Applying the Model of Goal-Directed Behavior, Including Descriptive Norms, to Physical Activity Intentions: A Contribution to Improving the Theory of Planned Behavior

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Abstract

The theory of planned behavior (TPB) has received its fair share of criticism lately, including calls for it to retire. We contribute to improving the theory by testing extensions such as the model of goal-directed behavior (MGDB, which adds desire and anticipated positive and negative emotions) applied to physical activity (PA) intention. We also test the inclusion of a descriptive norms construct as an addition to the subjective norms construct, also applied to PA, resulting in two additional models: TPB including descriptive norms (TPB + DN) and MGDB including descriptive norms (MGDB + DN). The study is based on an online survey of 400 young adult Internet users, previously enrolled in a subject pool. Confirmatory factor analysis
(CFA) showed that TPB and TPB + DN were not fit for purpose, while MGDB and MGDB + DN were. Structural equation modelling (SEM) conducted on MGDB and MGDB + DN showed that the inclusion of descriptive norms took over the significance of injunctive norms, and increased the model's account of total variance in intention to be physically active.

Keywords
attitudes, subjective norms, young adults, structural equation modelling

Despite widespread awareness of the benefits to health of moderate physical activity (Cragg, Wolfe, Griffiths & Cameron, 2007; Malik, Willett & Hu, 2013), the prevalence of physical activity (PA) remains low (Brownson, Boehmer & Luke, 2005; Irwin, 2004). Public health campaigns have tried to increase levels of PA with varying degrees of success (Latimer et al., 2008; Randolph & Viswanath, 2004). Better evidence of the factors that drive people to be physically active might not be a guarantee for a successful public health campaign. However, it does facilitate more targeted and focused, and therefore perhaps more effective, campaigns (Gallagher & Updegraff, 2012; Latimer, Brawley & Bassett, 2010). This paper aims to contribute to this improved understanding.

The theory of planned behavior (TPB; Ajzen, 1991) has been the preeminent theoretical approach guiding research on health behavior generally and PA in particular (Downs & Hausenblas, 2005; Hales, Evenson, Wen & Wilcox, 2010; Hamilton & White, 2008; Plotnikoff et al., 2011). Theoretically, TPB posits that intention influences behavior. In turn, attitudes, subjective norms, and perceived behavioral control (PBC) influence intention (with PBC also directly influencing behavior, see Figure 1). The relationships between these factors in the model have been supported when applied to PA (Hagger, Chatzisarantis & Biddle, 2002). TPB had promise for obesity prevention, including increasing PA as a key component of energy balance (Baranowski, Cullen, Nicklas, Thompson & Baranowski, 2003). Indeed PA is the best predicted health-related application of this theory (23.9% of the variance explained, according to a meta-analysis by McEachan, Conner, Taylor & Lawton, 2011).

TPB has been criticized recently due to concerns over its validity and utility, with some arguing that the theory should be retired (Sniehotta, Presseau & Araújo-Soares, 2014). Others, however, aware of the possible shortcomings of TPB, have sought to extend and improve. New constructs and new relationships between them are continuously being sought (Baranowski & Lytle, 2015). The model of goal-directed behavior (MGDB) is a case in point. It acknowledges that the variables in TPB do not capture whether people really want to do something, which is linked to the emotions they expect to feel if they do it.
Therefore, MGDB adds desire (to capture whether people *want* to do something, out of joy or a feeling of satisfaction, as opposed to out of obligation or because it is “the right thing to do”) and the perceived anticipated emotional consequences of a targeted behavior. Desire is presumed to mediate the influence of attitudes, subjective norms, and PBC on intention. Anticipated emotions appear in the model as factors that also influence desire (and, eventually, intention and behavior, see Figure 2).
The model explained significantly greater amounts of variance in intentions and behavior in comparison to the TPB in other behavioral domains (Perugini & Bagozzi, 2001; Perugini & Conner, 2000; Taylor, Bagozzi & Gaither, 2005). With regard to health behaviors, a recent TPB-based study showed that the only significant moderator of the intention-behavior relationship was the extent to which intentions were based on anticipated affective reactions (Conner, McEachan, Lawton & Gardner, 2015). Finally, in the field of behavioral nutrition and physical activity, MGDB has been applied to parents’ practices for getting their children to eat and enjoy vegetables (Baranowski et al., 2013; Hingle et al., 2012).

This study is based on the conviction, reflected in MGDB, that, when seeking to understand young adults’ levels of PA, desire and anticipated emotions are important explanatory variables that should be included. It therefore presents the first attempt – to the best of our knowledge – at applying MGDB to PA.

The role of subjective norms in TPB also merits closer scrutiny. In a meta-analysis of TPB studies, the link between subjective norms and intention was weaker than other links in the model, perhaps because it is often measured with single item constructs instead of more reliable multi-item constructs (Armitage & Conner, 2001). However, the narrow conceptualization of subjective norms in TPB may also play a role (Rivis & Sheeran, 2003; Sheeran & Orbell, 1999). The subjective norms construct attempts to bring the element of social influence into the equation by capturing an individual’s perception of what significant others think he or she ought to do. In the social influence literature, these are referred to as injunctive norms. However, the subjective norm construct neglects the influence of descriptive norms, which refer to what significant others themselves do (Cialdini, Reno & Kallgren, 1990; Lee, 2011).

In this study, we introduce descriptive norms in TPB and MGDB models as an additional construct which influences intention (similar to what the subjective – or injunctive – norm construct does) out of the conviction that, at least in PA, what significant others do has at least as much of an influence on people’s behavior (because it is taken as a cue) as what significant others think people ought to do. This belief is supported by popular wisdom, hence the need for the saying “do as I say, not as I do”, and by the scientific literature. Descriptive norms have been shown to correlate with intention (Rivis & Sheeran, 2003). Their persuasive impact has also been demonstrated, experimentally, in the study of towel re-use in hotel rooms (Goldstein, Cialdini & Griskevicius, 2008). With regard to PA, descriptive norms associated with friends’ PA are among the strongest correlates of behavior (Priebe & Spink, 2011). In this study, we first tested TPB and MGDB with the traditional subjective norms construct (referred to as injunctive norms in this paper), and then added descriptive norms. The hypotheses guiding the research were the following:

Hypothesis 1. TPB will be a plausible model.
**Hypothesis 2.** TPB including descriptive norms (TPB + DN) will be a plausible model.

**Hypothesis 3.** MGDB will be a plausible model.

**Hypothesis 4.** MGDB including descriptive norms (MGDB + DN) will be a plausible model.

**Hypothesis 5.** MGDB will account for more total variance in intention to be physically active than TPB.

**Hypothesis 6.** TPB including descriptive norms (TPB + DN) will account for more total variance in intention to be physically active than TPB.

**Hypothesis 7.** MGDB including descriptive norms (MGDB + DN) will account for more total variance in intention to be physically active than MGDB.

**Hypothesis 8.** MGDB + DN will account for more total variance in intention to be physically active than TPB + DN.

Confirmatory factor analysis (CFA) was conducted on the constructs of the models to evaluate if they were fit for purpose. Then, structural equation modelling (SEM) was conducted to assess the total variance in intention accounted by the model, as measured by the R².

**Method**

**Participants**

An online survey was conducted among 400 young adults (18-24 yr.) in Bulgaria, Croatia, and Romania. The focus on young adults was due to their being particularly vulnerable to weight gain (Huang et al., 2003; Mokdad et al., 2003) and difficult to reach through public health campaigns (Poobalan, Aucott, Clarke & Smith, 2012).

The survey was part of a larger project with an experimental design testing the impact of normative messages, where a total of 1200 participants were studied (drop-out rate: 24%; van Bavel, Esposito & Baranowski, 2014). These were split into three equal groups of 400: two receiving a normative message before filling out scales pertaining to TPB, TPB + DN, MGDB and MGDB + DN, and one receiving no such message (the control group). To avoid contamination from the treatments, the sample of 400 participants analysed in this paper was that of the control group.
The 400 participants were equally split by country (133 in Croatia, 133 in Romania, and 134 in Bulgaria) and by gender (192 females vs. 208 males). The average age was 20.3 yr. \( (SD = 2.5) \).

**Measures**

Forty items representing eight constructs were included in the questionnaire, all as 7-point binary adjectives (see Table 1). The TPB and enhanced TPB constructs were taken from previous work applying TPB to PA (Hagger, Chatzisarantis, Biddle & Orbell, 2001; Hales, Evenson, Wen & Wilcox, 2010). The attitude construct provided an incomplete statement at the start, namely ‘Doing regular physical activity is . . .’ followed by binary adjective items with options such as ‘important’ vs. ‘not important’. Intention to be physically active measured three statements evaluated such as ‘I intend to do physical activities at least 30 minutes on most days next week’ on the item ‘yes, definitely’ vs. ‘no, definitely’. The perceived behavioral control (PBC) construct included questions such as ‘it is mostly up to me whether I do physical activities at least 30 minutes on most days in the next week’ to be answered on an ‘agree’ vs. ‘disagree’ item. The injunctive norms construct asked whether people who were important to the participant thought they ‘should do physical activities at least 30 minutes on most days’, with replies running along the item ‘yes, I think so’ vs. ‘no, I don’t think so’.

The MGDB-specific constructs were previously validated in studies on MGDB generally (Perugini & Bagozzi, 2001; Perugini & Conner, 2000) and as applied to other health-related behavior (Hingle et al., 2012). They were modified only minimally to refer to PA as the targeted behavior. These constructs were desire, positive anticipated emotions and negative anticipated emotions. Desire included the incomplete statement ‘Finding the motivation to do physical activity at least 30 minutes on most days is . . .’ followed by several binary adjective items such as ‘rewarding’ vs. ‘not rewarding’. Positive anticipated emotions asked: ‘Now imagine you are trying to do a physical activity that you like on a regular basis. How would you feel if you actually did it on a regular basis?’ Negative anticipated emotions asked: ‘Now imagine you are trying to do a physical activity that you don’t like on a regular basis. How would you feel if you actually did it on a regular basis?’ Both were followed by binary adjective items such as ‘happy’ vs. ‘unhappy’ or ‘proud’ vs. ‘not proud’.

Finally, the descriptive norms construct, added to both TPB and MGDB, also mentioned people who were important to the respondent (same as those in the injunctive norms scale, except for ‘most of my physicians’), but simply asked whether they ‘did physical activities at least 30 minutes on most days’. As with injunctive norms, the replies ran along the category response form ‘yes, I think so’ vs. ‘no, I don’t think so’.
| Construct                  | Stem                                               | Leaf                                                                 | Theory of Planned Behavior | Theory of Planned Behavior (incl descriptive norms) | Model of Goal-directed Behavior | Model of Goal-directed Behavior (incl descriptive norms) |
|----------------------------|----------------------------------------------------|----------------------------------------------------------------------|---------------------------|-----------------------------------------------------|---------------------------------|----------------------------------------------------------|
| Attitude                   | Doing regular physical activity is...              | ...something that makes me feel good/                               | 0.69                      | 0.69                                                | 0.71                            | 0.71                                                      |
|                            |                                                    | ...something that does not make me feel good                        |                           |                                                     |                                 |                                                          |
|                            |                                                    | ...important/not important                                          | 0.71                      | 0.71                                                | 0.69                            | 0.69                                                      |
|                            |                                                    | ...beneficial/not beneficial                                        | 0.68                      | 0.68                                                | 0.65                            | 0.65                                                      |
|                            |                                                    | ...good/not good                                                   | 0.67                      | 0.67                                                | 0.65                            | 0.65                                                      |
|                            |                                                    | ...something that gives me extra energy/something that does not give | 0.66                      | 0.66                                                | 0.67                            | 0.67                                                      |
|                            |                                                    | me extra energy                                                    |                           |                                                     |                                 |                                                          |
|                            |                                                    | ...stress relieving/not stress relieving                            | 0.62                      | 0.62                                                | 0.62                            | 0.62                                                      |
|                            |                                                    | ...wise/not wise                                                   | 0.59                      | 0.59                                                | 0.59                            | 0.59                                                      |
|                            |                                                    | ...fun/not fun                                                     | 0.56                      | 0.56                                                | 0.59                            | 0.59                                                      |
|                            |                                                    | ...exciting/not exciting                                           | 0.57                      | 0.57                                                | 0.58                            | 0.58                                                      |
| Injunctive norms           | Most of my close friends...                       | ...think I should do physical activities                              | 0.73                      | 0.73                                                | 0.73                            | 0.73                                                      |
|                            |                                                    | at least 30 minutes on most days (yes, I think so/no, I don’t think so) |                           |                                                     |                                 |                                                          |
|                            | Most of other people important to me...            | ...think I should do physical activities                              |                           |                                                     |                                 |                                                          |
|                            |                                                    | at least 30 minutes on most days (yes, I think so/no, I don’t think so) |                           |                                                     |                                 |                                                          |
|                            |                                                    |                                                                       |                           |                                                     |                                 |                                                          |

(continued)
Table 1. Continued.

| Construct                  | Stem                                      | Leaf                                                                 | Theory of Planned Behavior (incl descriptive norms) | Theory of Planned Behavior (incl descriptive norms) | Model of Goal-directed Behavior (incl descriptive norms) | Model of Goal-directed Behavior (incl descriptive norms) |
|----------------------------|-------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| Most of my close family members... | ... think I should do physical activities at least 30 minutes on most days (yes, I think so/no, I don't think so) | 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 | 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 | 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 | 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 |
| Most of my friends belonging to the gender that I find sexually attractive... | ... think I should do physical activities at least 30 minutes on most days (yes, I think so/no, I don't think so) | 0.90 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 | 0.90 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 | 0.90 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 | 0.90 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 |
| Most of my friends with whom I mostly interact online (e.g. Facebook friends)... | ... think I should do physical activities at least 30 minutes on most days (yes, I think so/no, I don't think so) | 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 | 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 | 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 | 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 |
| Most of my physicians... | ... think I should do physical activities at least 30 minutes on most days (yes, I think so/no, I don't think so) | 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 | 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 | 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 | 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 0.79 |
| Descriptive norms Most of my close friends... | ... do physical activities at least 30 minutes on most days (yes, I think so/no, I don't think so) | 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 | 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 | 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 | 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 0.87 |

(continued)
| Construct                              | Stem                                                                 | Leaf                                                                 | Theory of Planned Behavior (incl descriptive norms) | Theory of Planned Behavior (incl descriptive norms) | Model of Goal-directed Behavior | Model of Goal-directed Behavior |
|---------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------|-------------------------------|-------------------------------|
| Most of other people important to me  | ... do physical activities at least 30 minutes on most days (yes, I think so/no, I don’t think so) |                                                                      | 0.77                                              | 0.77                                              |                               |                               |
| Most of my friends with whom I mostly interact online (e.g. Facebook friends) | ... do physical activities at least 30 minutes on most days (yes, I think so/no, I don’t think so) |                                                                      | 0.74                                              | 0.74                                              |                               |                               |
| Most of my close family members       | ... do physical activities at least 30 minutes on most days (yes, I think so/no, I don’t think so) |                                                                      | 0.61                                              | 0.60                                              |                               |                               |
| Most of my friends belonging to the gender that I find sexually attractive | ... do physical activities at least 30 minutes on most days (yes, I think so/no, I don’t think so) |                                                                      |                                                   |                                                   |                               |                               |
| Perceived behavioral control          | If I wanted to I could do physical activities at least 30 minutes on | ... agree/disagree                                                    | 0.87                                              | 0.87                                              | 0.88                          | 0.88                          |

(continued)
| Construct                          | Stem                                                                 | Leaf                                | Theory of Planned Behavior (incl descriptive norms) | Theory of Planned Behavior (incl descriptive norms) | Model of Goal-directed Behavior (incl descriptive norms) | Model of Goal-directed Behavior (incl descriptive norms) |
|----------------------------------|----------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| Desire                           | Finding the motivation to do physical activity at least 30 minutes on most days is... | ... agree/disagree                   | 0.76                                                  | 0.76                                                  | 0.75                                                     | 0.75                                                     |
|                                  |                                                                      | ... enjoyable/not enjoyable          |                                                       |                                                       |                                                          |                                                          |
|                                  |                                                                      | ... rewarding/not rewarding          |                                                       |                                                       |                                                          |                                                          |
|                                  |                                                                      | ... something that comes naturally to me/something that does not come naturally to me |                                                       |                                                       |                                                          |                                                          |
|                                  |                                                                      | ... frustrating/not frustrating (reversed item) |                                                       |                                                       |                                                          |                                                          |

(continued)
| Construct                      | Stem | Leaf          | Theory of Planned Behavior (incl descriptive norms) | Model of Goal-directed Behavior (incl descriptive norms) |
|-------------------------------|------|---------------|----------------------------------------------------|----------------------------------------------------------|
| Positive anticipated emotions | hard/not hard (reversed item) | happy/unhappy | 0.46                                               | 0.88                                                     |
| Negative anticipated emotions |        | happy/unhappy | 0.46                                               | 0.88                                                     |
|                               | proud/not proud | happy/unhappy | 0.79                                               | 0.63                                                     |
|                               | excited/not excited | happy/unhappy | 0.89                                               | 0.89                                                     |

Now imagine you are trying to do a physical activity that you like on a regular basis. How would you feel if you actually did it on a regular basis?

Now imagine you are trying to do a physical activity that you don’t like on a regular basis. How would you feel if you actually did it on a regular basis?
Table 1. Continued.

| Construct                        | Stem                  | Leaf                                                                 | Theory of Planned Behavior | Theory of Planned Behavior (incl descriptive norms) | Model of Goal-directed Behavior | Model of Goal-directed Behavior (incl descriptive norms) |
|----------------------------------|-----------------------|----------------------------------------------------------------------|-----------------------------|---------------------------------------------------|-------------------------------|---------------------------------------------------|
| Intention to do physical activity | I intend to do . . .  | . . . excited/not excited                                           | 0.91                        | 0.91                                              | 0.91                          | 0.91                                              |
|                                  |                       | . . . proud/not proud                                                | 0.82                        | 0.82                                              | 0.82                          | 0.82                                              |
|                                  | I expect I will do . . | . . . physical activities at least 30 minutes on most days next week (yes, definitely/no, definitely) | 0.95                        | 0.95                                              | 0.95                          | 0.95                                              |
|                                  | I plan to do . . .    | . . . physical activities at least 30 minutes on most days next week (yes, definitely/no, definitely) | 0.93                        | 0.93                                              | 0.93                          | 0.93                                              |
Binary adjective items were chosen over Likert-type items (such as ‘strongly agree’, ‘somewhat agree’, ‘not sure’, etc.) since they minimize discrepancies in the interpretation of these items between participants, especially between those speaking different languages (Friborg, Martinussen & Rosenvinge, 2006). Moreover, the distance between values can more justifiably be inferred to be equal by respondents, making them better suited for treatment as an interval scale than Likert-type items (Jamieson, 2004).

**Procedures**

Data were collected by Block de Ideas, a social research company based in Barcelona. An internal Evaluation Committee at the Institute for Prospective Technological Studies approved the study and required it follow the appropriate ethical guidelines for conducting questionnaires (in this case, those of ESOMAR, the World Association for Social, Opinion and Market Research). All participants gave informed consent. The questionnaire was translated into Bulgarian, Croatian, and Romanian, with a back-translation quality check. The survey was launched in March 2013. The sample was taken from survey panels (or subject pools) in which participants were formally enrolled. In order to mitigate potential risks associated with online questionnaires (e.g. not knowing who lies behind an IP address), these panels adhered to a number of quality control measures. For example, people had to log in securely using username and passwords, and duplicates and e-mail addresses that did not function properly were automatically detected and removed. The data were made anonymous, kept confidential and used only for the purpose of this research.

**Analysis**

Confirmatory factor analysis (CFA) was used to assess the validity of constructs. A cut-off point of 0.4 was taken for the standardized coefficients, opting for a slightly more conservative threshold than the 0.3 proposed by Nunnally (1978). This was done to prevent the risk of items loading onto more than one factor. To assess goodness of fit, Hu and Bentler’s two-index presentation strategy was used (Hu & Bentler, 1999). Means, standard deviations, and ranges of scores for each scale were computed and reported, as well as Cronbach’s alphas and average inter-item correlations. For the latter, values between 0.15 and 0.50 were considered acceptable (Clark & Watson, 1995).

Structural equation modelling (SEM) was then conducted to examine the relationships among constructs. The estimation procedure was an adjusted maximum likelihood method, which is robust to non-normality in the data (Satorra & Bentler, 2001). The software used was STATA Version 14 (StataCorp LP, College Station, Texas, USA).
Results

Forty items were initially included in the CFA, from which 36 items (and 8 constructs) were retained. Four initially included items did not load on their related constructs and were omitted from the final list of 36 items: two hypothesized to belong to the attitude scale and two to the PBC scale. The item ‘doing regular physical activity is . . . childish vs. not childish’ was less established in the literature: it was inspired by previous work suggesting 11-to-16 year-old girls considered physical activity ‘babyish’ (Poobalan et al., 2012). The item ‘doing regular physical activity is . . . tiring vs. not tiring’ also did not load on the attitudes scale. In hindsight, this stands to reason: people can still hold positive attitudes towards something that makes them tired. Of the two discarded items hypothesized to belong to PBC, one specifically mentioned ‘physical activities which make you out of breath’, which could explain the relatively poor fit of this item. It nevertheless was almost acceptable, with a factor loading of 0.38. The other item was a bit ambiguous in the combination between the incomplete initial statement (‘there is very little I can do to make sure . . .’) and the binary adjective item (‘agree’ vs. ‘disagree’). Some of the participants may have been puzzled as ‘agree’ is associated to a negative statement.

TPB, TPB + DN, MGDB, and MGDB + DN were tested separately, since they all comprised a different set of constructs with their corresponding items (see Table 1, where the psychometric assessment is presented). Neither TPB nor TPB + DN showed an adequate model fit; CFI was less than 0.90 and they did not satisfy Hu and Bentler’s (1999) two-index conditions (TLI ≥ 0.96 and SRMR ≤ 0.09; RMSEA ≤ 0.06 and SRMR ≤ 0.09; or CFI ≥ 0.96 and SRMR ≤ 0.09). Even allowing for Browne & Cudeck’s (1993) “reasonable error of approximation”, which accepts RMSEA values up to 0.08, these models do not show an adequate fit, as their SRMR exceeded 0.09 (Table 2). Hypotheses 1 and 2 were not supported.

| Model | X²   | df  | p      | RMSEA | SRMR | CFI | TLI  |
|-------|------|-----|--------|-------|------|-----|------|
| Theory of Planned Behavior (TPB) | 1048.87 | 412 | <0.001 | 0.062 | 0.107 | 0.878 | 0.866 |
| TPB incl. descriptive norms (TPB + DN) | 1025.57 | 411 | <0.001 | 0.061 | 0.104 | 0.882 | 0.871 |
| Model of Goal Directed Behavior (MGDB) | 1541.74 | 709 | <0.001 | 0.054 | 0.070 | 0.887 | 0.877 |
| MGDB incl. descriptive norms (MGDB + DN) | 1529.28 | 708 | <0.001 | 0.054 | 0.066 | 0.889 | 0.878 |

Note. RMSEA: Root mean square error of approximation; SRMR: Standardized root mean square residual; CFI: Comparative fit index; TLI: Tucker Lewis index. Hu and Bentler’s (1999) two-index conditions for goodness of fit: TLI ≥ 0.96 and SRMR ≤ 0.09; RMSEA ≤ 0.06 and SRMR ≤ 0.09; or CFI ≥ 0.96 and SRMR ≤ 0.09.
In the case of MGDB and MGDB + DN, CFI was also lower than 0.90 (0.89 in both cases). However, their values for RMSEA (0.054 in both cases) and SRMR (0.070 and 0.066 respectively) confirmed the model was fit for purpose following Hu and Bentler’s (1999) two-index criteria. Hypotheses 3 and 4 were supported.

Since MGDB had an adequate fit, but not TPB, it was not possible to compare the total variance accounted for in intention to be physically active. Thus, Hypothesis 5 was not supported. Since TPB and TPB + DN did not have an adequate fit, we could not conduct a structural assessment and therefore could not determine whether TPB + DN accounted for more total variance in intention. Thus, Hypothesis 6 was not supported. MGDB and MGDB + DN did have adequate fit, allowing for a SEM analysis of the amount of variance in intention they each accounted for (next section). Finally, MGDB + DN had adequate fit while TPB + DN did not, and so a comparison of the amount of variance they each accounted for was not possible. Hypothesis 8 could not be supported.

Cronbach’s alphas of all constructs were acceptable to high, varying from 0.79 to 0.95 (Table 3). Average inter-item correlations ranged from 0.41 to 0.87. They were higher than 0.5 for all constructs for attitudes and desire, for which the value (0.41) was nevertheless above acceptable thresholds.

A structural assessment of MGDB showed that attitudes, injunctive norms and PBC correlated with desire, and desire with intention (as predicted by the theory). Positive and negative anticipated emotions, however, did not correlate with desire as predicted (Figure 3). For MGDB + DN, attitudes and PBC correlated with desire. Interestingly, descriptive norms also correlated significantly with desire, but not injunctive norms. As with MGDB, neither positive nor negative anticipated emotions correlated with desire, but desire did correlate

| Table 3. Summary of Statistics for Model of Goal-Directed Behavior Constructs (incl. Descriptive Norms). |
|---------------------------------------------------------------|
| **Scales**                  | **M** | **SD** | **Number of items** | **Cronbach’s alphas** | **Average inter-item correlation** |
|--------------------------------|-------|--------|---------------------|-----------------------|----------------------------------|
| Attitudes                     | 1.93  | 0.87   | 9                   | 0.86                  | 0.41                             |
| Injunctive norms              | 0.45  | 1.67   | 6                   | 0.91                  | 0.63                             |
| Descriptive norms             | -0.12 | 1.6    | 5                   | 0.88                  | 0.59                             |
| Perceived behavioral control  | 2.07  | 1.24   | 2                   | 0.79                  | 0.66                             |
| Positive anticipated emotions | 2.08  | 1.08   | 3                   | 0.81                  | 0.58                             |
| Negative anticipated emotions | -0.51 | 1.9    | 3                   | 0.89                  | 0.75                             |
| Desire                        | 1.08  | 1.27   | 5                   | 0.80                  | 0.45                             |
| Intention                     | 1.27  | 1.58   | 3                   | 0.95                  | 0.87                             |
with intention (Figure 4). Further research along these lines is warranted on the role of descriptive norms and the effect its inclusion might have on other constructs in the MGDB model.

Hypothesis 7 referred to the amount of total variance in intention explained by MGDB and MGDB + DN models. Results show that, for MGDB, the percentage of explained variance in intention, measured by the $R^2$, was 0.34 (in desire it was 0.56). For MGDB + DN it was 0.35 (for desire: 0.58). Hypothesis 7 was supported.

**Discussion**

This study assessed the addition of desires and positive and negative anticipated emotions to TPB applied to PA intentions, guided by the literature’s suggestion that what people *want* to do (which in turn is related to how they expect to feel about doing it) is a key variable to include in models explaining intention. It also assessed the addition of descriptive norms, based on the belief and evidence that what significant others do has an influence on intention. MGDB and MGDB + DN, which incorporate these additions, had an acceptable fit, with the direction of correlation of coefficients as expected from the theory and with substantial amounts of variance in intention accounted for. These results add to previous findings on the ability of MGDB to account for greater variance in
intention and behavior than TPB (Perugini & Bagozzi, 2001; Taylor, Bagozzi & Gaither, 2005; Perugini & Conner, 2000). To the best of our knowledge, this is the first reported attempt at applying MGDB to PA in the literature.

The fact that MGDB and MGDB + DN were fit for purpose, and TPB and TPB + DN not, suggest that emotions and desire should be taken into account when studying young adults’ levels of PA. Simply put, young adults will intend to be physically active if the emotions they anticipate from doing PA are positive, which in turn will drive their desire. To neglect this aspect of young people’s motivation to do sports is to miss a big part of the picture, and might result in suboptimal public health policies.

Similarly, the results showing that descriptive norms were significant instead of injunctive norms in MGDB + DN highlight the influence, on young adults, of what their peers and significant others do. In fact, the inclusion of descriptive norms as a construct displaced injunctive norms as the relevant measure of subjective norms, suggesting that, at the very least, descriptive norms should be considered alongside injunctive norms in MGDB studies (and possible TPB studies too). For public health policies, this finding suggests that campaigns aimed at increasing PA could highlight its prevalence in the community. If young adults get a sense that “everybody’s doing it”, they might just be encouraged to abandon their sedentary lifestyles. Further research should continue to explore the role of descriptive norms in PA levels.

**Figure 4.** SEM results for the Model of Goal-Directed Behavior (incl. Descriptive Norms).

Note. Structural equation modelling results reported with standardized coefficients. $R^2$ in desire: 0.58; $R^2$ in intention: 0.35. Level of significance: * $< 0.1$, ** $< 0.05$, *** $< 0.01$. 

![SEM diagram](image-url)
This study has some limitations which further research could overcome. First, the questionnaire was online and self-administered; therefore some limitations of these kinds of surveys might apply (such as self-selection bias and a high dropout rate).

Second, all scales showed high values in average inter-item correlation except for attitudes. Although the scale is nevertheless adequate and detects a real dimension, research should further improve it as applied to PA.

Third, the study aimed at capturing general attitudes towards PA, but in doing so violated Ajzen’s (2005) compatibility principle. In particular, while all other TPB scales referred to doing ‘physical activities at least 30 minutes on most days’, the attitude scale referred to doing ‘regular physical activity’. However, since this imperfect attitude construct was part of TPB, TPB + DN, MGDB and MGDB + DN the comparison between these theories, while hampered, was still possible.

Finally, differences by sex, age and country of residence may have affected the responses. In particular, participants in Croatia had a lower score for desire ($p < 0.001$) and intention and ($p < 0.05$). We cannot identify an explanation for these differences.

Despite these limitations, this paper contributes to the ongoing debate about the role of TPB and possible additions in explaining PA intentions. Specifically, MGDB – by including desires and anticipated emotions – can account for greater amounts of variance in intention to be physically active. Moreover, the inclusion of descriptive norms, as a complement to injunctive norms, improves MGDB’s model fit. These are contributions that improve the ability of TPB, as the dominant approach to guiding research on PA, to account for the differences in intention to be physically active and so remain a relevant theory for explaining health-related behavior.

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