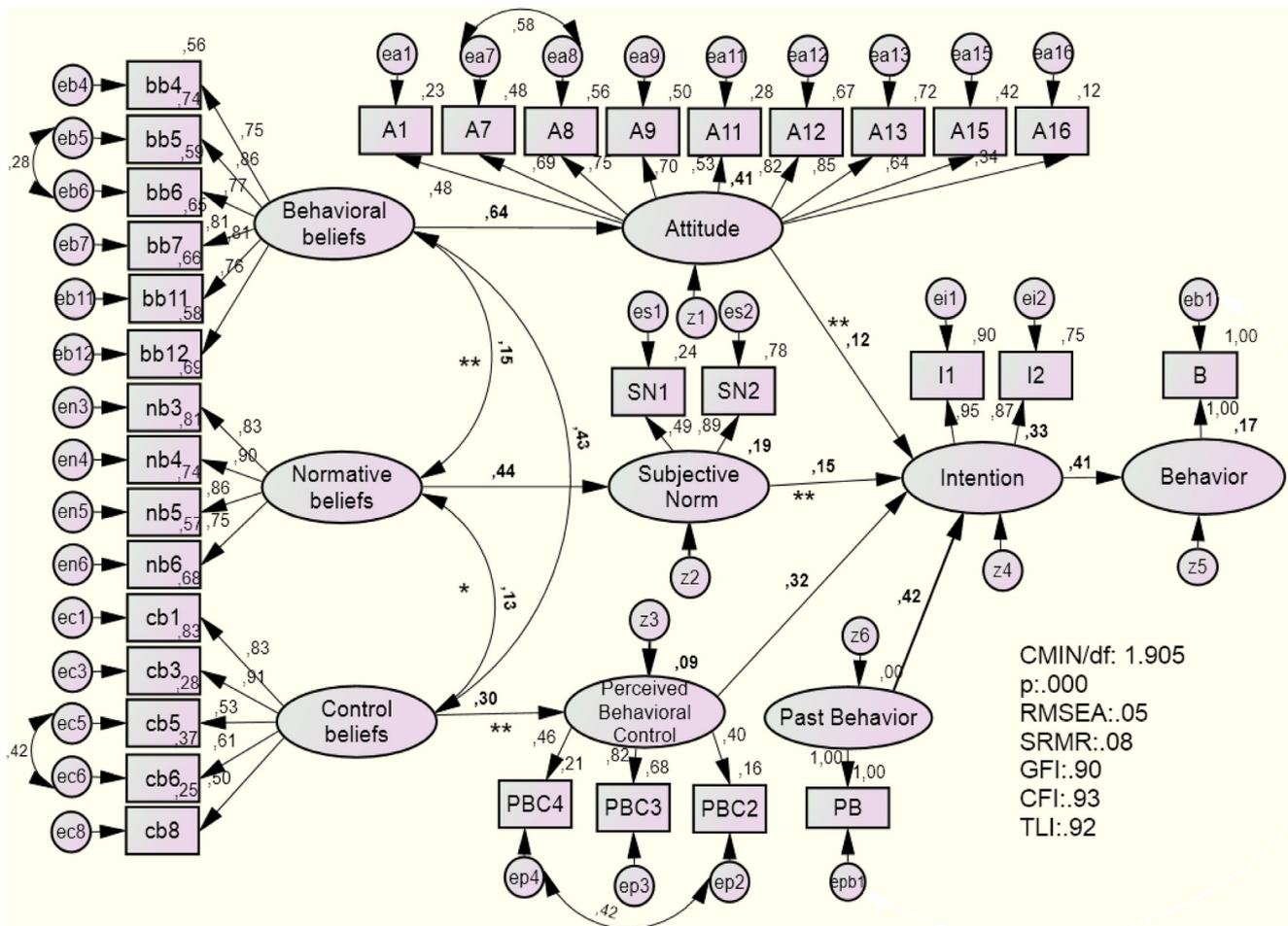


Fig. 4. Fitted TPB model of males' recycling behavior.

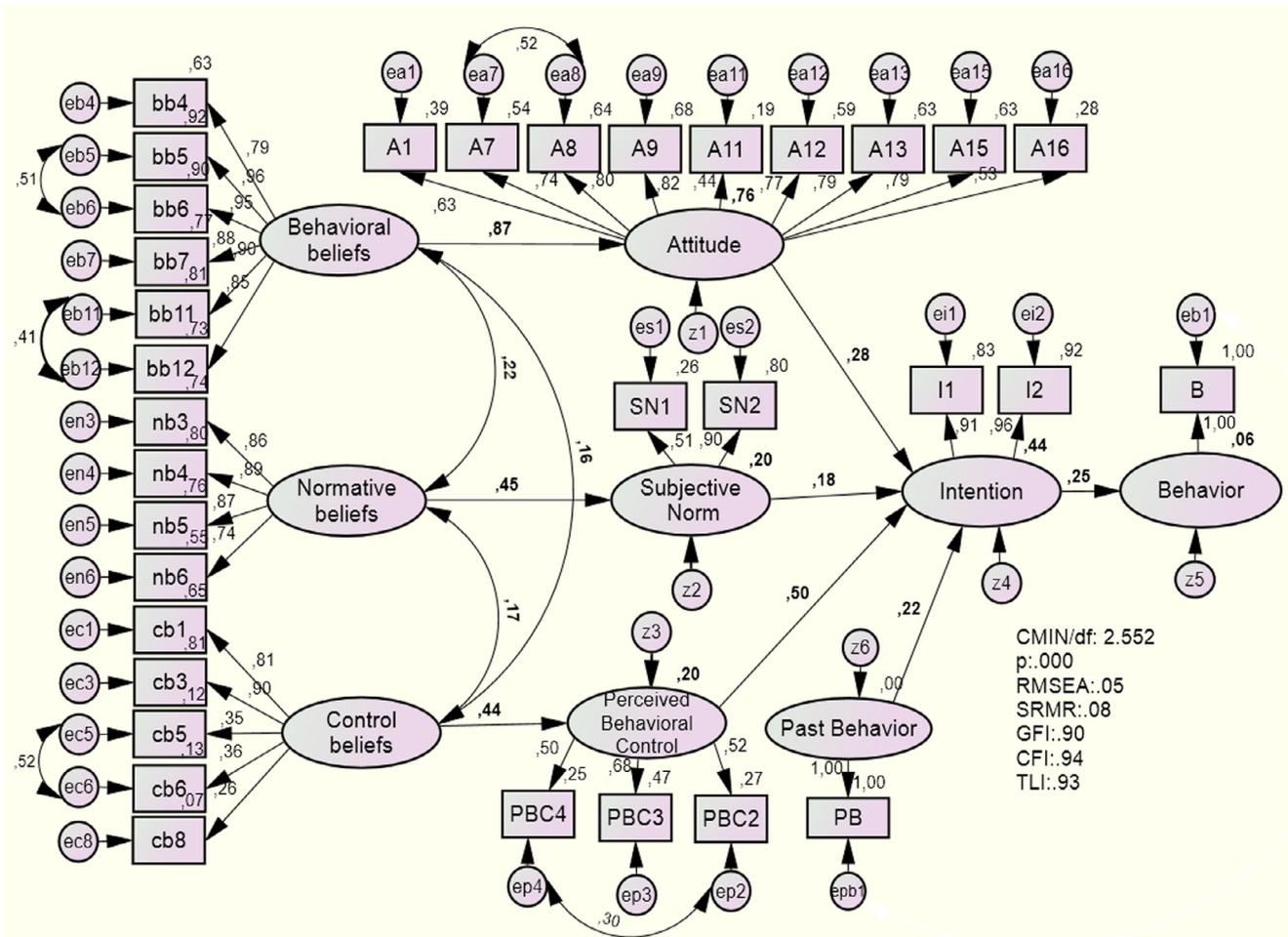


Fig. 5. Fitted TPB model of females' recycling behavior.

3.3.1. Males

Considering the fitted recycling model of the TPB attributes for males, it was found that attitude, subject norm, and perceived behavioral control were significantly and positively linked to their antecedent belief attributes. With respect to Cohen's interpretation on the absolute magnitudes of standardized path coefficients, the path coefficients from Behavioral beliefs to Attitude ($\beta = 0.64$), which were above 0.50 indicated a large effect size while the path coefficients from Normative Beliefs to Subjective Norm ($\beta = 0.44$), from Control Beliefs to Perceived Behavioral Control ($\beta = 0.30$) demonstrated medium effects for these latent variables.

Examining males' intentions to recycle, it was found that this latent variable was significantly and positively related to the combination of four variables namely, attitude, subjective norm, perceived behavioral control, and past behavior. According to the Cohen's criteria, the path coefficients from Past Behavior ($\beta = 0.42$) and Perceived Behavioral Control ($\beta = 0.32$) to Intentions showed medium effect size in the model fitted. However, the path coefficients from Attitude ($\beta = 0.12$) and Subjective Norm ($\beta = 0.15$) to Intention which were below 0.30 indicated small effect size. Thus, it was concluded that past behavior made the largest contribution to explain males' intention to recycle. The findings also revealed that 33% of the variance in males' intention to recycle could be explained by the combination of these predictor variables; past behavior, perceived behavioral control, subjective norm, and attitude. With regard to males' recycling behavior, this latent variable was moderately related to their intention to recycle in a positive way ($\beta = 0.41$). Still, intention

to recycle accounted for 17% variance of recycling behavior for males (Fig. 4).

3.3.2. Females

The fitted recycling model of the TPB attributes for females showed that attitude, subject norm, and perceived behavioral control were significantly related to their antecedent belief attributes in a positive way. According to Cohen's interpretation, the path coefficients from Behavioral beliefs to Attitude ($\beta = 0.87$), which was above 0.50 indicated a large effect size while the path coefficients from Normative Beliefs to Subjective Norm ($\beta = 0.45$), from Control Beliefs to Perceived Behavioral Control ($\beta = 0.44$) showed medium effects for these variables.

According to the fitted TPB model, it is possible to define females' intention to recycle by the combination of four variables, namely, perceived behavioral control, past behavior, attitude, and subjective norm significantly predicted this latent variable. Using Cohen's criteria, the path coefficients from Perceived Behavioral Control ($\beta = 0.50$) to Intentions demonstrated large effect size in the model fitted while the path coefficients from Attitude ($\beta = 0.28$), Past behavior ($\beta = 0.22$) and Subjective Norm ($\beta = 0.18$) to Intention which were below 0.30 reflected small effect size. In this regard, it was inferred that perceived behavioral control made the largest contribution to explain females' intention to recycle. It was found that 44% of the variance in females' intention to recycle could be explained by the combination of these predictor variables; past behavior, perceived behavioral control, subjective norm, and attitude.

Table 4
Comparison between recycling behaviors of female and male participants.

	Female		Male	
	(R ²)	β values	(R ²)	β
Percent of explained variance by intention	0.44		0.33	
Percent of explained variance by behavior (R ²)	0.06		0.17	
Constructs explaining Intention				
Attitude		0.28		0.12
Subjective Norm		0.18		0.15
PBC		0.50		0.32
Past Behavior		0.22		0.42
Attitude (R ²)	0.76		0.41	
A1. Recycling is good		0.63		0.48
A7. Recycling is necessary		0.74		0.69
A8. Recycling is useful		0.80		0.75
A9. Recycling is sensible		0.82		0.70
A11. Recycling is hygienic		0.44		0.53
A12. Recycling is valuable		0.77		0.82
A13. Recycling is correct		0.79		0.85
A15. Recycling is wise		0.79		0.64
A16. Recycling is responsible		0.53		0.34
Subjective Norms				
SN1. People who are important to me would support my recycling	0.20	0.51	0.19	0.49
SN2. People who are important to me expect me to recycle		0.90		0.89
Perceived Behavioral Control				
PBC2. It would be difficult for me to recycle the recyclable materials (paper, glass, plastic, etc.) regularly for the next months	0.20	0.52	0.09	0.40
PBC3. I have complete control of recycling the recyclable materials (paper, glass, plastic, etc.) regularly for the next months.		0.68		0.82
PBC4. The number of external influences that may prevent me from recycling the recyclable materials (paper, glass, plastic, etc.) regularly for next months	0.50			0.46

Concerning females' recycling behavior, this latent variable was significantly related to their intention to recycle in a positive way, but with a small effect size ($\beta = 0.25$). Besides, intention to recycle accounted for only 6% variance of recycling behavior for females.

3.3.3. Comparison of TPB models for recycling with respect to gender

The distinguished features obtained from the models fitted for the above 3 cases are summarized below (Table 4). Referring to the major outcomes presented in the table, it can be inferred that the amount of explained variance that explains recycle behavior by "intention" (R²) differs according to gender. Although recycle behavior is explained by 17% by intention for male, that for female, however, is 6%. The percentage of explained variance of intention (R²), on the other hand, was calculated as 44% for females and 33% for males.

A similar distinction can also be seen when the effect sizes for the relation between recycling behavior and intention to recycle are considered. The relation is moderate ($\beta = 0.41$) for the case of males, but it is small ($\beta = 0.25$) for that of females. Furthermore, although the largest contribution to intention to recycle is due to PBC for females, it is past behavior for males. Therefore, the possible outcomes of gender based fitted TPB models of this study may be twofold. First of all, the power/impact of "intention" to explain recycling behavior differs according to gender. Secondly, "intention" is shaped by different variables for females and males. Males' recycling behavior can moderately be explained with "intention" and with "past behavior" shaping the "intention"; female's recycling behavior, however, can be weakly explained with "intention" and with "PBC" shaping the "intention".

Recalling the meanings cast burden on the variables, females' intention to recycling behavior is shaped by 6%, by their belief that "it would be easier to recycle if there were opportunities in the campus that will make recycling easier"; their behavior, however, is weakly affected by their intention. However, what shapes females' intention to recycle apart from PBC is their attitude to recycling behavior (Fig. 5). As displayed in Table 4, attitude has an important share shaping females' intention to recycle ($\beta = 0.50$). The females in this

study regarded recycling as good, necessary, useful, sensitive, reasonable and requiring responsibility with higher β scores compared to males (Table 4). Therefore, it is possible to infer that one of the reasons that generates distinct recycling behavior models for females and males is the attitude toward recycling behavior that shapes intention. In the same manner, males' intention for recycling behavior is shaped, 17%, by their past behavior as they mentioned; "I recycled PET bottles, plastics last year"; their behavior, however, was moderately affected by their intention. However, what shapes males' intention to recycle in addition to past behavior is PBC (Fig. 5). As displayed in Table 4, PBC has an important share in shaping males' intention to recycle ($\beta = 0.32$). The males in this study regarded recycling as correct, valuable and healthy with higher β scores compared to females (Table 4). As a result, our model results for split data according to gender revealed that behavioral intention of females is shaped by perceived behavior control, attitude, past behavior and subjective norm, in an ascending order whereas intention explains recycling behavior of females by the model proposed in this study by 6%. Behavioral intention of males, however, is shaped by past behavior, perceived behavior control, subjective norm in an ascending order although intention explains recycling behavior of males by the model proposed in this study by 17%.

One closer look at Table 4, illustrates two concluding remarks about the models: 1. Although the percentage explaining variance of intention through TPB for females is 0.44, that of behavior is 0.06. However, those for males are 0.33 and 0.17, respectively. That is to say, in the case of explaining gender difference, explaining intention for recycling behavior does not necessarily assure explaining recycling behavior. Therefore, it has been inferred that it might be more convenient to construct different hypothesis of the TPB for females and males.

4. Discussion and conclusions

Agenda 21 requires governments, industry and the public to make efforts to reduce the amount of wastes by encouraging

recycling, reducing wasteful packaging of products, introducing products that are more environmentally sound. At the moment, the amount of waste produced in the developed world is not sustainable. For example, according to the results of the research on recycling in developing countries conducted by [Troschinetz and Mihelcic \(2009\)](#) the average municipal solid waste generation rate was 0.77 kg/person/day, with recovery rates from 5 to 40%. The waste streams of 19 of the cases in the context of the study consisted of 0–70% recyclables and 17–80% organics. As the authors reported, the barriers or incentives to recycling in such developing countries are government policy, government finances, waste characterization, waste collection and segregation, household education, household economics, municipal solid waste management, personnel education, local recycled-material market, technological and human resources, and land availability.

The situation in Turkey is not different. According to the Turkish Statistical Institute's 2012 data ([Turkish Statistical Institute, 2012](#)) annual total waste collected by the municipalities is 25.8 million tones and the amount delivered to controlled landfill sites is 60%. As reported by the institution, there are 10 million tons (39%) of metal, plastic and paper recycled in the 551 licensed recycling plants in Turkey. However, most of the recyclable wastes have not been collected by the individuals, instead they were separated in the plants.

As was summarized in the former section, environmental issues such as solid waste management are closely related to individuals' daily behaviors. Thus, investigating the determinants of recycling behavior may be one of the promising solutions to tackle the incentives to recycling. Within this context and through the TPB which offers a theoretical framework to identify determinants of the recycling behavior, it is possible to find out how individuals' recycling behavior is shaped and how education can help to reshape behavior for a sustainable solid waste management. Furthermore, considering their role in educating members of society, including future leaders, colleges and universities must be at the forefront of the sustainability movement, including recycling. As is also suggested by the 1990 Talloires Declaration ([University Leaders for a Sustainable Future, 1990](#)), many educators emphasize that a university must act more responsibly before its faculty can teach ethics of responsibility ([Allen, 1999](#); [Creighton, 1998](#); [Orr, 1992, 1994](#)). Similarly, as stated by [Orr \(1994\)](#); students learn, without anyone ever telling them that they are helpless to overcome the frightening gap between ideals and reality. The solution to this problem is to increase emphasis on sustainability in practice rather than solely in theory. Colleges and universities which attempt to integrate sustainability into campus operations often observe positive effects such as reducing ecological footprint ([Eagan and Keniry, 1998](#); [Leal Filho, 2000](#); [Strauss, 1996](#)). Therefore, realizing universities' role in educating future leaders of the society can be possible by practical campus operations, particularly setting recycling in the center.

All in all, the significance of investigating recycling behavior of future leaders of society in campuses where recycling is one of the campus operations is fourfold; 1. To propose a promising solution for incentives to recycling within the context of TPB, 2. To present a new case on the role of some socio-psychological attributes in explaining recycling behavior, 3. To clarify the variations on the power of the factors predicting the recycling behaviors from a gender perspective and 4. To remind the role of education in shaping individuals' behavior for a sustainable solid waste management.

This research set out with the assumption that separating recyclable items from household waste may possess different precursors compared to other kinds of pro-environmental behavior. As has been asserted, recycling is unique and distinguished compared to other types of behavior because its nature is repetitive and individuals perceive it costly, inconvenient, messy, time and

effort-consuming. As research in this field has provided evidence, the theory of planned behavior has been used to provide a sound theoretical starting point to understand recycling behavior of a university community. In addition, an additional variable (past experience) has been included in the models to investigate the explanatory power of the model also indicating the stability of recycling behavior over time as suggested by many researchers. Besides, the recycling behavior of the sample has been examined by the TPB in 3 sessions: the whole sample, females and males, depending on the arguments that explain gendered pattern of private and public environmental behavior. Several facts have especially been focused. For example; why females with stronger environmental values, beliefs, and attitudes do not tend to demonstrate greater engagement in public behavior. However, since identifying the gendered pattern of behavior is not a common issue in the field of recycling behavior research, the outcomes of the past studies have also been discussed.

Hence, by analyzing fitted 3 TPB models, it has been inferred that most findings are in line with what was suggested by the TPB with an additional variable (past behavior). Testing the direct link from past behavior to current recycling behavior let us conclude that recycling behavior was consistent over time. However, in order to observe how the individuals from the universities providing recycling facilities dealt with their waste, we utilized the path from past behavior to solely behavioral intentions. In this way, the fitted models of this study provide evidence for the predictive power of the attitude, subjective norm, and perceived behavioral control in predicting behavioral intention and behavior. That is to say, the results of this study support the suggestion that intentions to perform recycling behavior can be predicted with large contribution of attitudes toward the behavior and subjective norms as well as perceived behavioral control. It can also be asserted that the results also support the original idea that attitudes, subjective norms, and perceived behavioral control are associated with some sets of salient behavioral, normative, and control beliefs about the behavior. Besides, a descriptive analysis to see if there is a significant difference between males' and females' recycling behavior upon six variables of the TPB has been performed. The outcomes of the analysis have given the clue that there is a significant gender difference through two variables. These variables are attitudes and intention. Attitudes and intention of females toward recycling were found to be stronger compared to males. Accordingly, the fitted the TPB models for females and males were also different in terms of the percentage of explained variance of intention and behavior (Table 5). However, the fitted models of the TPB for the whole sample and for the females accounted for 11% and 6% of the variance in behavior, respectively. Besides, 36% of the variance in intentions to recycle has been explained by the combination of the predictor variables (perceived behavioral control, past behavior, attitude, and subjective norm) for the whole sample, which was found to be 44%. For the males' recycling behavior model, on the other hand, 17% of the variance in behavior and 33% of the intentions to recycle is explained by the combination of predictor variables. Therefore, comparing the results of this study with those of [Armitage and Conner's \(2001\)](#) meta-analysis on the TPB (as a result of which 27% of the variance in behavior and 39% of the variance in intention), it can be asserted that the % variance accounted by the TPB (with the inclusion of past behavior) to explain recycling behavior of females of this study is well behind the average. Despite still being behind the average, those found for the whole sample and for males are much higher.

Furthermore, it has been found that different variables shaping intention for behavior for females and males'; although it was past behavior for males, it was PBC for females. Implications of the above mentioned results coincide with those of found by [Boldero \(1995\)](#). The author reported that although intentions to recycle

predict actual behavior, the relationship is not perfect. He specifically evaluated that intentions alone were capable of accurately identifying recyclers (those who carried out their intentions). However, non-recyclers (those who did not carry out intentions) were not classified with the same accuracy. Thus, he asserted that it was necessary to take other factors into account in order to understand why individuals do not carry out their intentions. Therefore, it can be concluded that [Boldero's \(1995\)](#) evaluations concede to our results in that females were the ones who did not carry out intentions (non-recyclers), and thus, they were not accurately identified by intentions. Furthermore, there may be other factors to be taken into account to understand the reason why they do not carry out the intentions. This distinction between males and females, however, can also be supported by one of the results of this study. As presented in Table 5 for the attitudes to recycle, female answers to define recycling were much more innate (recycling is good, necessary, useful, sensitive) whereas those of males were much more learnt (recycling is healthy, valuable, correct). Males, on the other hand, do carry out their intentions, and hence, they were accurately identified as recyclers. But the reason why males carried out their intentions was their past behavior. The high correlation between past behavior, current behavior and intentions therefore, suggests that recycling becomes a habitual behavior. In parallel with [Boldero's \(1995\)](#), [Bentler and Speckart's \(1979\)](#), [Macey and Brown's \(1983\)](#), [Whitmarsh and O'Neill's \(2010\)](#) and [White and Hyde's \(2012\)](#) findings, it can be asserted that past behavior is important and it must be included along with attitudes and intentions when considering the prediction of recycling.

Likewise, the present study has demonstrated that PBC is a significant factor to predict females' intentions to recycling. This suggests that although there is an increasing trend towards recycling in Turkey, measures must be taken to ensure that recycling becomes easier and more convenient especially for females. A similar concern was reported in 1978 by [Dunlap and Van Liere \(1978\)](#) as the case for the USA for certain segments of the population. Similarly, [Goldenhar and Connell \(1993\)](#) reported that the association between norms and intention to recycle was statistically significantly greater for females than for males whereas past experience with recycling was reported to be directly linked to behavior for males.

Furthermore, although the results for fitted model for females of this study are consistent with those of [Macey and Brown \(1983\)](#), attitudinal factors had greater predictive ability than subjective norms. The failure of subjective norms to predict recycling of females may be explained by the fact that females in this study do not believe that their neighbors, friends, family and the municipality thought recycling was neither important nor were they motivated enough to comply with the wishes of these referents. Alternatively, as reported by [White and Hyde \(2012\)](#), the role of the self-perception constructs conscientiousness and self-identity in the prediction of household recycling intentions and behavior from a TPB framework which are important factors worth assessing as underpinning recycling decisions.

In conclusion, the findings of the present study support most of the predictions of the standard TPB framework. Yet, this study was limited by its reliance on self-reported data only in terms of the relationships among attitudes, intentions, norms and behaviors. Such statistically significant relationships could not be interpreted in a causal way. In other words, these associations might occur due to some other factors. Considering the fitted TPB model for the total sample, some support has been provided for attitudes, subjective norm and perceived behavioral control and past behavior significantly predicted university community's recycling intentions, indicating that a person's positive attitudes toward recycling, their perception of pressure to perform recycling, PCB and past behavior explain their intentions to recycle. However, the absence of

significant findings for PBC has been the case for males' recycling behavior. Although perceived behavior control has been found as one of the strongest predictors of TPB by several researchers (e.g. [Mannetti et al., 2004](#)), it did not come as a surprise because of the weakness found for PBC, since it was the case especially with the previous research: [Boldero \(1995\)](#), [Cheung et al. \(1999\)](#); and [Terry et al. \(1999\)](#) stated that there was only mixed support for the contribution of PBC in the context of recycling with evidence that it did not always predict intentions (e.g., [Boldero, 1995](#)) or behavior. All in all, the results of the present study provide further support for the utility of the TPB as a model of behavioral prediction ([Armitage and Conner, 2001](#)) and concur with other studies examining the utility of the TPB in the context of recycling (e.g. [Cheung et al., 1999](#); [Terry et al., 1999](#); [Aguilar-Luzón et al., 2012](#); [Greaves et al., 2013](#); [Ramayah et al., 2012](#); [Rhodes et al., 2015](#); [Stancu et al., 2016](#)).

Last of all, depending on the findings of the present study and considering [Bagozzi et al. \(1989\)](#), [Whitmarsh and O'Neill's \(2010\)](#) and [White and Hyde's \(2012\)](#) findings, it can be suggested that further research should be carried out using a direct link from attitude to behavior as an attempt to overcome unreliable measures of intention.

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