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Carfora, V, Caso, D and Conner, M orcid.org/0000-0002-6229-8143 (2016) The role of self-identity in predicting fruit and vegetable intake. *Appetite*, 106. pp. 23-29. ISSN 0195-6663

<https://doi.org/10.1016/j.appet.2015.12.020>

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1 **The role of self-identity in predicting fruit and vegetable intake**

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6

7 **Abstract**

8 This research investigated whether the Theory of Planned Behavior (TPB) with the addition of self-
9 identity could predict fruit and vegetable intake when controlling for past behavior. Previous
10 research had demonstrated the efficacy of TPB to predict intention and behavior in relation to food
11 choice and the additional power of self-identity, but had failed assess the effects of self-identity
12 while controlling for past behavior. At baseline (N = 210) TPB components and past behavior in
13 relation to fruit and vegetable consumption plus self-identity as a healthy eater were measured by
14 questionnaire in a sample of university students. At time 1, 4 weeks later, self-reported fruit and
15 vegetable consumption was measured. Structural Equation Modelling (SEM) indicated attitude,
16 PBC and self-identity to be significant predictors of intention (subjective norm and past behavior
17 were not significant). Intention, self-identity and past behavior were direct predictors of behavior.
18 The current findings support the independent effect of self-identity as a healthy eater on both
19 intentions and future behaviour when controlling for TPB variables and also past behavior. The
20 discussion considers the importance of self-identity in changing intentions and behavior for
21 behaviors such as fruit and vegetable consumption.

22

23

24 **Keywords:**

25 Fruit and vegetable

26 Intake

27 Theory of planned behavior

28 Self-identity

29

30

31 **Introduction**

32 The current research is an application of an extended model of the Theory of Planned Behavior
33 (TPB; Ajzen, 1991) to understanding fruit and vegetable consumption in a sample of students from
34 South Italy. Healthy eating is an important determinant of various health outcomes. Guidelines for
35 healthy eating (Cialfa et al., 2003; USDA/USDHHS, 2010) recommend the daily consumption of at
36 least five servings of fruits and vegetables and also for any fresh vegetables consumed to be as
37 varied as possible. This behavior can promote health by providing the necessary vitamins and
38 antioxidants (CDC, 2012) and contributes to physical health by helping preventing cancers and
39 chronic illnesses (e.g., Dauchet, Amouyel, & Dallongeville, 2006; He, Nowson, & MacGregor,
40 2006; WHO, 2003), and weight gain (e.g., Alinia, Hels, & Tetens, 2009; Sartorelli, Franco, &
41 Cardoso, 2008). The World Health Organization (WHO, 2003) reported that low fruit and vegetable
42 intake was responsible for 11% of strokes, 19% of gastrointestinal cancers and 31% of ischemic
43 heart disease.

44 European levels of daily fruit and vegetables intake in 2013 amounted to 342grams per capita
45 (Freshfel, 2015). This is below the recommended minimum of 400grams of fruit and vegetables per
46 day recommended by the World Health Organization (2003). Although Italians are traditionally

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47 viewed as consuming a healthy ‘Mediterranean diet’ that includes plenty of fruits and vegetables
48 (e.g., Turati et al., 2015), the National Institute of Statistics (Multiscopo ISTAT, 2014) reported that
49 only 18.1% of the Italian population consumes at least four daily servings of fruits, vegetables and
50 fresh vegetables. Disadvantaged consumers in the South of Italy report even lower rates of fruit and
51 vegetable consumption (14.2% in South versus 21.1% in the North of Italy consumed at least 4
52 portions; Multiscopo ISTAT, 2013). Therefore, the understanding of factors involved in regular
53 fruit and vegetable consumption in Italians could be used to inform interventions designed to
54 increase this behavior.

55

56 Theoretical Background

57

58 The present study adopted the theory of planned behavior (TPB; Ajzen, 1991) as a theoretical
59 framework to predict fruit and vegetable consumption, since TPB constructs have been found to be
60 strong predictors of various dietary behaviors (Armitage & Conner, 2001a; Conner & Norman,
61 2005; McEachan et al., 2011; Mullan, Wong & Kothe, 2013). In a meta-analytic review across
62 various behaviors, Armitage and Conner (2001a) indicated that the TPB model reliably explained
63 between 40 and 50% of the variance in intention, and between 20 and 40% of the variance in
64 behavior. More recently, the review of McEachan et al. (2011), which considered the efficacy of
65 TPB for different health behaviors showed that the TPB predicted 21.2% of the variance in dietary
66 behavior (mainly based on intentions) and 52.4% of dietary intentions. In this review, attitude
67 emerged as the most important predictor of intention ($\beta = 0.39$), followed by perceived behavioral
68 control ($\beta = 0.27$), subjective norm ($\beta = 0.22$) and past behavior ($\beta = 0.16$).

69

70 Studies have applied the TPB model to predict a variety of specific eating behaviors including fruit
71 and vegetable intake (e.g., Blanchard et al. 2009a; Blanchard et al., 2009b; Conner, Norman, &
72 Bell, 2002; De Bruijn et al., 2007; Elliott & Armitage, 2009; Godin et al., 2010; Kothe, Amaratunga
73 & Mullan, 2011; Kothe & Mullan, 2014; Povey et al., 2000). In a review of 23 such studies
74 (specifically, 15 studies on the determinants of fruit and vegetable intake, 7 on the determinants of
75 intention and fruit and vegetable intake and one on the determinants of intention), Guillaumie,
76 Godin, and Vézina-Im (2010) reported that 30% to 57% of the variance in intentions were
77 accounted for by attitudes, perceived norms, and perceived behavioral control, while 6% to 32% of
78 the variance in fruit and vegetable consumption was accounted for by intentions and perceived
79 behavioral control. Therefore there exists ample empirical evidence that TPB is a useful way to
80 understand fruit and vegetable intake.

81

82 The present research further analyzes how well the TPB predicts intentions and action for this
83 behavior in an Italian population. Importantly, additional predictors (self-identity and past behavior)
84 were included in the present research to increase the predictive validity of the TPB in relation to
85 fruit and vegetable consumption (Figure 1).

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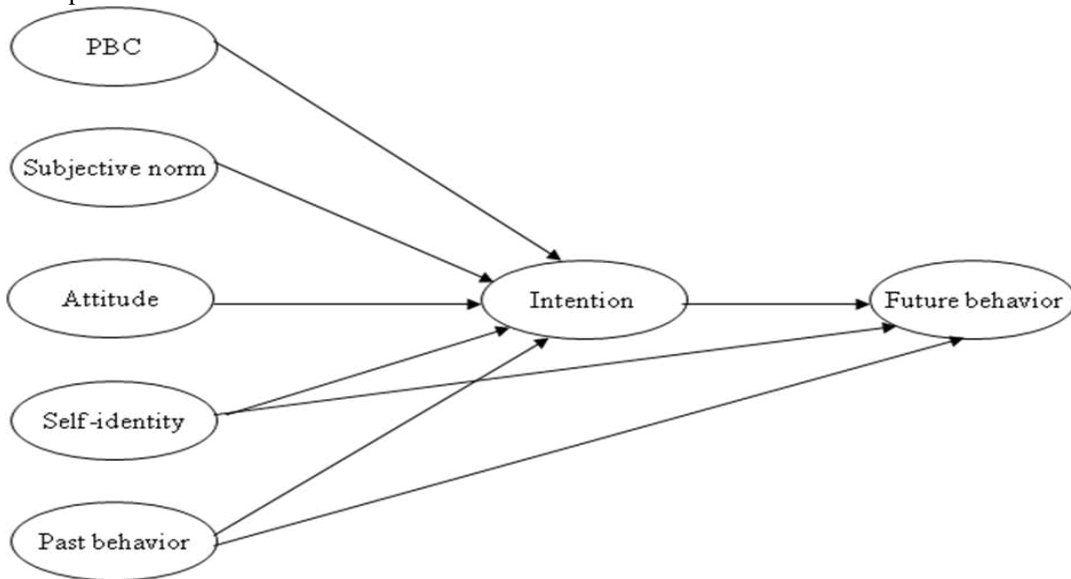
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100 **Figure 1**
 101 Conceptual model.



102 **Note. PBC = Perceived behavioral control**
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104
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106 Self-identity appears to be a motivational construct that adds to predictions within the TPB (Conner
 107 & Armitage, 2002). This concept can be described as a salient aspect of one's self-perception (e.g.,
 108 "I think of myself as a green consumer"; Sparks, 2000). Several authors have suggested self-identity
 109 as a useful additional variable in the TPB (e.g., Bissonnette & Contento, 2001; Charng, Piliavin, &
 110 Callero, 1988; Cook, Kerr, & Moore, 2002; Nigbur, Lyons & Uzzell, 2010; Terry, Hogg, & White,
 111 1991). The basis of the assumed relationship between self-identity and behavioral intentions relies
 112 on identity theory (Stryker, 1968, 1980, 1987), where the self is regarded as a social construct, a set
 113 of identities related to the different roles that everyone occupies in the social settings. A role can be
 114 considered as a collection of expectations about role-appropriate behavior (Simon, 1992); it is
 115 assumed that the pattern of behaviors have been internalized as a role identity and the more salient
 116 the identity, the more it will increase the intention to implement the related behaviors (Charng,
 117 Piliavin, & Callero, 1988). This is because acting a role-congruent behavior helps to confirm a
 118 person's status as a role member (Callero, 1985).

119

120 Consistent with this view, Terry, Hogg and Duck (1999) argued that self-identity influences
 121 intentions because the performance of a certain behavior allows the individual to validate the self-
 122 concept that originates from role identities and helps the person to develop a positive and significant
 123 self-evaluation. Therefore, people intend to perform a behavior consistent with their personal
 124 beliefs, norms and their social roles (e.g., self-identity). The predictive power of self-identity has
 125 been found over and above the effects of other TPB variables (e.g., Charng, Piliavin, & Callero,
 126 1988; Conner & Armitage, 1998; Ries et al., 2012), especially in the domain of food choice (Sparks
 127 & Guthrie, 1998; Sparks & Shepherd 1992; Sparks et al., 1995). This is particularly the case for
 128 self-identity as a predictor of intention (Sparks & Guthrie, 1998, Sparks & Shepherd 1992). For
 129 example, Sparks et al. (1995), examining five dietary changes linked to fat consumption, included a
 130 measure of self-identity. This was defined as the "identification as someone who is concerned about
 131 the health consequences of diet". They reported that this construct significantly predicted the
 132 expectations of making dietary changes independently of attitudes. Conner and Armitage's (1988)
 133 review of six similar studies, indicated that self-identity accounted for 1% of the variance in
 134 intention over and above TPB variables (attitude, subjective norm, perceived behavioral control).
 135 More recent work has shown similar effects for self-identity on intentions over and above TPB

136 variables (Armitage & Conner, 2001b; Arnold et al., 2006; Evans & Norman, 2003; Hagger &
 137 Chatzisarantis, 2006; Manetti, Pierro & Livi, 2004).

138

139 Some studies have also examined the effects of self-identity on behavior whilst controlling for TPB
 140 variables. The suggestion is that self-identity may influence behavior independently of intentions
 141 (and perceived behavioral control). This occurs for two reasons. On one side, implicit aspects of
 142 identity could emerge through unconscious processes beyond the awareness (Devos & Banaji, 2003
 143 for review). On the other side, identity could involve experiences of reflexive consciousness
 144 through its regulating function (Baumeister, 1998). In fact, identities produce a standard for
 145 behavior (Stryker & Burke, 2000), allowing individuals' to evaluate the congruency between
 146 behavior meanings and their identities. Negative or positive emotions could arise from this
 147 evaluation and individuals could change their behaviors if they are not consistent with identity
 148 expectations (Burke, 2006).

149 Biddle, Bank, and Slavings (1987) showed that self-identity had an effect on a social behavior over
 150 and above the effect of intentions and PBC. Theodorakis (1994) showed that role-identity about
 151 physical activity explained intention and behavior. More pertinently, Strachan and Brawley (2009),
 152 in a study on healthy-eater identity and self-efficacy as determinants of healthy eating behavior
 153 demonstrated that these variables increased the explained variance in healthy eating behavior.
 154 Similarly, Dunn et al. (2011), in a study of fast food consumption, reported intention was predicted
 155 by attitude, subjective norms, self-efficacy and self-identification as a healthy eater, although self-
 156 identification did not influence behavior. Ries et al. (2012), in a study on prediction of intention to
 157 perform physical activity, showed that self-identity significant determined intention and behavior,
 158 independently of other TPB variables. Brouwer (2012) reported that self-identity as a healthy eater
 159 predicted intention and healthy eating independent of other TPB variables. More recently, Brouwer
 160 and Mosack (2015) showed that identity as a healthy eater was a significant determinant of healthy
 161 eating intentions over and above the TPB components and a significant determinant of overall
 162 healthy eating behaviors, fruit and low-fat dairy intake over and above intentions and PBC.

163 A limitation of a number of the above studies is that in examining the effect of self-identity they
 164 failed to consider the effect of controlling for past behavior. Although the role of past behavior in
 165 the TPB has prompted considerable debate (see Eagly & Chaiken, 1993: 178-182; Ajzen, 1991,
 166 2002 for reviews), a number of studies shown past behavior to be a strong predictor of intentions
 167 and behavior (e.g., Conner et al., 1999; Hagger, Chatzisarantis, & Biddle, 2002; Mullen et al. 1987;
 168 Norman & Conner, 2006; Norman & Smith, 1995) that remains when controlling for TPB variables
 169 (e.g., Conner & Armitage, 1998; Ouellette & Wood, 1998). Relatedly, Fishbein (1997) claimed that
 170 measures of self-identity could be a measure of past behavior, since people possibly could infer
 171 their self-identities by examining their past behavior (Sparks & Guthrie, 1998). This would point to
 172 the need to examine the effects of self-identity within the TPB whilst controlling for past behavior
 173 in order to show their independent effects. Sparks and Guthrie (1998) showed that self-identity as a
 174 "health-conscious consumer" predicted intention to avoid meat independently of other TPB
 175 variables and also controlling for past behavior. Armitage and Conner (1999a, 1999b, 1999c) in
 176 three studies with different samples (students, hospital workers and general population) showed that
 177 self-identity independently predicted intentions to follow a low-fat diet, also controlling for past
 178 behavior (see also Astrom & Rise, 2001 on healthy eating). Similarly, Dean, Raats and Shepperd
 179 (2012), in relation to fresh and processed organic food purchase, confirmed that self-identity and
 180 past behavior independently predict intention, over and above the effect of the traditional TPB
 181 constructs. Granberg and Holmberg (1990), in a study on U.S. and Swedish Voters, showed that
 182 self-identity, controlling for past behavior, impacted not only on intention, but also on behavior.
 183 Conner et al. (1999), applying the TPB to alcohol consumption, showed that self-identity as a
 184 "drinker" and past behavior contributed to predict intentions over and above the effects of the
 185 traditional three components of the TPB (attitudes, subjective norms, and PBC). Moreover, alcohol
 186 consumption was predicted by past behavior but not by self-identity over and above the effects of

187 intentions and PBC. More recently, a meta-analysis (Rise, Sheeran & Hukkelberg, 2010) showed
 188 that self-identity was a significant predictor of intentions and also behavior. In this meta-analysis,
 189 the addition of self-identity explained an additional 6% ($p < .001$) of variance in intentions and an
 190 additional 2% variance in behavior.

191
 192 In summary, the present research builds on previous research by examining the impact of self-
 193 identity as a healthy eater on intentions and fruit and vegetable consumption in the context of TPB
 194 variables and past behavior. We predicted that self-identity would add to predictions of intentions
 195 and behavior over and above the TPB variables whilst controlling for past behavior.

196
 197

198 **Material and Method**

199
 200

200 Participants and procedures

201

202 In March 2014, a total of 250 online questionnaires were sent to a convenience sample of university
 203 students on two occasions separated by 4 weeks. A total of 210 returned completed questionnaires
 204 at time 1 and 206 at time 2 (58 male; 146 female; mean age = 22.91; SD = 8.33). Only those
 205 participants who responded at both time 1 and time 2, were selected for the analyses ($N = 206$).
 206 Students were recruited from second-year psychology undergraduates of South Italy. Participants
 207 had the study explained to them, provided written consent and then completed the first
 208 questionnaire. A link to the second questionnaire was sent by email allowing completion on-line.
 209 The low sample attrition rate between time points can probably be attributed to the fact that data at
 210 each time point was collected during classroom time.

211

212 Measures

213

214 The questionnaire at time 1 included measures of components of TPB and past behavior in relation
 215 to the consumption of fruit and vegetable, self-identity as a healthy eater and also gender and age.
 216 Intentions (INT) to eat 5 portion of fruit and vegetable per day in the next month were measured
 217 using three items on a 7-point Likert scale (Armitage & Conner, 1999a; e.g., “I intend to eat a diet
 218 based on the consumption of at least five portions of fruit and vegetables per day over the next
 219 month...definitely do not – definitely do”); all scored 1–7, with higher scores indicating greater
 220 intention to eat five portions of fruit and vegetables per day). Composite reliability was 0.79.

221

222 Three items were used to assess students' general attitudes (ATT) towards consumption of 5
 223 portions of fruit and vegetable per day. Each adjective pair was rated on a 7-point response format
 224 (Armitage & Conner, 1999a; e.g., “The consumption of at least five portion of fruit and vegetable
 225 per day in the next month is bad – good, negative – positive, unfavorable- favorable”); all scored 1–
 226 7, with higher scores indicating positive attitude to eat five portions of fruit and vegetables per day).
 227 Composite reliability was 0.79.

228

229 To assess subjective norm (SN) three items on a 7-point Likert scale were used (Armitage &
 230 Conner, 1999a; e.g., “People who are important to me want me to eat at least five portions of fruit
 231 and vegetables per day over the next month...strongly disagree- strongly agree”); all scored 1–7,
 232 with higher scores indicating greater level of subjective norm about eat five portions of fruit and
 233 vegetables per day).. Composite reliability was 0.77.

234

235 Perceived behavioral control (PBC) was measured by three items (Armitage & Conner, 1999a; e.g.,
 236 “Whether or not I eat at least five portions of fruit and vegetables per day over the next month is
 237 entirely up to me... strongly disagree-strongly agree”); all scored 1–7, with higher scores indicating

238 greater control over eating five portions of fruit and vegetables per day). Composite reliability was
 239 0.81.

240

241 Self-identity (SI) was measured by three items on a 7-point Likert scale (Sparks et al., 1995; “I think
 242 of myself as a healthy eater”; “I think of myself as a person who is interested in eating healthy”; “I
 243 think of myself as someone who is concerned about the health consequences of what I
 244 eat...strongly agree - strongly disagree”; all scored 1–7, with higher scores indicating greater
 245 values of self-identity as healthy eater). Composite reliability was 0.86.

246

247 Self-reported (PB) past behavior was assessed with one item. Response format were
 248 formed by 6-points ranging from 1 to more than 5 portions of fruit and vegetable per day (“How
 249 many portion of fruit and vegetable did you eat a day in the last month?”).

250

251 At time 2, after one month, self-reported future behavior (FVI) was measured with the same item
 252 used at time 1 to tap past behavior.

253

254 Tested Model

255

256 The present study aimed to verify whether self-identity played a decisive role in the prediction of
 257 intention and behavior, about the daily consumption of fruit and vegetable, in a sample of Italian
 258 students, controlling their past behavior. According to the TPB (Ajzen, 1991), we hypothesized that
 259 intention mediated the impact of attitude, PBC, subjective norm, past behavior and self-identity on
 260 behavior, and behavior was also predicted by a direct effect of self-identity and past behavior on it.
 261 Figure 1 showed the hypothesized structural model for the study. Larger ovals indicate latent
 262 variables, smaller ovals indicate error variance, and rectangles depict observed measures.

263

264

265 Statistical analysis

266

267 All descriptive analyses were performed using PASW 17. Mplus 7 statistical software was used to
 268 conduct structural equation modeling (SEM). Adequacy of fit of the SEM models was estimated by
 269 using Chi-Square and recommended incremental goodness-of-fit indexes: the root mean square
 270 error of approximation (RMSEA), the comparative fit index (CFI), the Tucker-Lewis Index (TLI)
 271 and the Standardized Root Mean Square Residual (SRMR; Iacobucci, 2010). A non-significant
 272 Chi-Square would indicate that the model fits the data well (Iacobucci, 2010). CFI and TLI cut-off
 273 values of at least 0.90 are generally considered to represent acceptable fit (Bentler, 1990; Tucker &
 274 Lewis, 1973). Browne and Cudeck (1992) suggest that a RMSEA value of 0.05 or less indicates
 275 good fit, and that values up to 0.08 represent errors that approximate to those expected in the
 276 population. Values of the SRMR less than 0.08 are generally considered acceptable (Hu & Bentler,
 277 1999).

278

279

280 Results

281

282 Table 1 reports the correlations among constructs and their mean and SD. The items generally
 283 showed reasonable variation and were not unduly skewed. The attitude measure tended to have a
 284 high mean and slightly reduced variance. Examination of the correlations (Table 1) indicated that
 285 PBC and self-identity were the strongest correlates of intentions, while self-identity, intention and
 286 past behavior were the strongest correlates of behavior.

287

288

289 **Table 1**
 290 Descriptive finding and correlations between study variables

	1.	2.	3.	4.	5.	6.	7.	M	SD
1. Intention	1							4.39	1.71
2. Future behavior	.33**	1						3.35	1.30
3. PBC	.65**	.35**	1					4.93	1.44
4. Attitude	.36**	.13**	.28**	1				6.31	0.98
5. Subjective norm	.20**	.08**	.20**	.36**	1			5.28	1.38
6. Self-identity	.45**	.39**	.45**	.42**	.06**	1		2.50	1.50
7. Past behavior	.24**	.32**	.21*	-.02	-.11	.31**	1	4.83	1.30

291 Note: ** p < 0.001; *p < 0.05

292

293 To test the construct validity, the measurement or confirmatory factor analysis model including five
 294 latent factors indicating attitude, PBC, subjective norm, intention and self-identity, while past
 295 behavior was incorporated as an observed variable. Goodness-of-fit statistics for the measurement
 296 model were acceptable. The chi-square was significant ($\chi^2 = 65.58$, $df = 38$, $p < 0.001$), but all the
 297 other indices pointed to a very good fit (RMSEA = 0.06; CFI = 0.96; TLI = 0.95; SRMR = 0.04).
 298 The parameter estimates were all significant and presented higher values (from 0.64 to 0.96). When
 299 the sample is small as is the case here, the Chi-Square statistic might not differentiate between good
 300 or poor fitting models (Barbaranelli, 2007). Therefore since all other indices indicated a good fit,
 301 the measurement model was accepted as a model with acceptable fit. No model modification was
 302 made and throughout a conservative strategy of not freeing cross-loadings was followed due to
 303 potential impacts on construct validity (Hair et al., 2006). Given the good fit of the confirmatory
 304 factor analysis, hypothesized paths among variables were verified.

305 The traditional TPB model was good fit to the data ($\chi^2 = 6.59$, $df = 3$; $p =$ not significant; RMSEA =
 306 0.07; CFI = 0.98; TLI = 0.94; SRMR = 0.03) PBC, attitude and past behavior were significant
 307 predictors of intention (respectively $\beta = 0.57$; $\beta = 0.19$; $\beta = 0.12$), future behavior was significantly
 308 predicted by intention ($\beta = 0.27$) and past behavior ($\beta = 0.26$). Intention mediated the impact of
 309 attitude, PBC and past behavior on future behavior. Levels of explained variance were significant
 310 for intention and behavior (respectively $R^2 = 0.47$, 0.18).

311 Adding self-identity to the TPB model also produced a good fitting model. Chi-square was not
 312 significant ($\chi^2 = 3.80$, $df = 3$) and all fit indices were optimal (RMSEA = 0.04; CFI = 0.99; TLI =
 313 0.99; SRMR = 0.02). Intention was significantly determined by PBC ($\beta = 0.51$), attitude ($\beta = 0.17$)
 314 and self-identity ($\beta = 0.16$), but not by subjective norm and past behavior. In this case, fruit and
 315 vegetable consumption was determined more by self-identity ($\beta = 0.24$) and past behavior ($\beta =$
 316 0.21) than by intention ($\beta = 0.18$). The final model accounted for 49% of the variance in intentions
 317 and 22% in behavior. Standardized estimates of paths results are shown in Figure 2.

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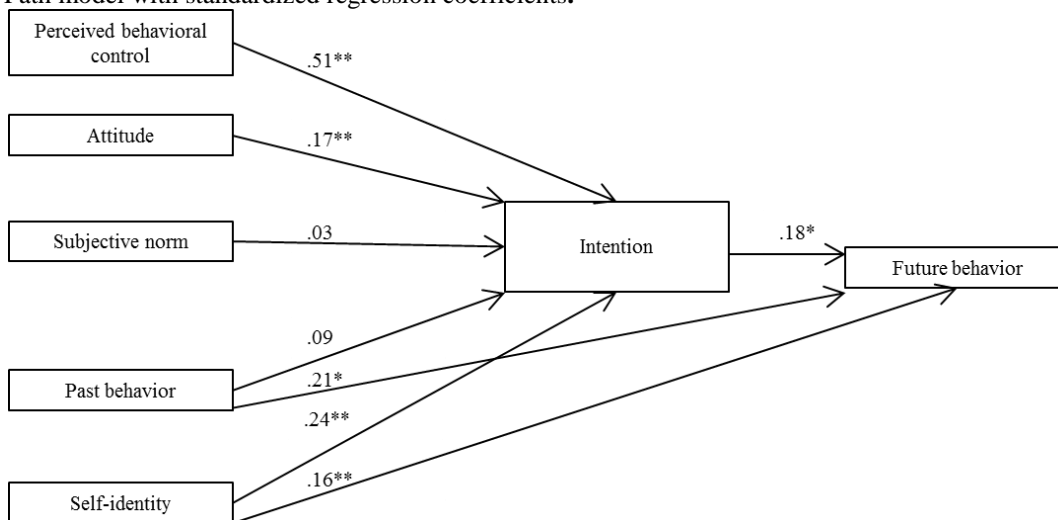
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332 **Figure 2**
 333 Path model with standardized regression coefficients.



334 Note. ** $p < 0.001$; * $p < 0.05$; covariances and error variables not shown for ease of interpretation.
 335
 336

337 Discussion

338 Theory of planned behavior, self-identity and fruit and vegetable intake

339 The present study aimed to test the validity of an extended TPB model, including past behavior and
 340 self-identity for predicting and understanding intentions and behavior for fruit and vegetable intake.
 341 The findings showed that the TPB is a useful framework to understand the fruit and vegetable
 342 intake. Attitude and self-identity (as a healthy eater) had a moderate impact on intention, while the
 343 PBC had a large effect on it, all constructs explained 49% of the variance of intention, controlling
 344 for past behavior, which was not a significant predictor of intention. Also subjective norm was
 345 shown to have no effect on intention. Considering the fruit and vegetable intake, intention, self-
 346 identity and past behavior had direct effects on behavior explaining 22% of the variance. Intention
 347 mediated the effects of attitudes and PBC on behavior, past behavior had only a direct effect on
 348 behavior, while self-identity showed both a direct effect and an indirect effect through intentions on
 349 behavior.

350 These findings are generally consistent with the literature, which report that attitude and perceived
 351 behavioral control are the more important predictors of healthy eating (Povey et al., 2000; Sjoberg
 352 et al., 2004), that subjective norms show low or not significant relationship to healthy eating
 353 (Blanchard et al., 2009; Lien, Lytle, & Komro, 2002; Louis, Chan, & Greenbaum, 2009; Paisley &
 354 Sparks, 1998) and that self-identity (e.g., Strachan & Brawley, 2009; Brouwer & Mosack, 2015)
 355 explains additional variance in intention. Congruent with Armitage and Conner (1999a, 1999b,
 356 1999c), self-identity as healthy eater was shown to be an important predictor of an individual's
 357 intention to eat 5 fruit and vegetables per day. In summary, the results of the present study
 358 suggested that intentions to eat 5 fruit and vegetables per day are driven in part by a desire to
 359 confirm a perception of the self as a healthy eater.

360 The predictive effect of past behavior on future behavior found here is also coherent with the review
 361 of Conner and Armitage (1998), which showed across seven tests that past behavior, after taking
 362 account intentions and PBC, explained 13% of behavior's variance. Consistent with the results of a
 363 review of Sparks (2000) and the studies of Astrom and Rise (2001) and more recently of Rise,
 364 Sheeran and Hukkelberg (2010), self-identity was here found to be a strong predictor of fruit and
 365 vegetable intake even when controlling for past behavior and TPB variables; therefore people who
 366 perceived themselves as healthy eaters were more likely to actually eat fruit and vegetables 1 month
 367 later. This finding that self-identity predicts behavior when controlling for past behavior is
 368 congruent with the review of Rise, Sheeran, and Hukkelberg (2010), but contrasts slightly with
 369

370 Allom and Mullan (2012) who showed that fruit and vegetable intake was predicted by intention
 371 and a healthy-eater self-schema (similar to self-identity), but not by past behavior.
 372 Fishbein and Ajzen (2010) criticized the inclusion of self-identity in the TPB framework starting
 373 from the way in which self-identity is assessed. They discussed the fact that some measure of self-
 374 identity overlap with the attitude (i.e., if items consider a person values performance of the
 375 behavior), with subjective norm (i.e., if items refer to a person's identification with a social group or
 376 with a social rule), and with past behavior (i.e., if items represent self-report of current behavior).
 377 The present research showed independent effects of a self-identity measure and measures of
 378 attitude, subjective norm and past behavior and the correlation with these constructs was modest.
 379

380 **Limitation and methodological issues**

381 A number of potential limitations of the present study should be noted. First, the sample was
 382 limited to young adults in higher education and contained a limited number of males potentially
 383 limiting the generalizability of the findings. Second, a reliance on self-reported measures of past
 384 and future behavior is a limitation, although a common one in studies on the TPB and various
 385 eating behaviors. This is particularly the case because reviews of the TPB indicate it to be less
 386 predictive of objective compared to self-reported behavior (Armitage & Conner, 2001). The
 387 reliance on self-reported behavior, although common in TPB studies of eating behavior, means the
 388 impact on objectively measured behavior is unknown. An more accurate way to measure self-report
 389 behavior could be the use of a food diary (e.g. Brouwer & Mosack, 2015; Conner et al., 2001) or
 390 more specific scale, as the seven-item food frequency questionnaire presented by the National
 391 Cancer Institute to measure fruit and vegetable consumption over the past 30 days (Thompson,
 392 Byers, & Kohlmeier, 1994) or the Food Frequency Questionnaire (Willett & Lenart, 1998).
 393 However, all these methods remain self-report and open to similar criticisms. Third, it should be
 394 noted that we employed a brief measure of self-identity measure (Sparks et al., 1995). Although
 395 reliable a longer measure such as the scale of Strachan and Brawley (2008), which uses nine-item to
 396 assesses it, or the Eating Identity Type Inventory, developed by Balke et al. (2013) could of
 397 provided more precise estimates of the effects of self-identity.
 398

399 **Future direction and practical implications**

400 Following the findings of Brouwer and Mosack (2015), which showed that healthy eater identity
 401 predicted fruit consumption but not vegetable intake, in the future it could be interesting to explore
 402 the power of self-identity to separately predict fruit consumption or fruit consumption while
 403 controlling for the different relevant TPB variables. This might provide useful insights into how to
 404 change each. For example, fruit consumption might be more determined by attitude and self-
 405 identity while vegetable consumption is more determined by PBC and subjective norms, suggesting
 406 the value of different intervention approaches.
 407

408 In addition, as suggested by Conner and Norman (2005) and by Sparks and Shepherd (1992) further
 409 investigation to define the precise nature of self-identity would be valuable. For example, overlap
 410 with other constructs such as moral or personal norm, which are related to individuals' feelings of
 411 obligation to act or not a particular behavior, would be useful. Moreover, the current findings
 412 suggestion that promoting the self-identity as a healthy eater as a useful way to promote both
 413 intentions and behavior in relation to fruit and vegetable intake in young adults need further
 414 exploration. In particular, we need to test if changing such identities can be a useful way to change
 415 intentions and behavior in this population. However, instilling such identities may be difficult.
 416 Nevertheless promoting various forms of positive reactions to healthy eating may be a more
 417 productive way to promote increased fruit and vegetable consumption than the more usual focus on
 418 tackling risk factors. For example, public health campaigns and educational programs could try to
 419 instill a healthy eating identity by associating fruit and vegetable intake with positive identity
 420 characteristics of people that eat them.

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Conclusion

The current study provides a useful contribution to the literature on the TPB and fruit and vegetable intake in showing that self-identity is a significant predictor of intentions and behavior, even when controlling for past behavior. The fact that self-identity influences behavior both directly and indirectly (through intentions) suggests it might be a useful basis for attempting to change fruit and vegetable consumption, at least in young people from the south of Italy.

429

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