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The theory of planned behavior: Frequently asked questions

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Abstract

The theory of planned behavior (TPB—Ajzen, Organizational Behavior and Human Decision Processes, 1991, 50, 179–211; Ajzen, Handbook of theories of social psychology, 2012, 1, 438–459) has been widely applied to the prediction and change of behavior, including behavior related to the use of technology. This article provides a brief description of the theory and discusses a number of issues and questions that have been raised with respect to the TPB. Among the issues discussed are the difference between the TPB and the theory of reasoned action, perceived behavioral control versus self-efficacy, the difference between perceived behavioral control and locus of control, the possibility of including additional predictors in the TPB, nonavailability of a standard TPB questionnaire, predicting behavior in a choice situation, the intention-behavior gap, and a comparison of the technology acceptance model to the TPB.

KEYWORDS
attitude, intention, perceived behavioral control, subjective norm, technology acceptance, theory of planned behavior

The ubiquitous intrusion of technology into everyday life is a blessing as well as a bane. It can make life easier and work more productive, but it also requires adoption of new skills in a rapidly changing environment, it is often accompanied by unwelcome invasion of privacy, and it can enable identity theft and other scams. Understanding people's responses to emerging technologies is a prerequisite for implementing effective interventions designed to facilitate behavioral changes that are needed to meet the demands of a high-tech society. In line with the focus of this special issue, the present article brings theory to bear on matters related to the prediction and change of behavior. Specifically, I describe the conceptual framework provided by my theory of planned behavior (TPB) (Ajzen, 1991, 2012) and deal with a number of questions and issues often raised in relation to this theory.

1 | BRIEF DESCRIPTION OF THE TPB

The theory of planned behavior (TPB) has been used successfully to explain and predict behavior in a multitude of behavioral domains, from physical activity to drug use, from recycling to choice of travel mode, from safer sex to consumer behavior, and from technology adoption to protection of privacy, to name but a few (for meta-analytic syntheses of some of this research, see e.g., Albarracin, Fishbein, & Goldestein de Muchinik, 1997; Armitage & Conner, 1999; Hagger, Chatzisarantis, & Biddle, 2002; Hirschey et al., 2020; McDermott et al., 2015; Riebl et al., 2015; Winkelnkemper, Ajzen, & Schmidt, 1919). The following description of the TPB is adapted from Ajzen and Kruglanski (2019).

1.1 | The principle of compatibility

The TPB starts with an explicit definition of the behavior of interest in terms of its *target*, the *action* involved, the *context* in which it occurs, and the *time* frame. Each of these elements can be defined at varying levels of specificity or generality. However, once the behavior has been defined, all other constructs in the theory must correspond to the behavior in all four elements. This is known as the *principle of compatibility* (Ajzen, 1988). For example, to study technology acceptance, an investigator may define the behavior of interest at a low level of generality, such as "installing (action) a webcam monitor (target) at

home (context) in the next three months (time frame)." Alternatively, the investigator may be interested in technology acceptance at a more general level and define the behavior as "buying (action) an internet-connected device (target) in the next three months (time)." Note that the target has been expanded to include a broad range of devices, not just a webcam, and that the context is left unspecified. The particular behavioral definition adopted determines how all constructs in the TPB are to be formulated and measured.

1.2 | Proximal determinants of behavior

The immediate antecedent of behavior in the TPB is the intention to perform the behavior in question; the stronger the intention, the more likely it is that the behavior will follow. To return to the above example, we could assess the intention to buy an internet-connected device in the next 3 months and determine whether participants did or did not implement their intentions. However, unanticipated events; insufficient time, money, or resources; lack of requisite skills; and a multitude of other factors may prevent people from acting on their intentions. The degree to which people have *actual control* over the behavior depends on their ability to overcome barriers of this kind and on the presence of such facilitating factors as past experience and assistance provided by others. In light of these considerations, the TPB postulates that degree of behavioral control moderates the effect of intention on behavior: The greater the actor's control over the behavior, the more likely it is that the intention will be carried out (for a discussion of the intention x control interaction, see Fishbein & Ajzen, 2010, pp. 65–66).

1.3 | Determinants of intentions

According to the TPB, behavioral intentions are determined by three factors: *attitude toward the behavior*, *subjective norm* concerning the behavior, and *perceived behavioral control*. In the current formulation of the theory, a favorable attitude and a supportive subjective norm provide the motivation to engage in the behavior but a concrete intention to do so is formed only when perceived control over the behavior is sufficiently strong. These notions are described in greater detail below.

1.3.1 | Attitude toward the behavior

The TPB relies on an expectancy-value formulation to describe the formation of attitude toward a behavior. Specifically, attitude toward the behavior is assumed to be a function of readily accessible beliefs regarding the behavior's likely consequences, termed *behavioral beliefs*. A behavioral belief is the person's subjective probability that performing a behavior of interest will lead to a certain outcome or provide a certain experience, for example, the belief that wearing a heart monitor (the behavior) can detect heart arrhythmia (the outcome) or is inconvenient (the experience).

In their aggregate, behavioral beliefs are theorized to produce a positive or negative attitude toward the behavior. Specifically, the positive or negative valence of each anticipated outcome or experience contributes to the overall attitude in direct proportion to the subjective probability that the behavior will produce the outcome or experience in question. This expectancy-value model is represented in Equation (1). As can be seen, the strength of each accessible belief (b) is multiplied by the subjective evaluation (e) of the outcome or experience and the resulting products are summed. A person's attitude (ATT) is expected to be directly proportional ($\propto$) to this composite belief index.

$$ATT \propto \Sigma b_i e_i \quad (1)$$

1.3.2 | Subjective norm

We can distinguish between two types of normative belief: *injunctive* and *descriptive* (see Fishbein & Ajzen, 2010). An injunctive normative belief is the expectation or subjective probability that a given referent individual or group (e.g., friends, family, spouse, coworkers, one's physician or supervisor) approves or disapproves of performing the behavior under consideration. Descriptive normative beliefs, on the other hand, are beliefs as to whether important others themselves perform the behavior. Both types of beliefs contribute to the overall perceived social pressure to engage in the behavior or subjective norm. As shown in Equation (2), each accessible normative belief (n) with respect to a given social referent, whether injunctive or descriptive, contributes to subjective norm (SN) in interaction with the referent's importance or significance (s) to the individual, and the subjective norm is directly proportionate to the sum of the $n \times s$ products.

$$SN \propto \Sigma n_i s_i \quad (2)$$

1.3.3 | Perceived behavioral control

Just as attitudes are assumed to be based on accessible behavioral beliefs and subjective norms on accessible normative beliefs, perceived behavioral control is assumed to be based on accessible control beliefs. These beliefs are concerned with the presence of factors that can facilitate or impede performance of the behavior. Control factors include required skills and abilities; availability or lack of time, money, and other resources; cooperation by other people; and so forth. A control belief is defined as a person's subjective probability that a given facilitating or inhibiting factor will be present in the situation of interest. Each control belief contributes to perceived behavioral control in interaction with the factor's perceived power to facilitate or impede performance of the behavior. Perceived behavioral control (PBC) is directly proportional to the composite score derived by

summing the products of control belief strength (c) times perceived power (p) over all accessible control factors, as shown in Equation (3).

$$PBC \propto \Sigma c_i p_i \quad (3)$$

In the TPB, perceived behavioral control is assumed to moderate the influence of attitude and subjective norm on intention, and actual behavioral control is assumed to moderate the effect of intention on behavior. That is, a favorable attitude and a supportive subjective norm are said to lead to the formation of a favorable behavioral intentions to the extent that people believe that they are capable of performing the behavior in question. Similarly, as noted earlier, people are expected to be able to act on their intentions to the extent that they have control over performance of the behavior. When knowledge about actual behavioral control is limited, perceived behavioral control can be used as a proxy to aid in the prediction of behavior under the assumption that perceived control reflects actual control reasonably well.

1.4 | Feedback effects

Performance of a behavior results in information about the *actual* (as opposed to anticipated) outcomes, experiences, reactions by significant others, as well as about facilitating or impeding factors encountered by the actor. This feedback is likely to change some of the behavioral, normative, and control beliefs and thus influence future intentions regarding the behavior in question. For example, a woman may initially believe that working out before work will be invigorating, that it will be applauded by her boss and coworkers, and that she can get to the gym early enough to be at work on time. Yet on her initial attempts she discovers that it takes her much longer to get to the gym than anticipated due to heavy rush hour traffic, that working out at the gym leaves her tired and dispirited rather than invigorated, and that neither her coworkers nor her supervisor express support for this behavior. These changes in behavioral, normative, and control beliefs may result in less favorable attitudes and subjective norms as well as in a lower sense of behavioral control, all of which may lead her to abandon her intention to work out at the gym prior to going to work.

2 | ISSUES AND QUESTIONS RAISED IN RELATION TO THE TPB

Well over 2,000 empirical studies have used the TPB in attempts to predict and/or change behavior in a variety of domains (for a partial list of references, see Ajzen, 2020). In their attempts to apply the theory, investigators have encountered a variety of issues, sometimes turning to me for assistance. When questions were posed repeatedly, I tried to provide brief answers or clarifications in the Frequently Asked Questions section of my website (https://people.umass.edu/aizen/faq.html). In the following discussion, I present or rephrase some of the frequently asked questions and expand on the information provided online.

2.1 | What is the difference between the theory of reasoned action and the TPB?

When formulating the theory of reasoned action, Ajzen and Fishbein (1980); Fishbein and Ajzen (1975) assumed that most behaviors of interest to social and behavioral scientists are likely to be under volitional control, and that perceptions of control are correspondingly strong. In other words, we proposed that people inclined to perform a behavior of interest to the investigator were capable of performing it and that they could easily refrain from doing so if they decided against it. It follows that performance of the behavior should be a direct function of behavioral intentions. We further proposed that intentions are determined by attitude toward the behavior and by subjective norm.

After working with the theory of reasoned action for several years, I realized that the assumption of perfect volitional control placed severe limitations on the theory's ability to deal with behaviors that pose difficulty of execution (see Ajzen, 1987). Clearly, people can face problems or be prevented from acting on intentions to perform even such a mundane behavior as attending a concert if, for example, the person's car breaks down on the way to the venue or tickets have run out. In fact, performance of many behaviors entails possession of certain skills and knowledge or requires cooperation by other people; and it may demand the ability to overcome such barriers as lack of money, time, or other resources. For this reason, I added the construct of control, calling the revised model the TPB. As noted earlier, in the TPB, *actual control* over a behavior is said to moderate the effect of intention on behavior such that intentions are likely to be followed by performance of the behavior to the extent that actual control is high. Moreover, building on Bandura's (1997) construct of self-efficacy, I postulated that the extent to which people *believe* that they have control over behavioral performance could moderate the effects of attitudes and subjective norms on intentions. I therefore added *perceived behavioral control*, defined as people's perceptions of their ability to perform a given behavior, as a third determinant of intention.

It can be seen that the theory of reasoned action is a special case of the TPB. The major difference between the two theories is that the TPB includes actual and perceived behavioral control as additional determinants of intentions and behavior. When people have perfect volitional control over the behavior of interest, and when they strongly believe that they are capable of performing the behavior if they so desire, behavioral control is irrelevant, and the TPB reduces to the theory of reasoned action.

2.2 | What is the difference between perceived behavioral control and self-efficacy?

Conceptually, there is no difference between perceived behavioral control and self-efficacy. Both refer to people's beliefs that they are

capable of performing a given behavior. Operationally, however, perceived behavioral control and self-efficacy are usually assessed in different ways. Research with Bandura's (1977) concept of self-efficacy typically defines a graded series of potential obstacles to performance of the behavior and participants are asked to indicate how likely it is that they could overcome each obstacle. To assess perceived behavioral control, participants are usually asked to rate the extent to which they have the ability to perform the behavior, how much the behavior is under their control, and so forth (see https://people.umass.edu/aizen/pdf/tpb.measurement.pdf). It would be a mistake to assume that some of these items (e.g., rated ability to perform the behavior) assess self-efficacy whereas other items (e.g., the extent to which the behavior is under my control) assess PBC.

2.3 | Is perceived behavioral control a direct determinant of intention or a moderator?

Theoretically, perceived behavioral control is a moderating variable, affecting the degree to which attitudes and subjective norms influence intentions. Indeed, in my original formulation of the TPB (Ajzen, 1985), perceived behavioral control was assigned the role of a moderator. However, because empirical research tended to find only main effects, later formulations (e.g., Ajzen, 1991, 2012) and most empirical applications of the model have treated perceived behavioral control as a direct determinant of intention with a status equal to that of attitude and subjective norm. Recent research, however, has provided evidence in support of the proposed interactions (see e.g., Castanier, Deroche, & Woodman, 2013; Earle et al., 2019; Hukkelberg, Hagtvet, & Kovac, 2014; Yzer & van den Putte, 2014).

2.4 | How do you measure actual behavioral control?

In the TPB, actual behavioral control moderates the effect of intentions on behavior. An essential prerequisite for assessing a person's actual control is a good understanding of the various internal factors (skills, knowledge, physical stamina, intelligence, etc.) and external factors (legal barriers, money, equipment, cooperation by others, etc.) that are needed to perform the behavior or that can interfere with its performance; as well as a way to assess the extent to which the person has or can obtain the requisite resources and overcome potential barriers. Because it is usually much more difficult to measure actual behavioral control than perceived behavioral control, most studies rely on perceived behavioral control as a proxy for actual control.

2.5 | What is the difference between perceived behavioral control and locus of control?

The locus of control concept involves a distinction between internal and external determinants of events in one's life. People are assumed to differ in their general beliefs that events in their lives are controlled by internal factors, such as their abilities, motivation, or personality traits, and external factors, such as the behavior of others or chance (Rotter, 1966). Locus of control has also been defined in relation to a particular life domain, such as health locus of control, that is, people's beliefs regarding the extent to which their health is controlled by internal vs. external forces (Wallston, Wallston, Kaplan, & Maides, 1976). In contrast, perceived behavioral control deals with a particular behavior of interest and refers to the perceived *degree of control* over the behavior, irrespective of whether the factors determining the perceived degree of control are internal or external. Perceived internal locus of control should therefore not be equated with high-perceived behavioral control, nor should perceived external locus of control be equated with low perceived behavioral control. Perceived lack of ability, for example, is an internal causal factor, yet it would produce a sense of low—not high—perceived behavioral control. Similarly, performance of a behavior may depend on the cooperation of others (an external factor), but people may believe that they nevertheless have high behavioral control because they are confident of obtaining the needed cooperation.

2.6 | Can the TPB be expanded by adding more predictors of intention or behavior?

According to the TPB, attitude, subjective norm, and perceived behavioral control are the lone predictors or intention; and intention and actual control are the only factors determining behavior. No additional constructs should be required to secure accurate prediction of intention and behavior. These propositions are known as the *assumption of sufficiency*. Nevertheless, the TPB is, in principle, open to the inclusion of additional predictors. Just as the theory of reasoned action was expanded to produce the TPB by adding actual and perceived behavioral control, so too it is possible to include other predictor variables not already part of the theory. Among the additional factors most often proposed by investigators are self-identity (the extent to which I consider myself to be the kind of person who performs the behavior of interest), anticipated affect (how performing the behavior would make me feel), and past behavior (as an indicator of habit strength). For a discussion of research testing the sufficiency assumption, see Fishbein & Ajzen, 2010, pp. 281–309.

However, for the sake of parsimony, additional predictors should be proposed and included in the TPB with caution, and only after careful deliberation and empirical exploration. Among the criteria that should be met by any proposed addition are the following.

- Like the theory's existing predictors (attitude toward the behavior, subjective norm, perceived behavioral control, actual control, and intention), the proposed variable should be behavior-specific, conforming to the principle of compatibility. That is, it should be possible to define and measure the proposed factor in terms of the target, action, context, and time elements that define the behavioral criterion.

- It should be possible to conceive of the proposed variable as a causal factor determining intention or action.
- Proposed additions should be conceptually independent of the theory's existing predictors, rather than be redundant with them.
- The factor considered should potentially be applicable to a wide range of behaviors studied by social and behavioral scientists.

2.7 | What about such general dispositions as personality traits, life values, and demographic characteristics?

Personality traits, intelligence, demographic characteristics, life values, and other variables of this kind are considered *background factors* in the TPB. They are assumed to influence intentions and behavior indirectly by affecting behavioral, normative, and/or control beliefs. That is, the components of the TPB are assumed to mediate the effects of background factors on intentions and behavior. The theory acknowledges that background factors can provide valuable information about possible precursors of behavioral, normative, and control beliefs, information not provided by the theory itself. Conversely, with the aid of the TPB it becomes possible to examine why a given background factor influences, or fails to influence, behavior by tracing its effects via the more proximal antecedents of the behavior.

2.8 | Why is there no standard TPB questionnaire?

For reasons described below, no standard TPB questionnaire can be offered. To be sure, customary *methods and procedures* have been developed over the years to devise reliable and valid measures of the TPB constructs (see Fishbein & Ajzen, 2010, appendix for a detailed description). Briefly, first, a pilot study is conducted to elicit behavioral, normative, and control beliefs readily accessible in the research population. The most frequently mentioned beliefs are selected. Second, the pilot study is used to develop items with good psychometric properties to assess attitude toward the behavior, subjective norm, perceived behavioral control, and intention, and where possible, to identify indicators of actual behavioral control. Third, in the main study, a questionnaire containing the items developed in the formative research is administered. Typically, seven-point bipolar adjective scales (e.g., probable—improbable; desirable—undesirable) are used, although other scale types are also possible. Lastly, the behavior of interest is observed or self-reported either immediately or at some later point in time.

Behavioral, normative, and control beliefs are considered *formative indicators* as they are assumed to assess the factors that determine (lead to the formation of) attitude, subjective norm, and perceived behavioral control, respectively. As implied by the expectancy-value formulation of attitude toward the behavior, subjective norm, and perceived behavioral control (see Equations (1)–(3)), two measures are obtained for each accessible belief identified in the pilot study: belief strength and associated value (outcome evaluation, significance of social referent, power of control factor). Prior to multiplication, an optimal scaling analysis must be conducted to determine whether to use bipolar (e.g., −3 to +3) or unipolar (e.g., 1 to 7) scoring of these measures (see Ajzen & Fishbein, 2008).

Attitude toward the behavior, subjective norm, perceived behavioral control, and intention are assessed by means of *reflective indicators*, sets of items designed to provide relatively direct measures of these constructs. Unlike the formative belief measures, whose content was provided by the research population, the reflective items are selected arbitrarily by the investigator and are interchangeable so long as they are good indicators of the underlying latent construct. The convergent and discriminant validities of the formulated reflective indicators are evaluated by means of confirmatory factor analysis. Items designed to assess a given latent variable (e.g., attitude toward the behavior) should load highly on a single factor, and there should be no strong cross-loading, that is, items designed to measure one construct (e.g., perceived behavioral control) should not exhibit significant loadings on other latent variables (e.g., intention).

Sample TPB questionnaires can be found on my website (https://people.umass.edu/aizen/pdf/tpb.questionnaire.pdf) and in the appendix to my book with Martin Fishbein (Fishbein & Ajzen, 2010). However, these questionnaires are provided only for purposes of illustration. The above discussion makes clear that the items shown in the sample questionnaires and items employed in published research papers may not be appropriate for a different behavior, population, or time period. Obviously, the behavioral, normative, and control beliefs that are readily accessible with respect to one behavior (e.g., buying an internet-connected electric switch) are likely to be very different from the beliefs accessible in relation to a different behavior (e.g., joining a social network). Moreover, readily accessible beliefs may vary from one population to another and beliefs can change over time such that the beliefs that were found to be accessible in an earlier study are not representative of the beliefs that dominate at a later time point. Even the reflective indicators of attitude toward the behavior, subjective norm, perceived behavioral control, and intention that were found to have good convergent and discriminant validity in one investigation may have poor psychometric properties in a different context, with a different population, and in a later time period. Formative research is therefore required to construct an original questionnaire suitable for the behavior and population of interest. If beliefs are to be assessed, they must be elicited anew from a representative sample of the research population. Similarly, items designed to directly assess the theory's constructs by means of reflective indicators must be validated prior to construction of the final questionnaire.

Note that the requirement of convergent and discriminant validity in relation to the reflective indicators of attitude toward the behavior, subjective norm, perceived behavioral control, and intention does not apply to the composite formative belief measures. The set of readily accessible behavioral beliefs, for example, may link the behavior to positive as well as negative outcomes and experiences, resulting in low internal consistency and an ambivalent attitude. The same is true of subjective norms and perceptions of control. Moreover, behavioral, normative, and control belief items may well correlate across constructs, resulting in limited discriminant validity.

2.9 | Can focus groups be used to elicit accessible behavioral, normative, and control beliefs?

The preferred method for eliciting accessible beliefs is a free-response format in which individuals are asked to take a few minutes to list, with respect to the behavior of interest, the likely outcomes and experiences, normative referents, and control factors that come readily to mind. In the TPB, the beliefs that come readily and spontaneously to mind are assumed to be the prevailing determinants of attitude toward the behavior, subjective norm, and perceived behavioral control. These may not be the beliefs identified when employing focus groups. By encouraging discussion of ideas brought up by individual group members, focus groups can lead to the selection of beliefs that are not readily accessible for most people in the research population.

2.10 | What is the relation between "direct" and "indirect" measures of attitude, subjective norm, and perceived behavioral control?

Composites of readily accessible behavioral, normative, and control belief ($\Sigma b_i e_i$, $\Sigma n_i s_i$, *and* $\Sigma c_i p_i$) are *not* indirect measures of attitude, subjective norm, and perceived behavioral control even though this terminology is often used. Instead, as noted, they are formative indicators (determinants) of attitude toward the behavior, subjective norm, and perceived behavioral control, respectively. Each of these latter constructs is assessed by means of reflective indicators (or so-called direct measures). Theoretically, attitudes are based on behavioral beliefs, subjective norms on normative beliefs, and perceived behavioral control on control beliefs (see Equations (1)–(3)). However, these propositions are subject to empirical test usually performed by correlating the belief composite with the corresponding direct measure of attitude toward the behavior, subjective norm, and perceived behavioral control. A strong correlation confirms the expectancy-value model and at the same time provides evidence for the validity of the formative and reflective indicators employed. Because the belief composites are assumed to assess the determinants of attitude toward the behavior, subjective norm, and perceived behavioral control, their effects on intentions are expected to be mediated by attitude toward the behavior, subjective norm, and perceived behavioral control as assessed by the reflective indicators (direct measures). It follows that the direct measures best reflect the immediate antecedents of intentions and they, rather than the belief composites, should be used to predict intentions.

2.11 | Why do we observe correlations among the theory's predictors?

Attitude, subjective norm, and perceived behavioral control are *conceptually* independent predictors of intentions. However, *empirically* they are free to correlate with each other and, indeed, empirical research has typically reported correlations of low to moderate magnitude among them (see e.g., Hagger et al., 2002). Any item of information can affect more than one of the theory's predictors and hence produce correlations among them. Consider, for example, a man who suffers from hypertension and who learns (forms the belief) that eating a low-calorie, easy to prepare diet can lower blood pressure. The new behavioral belief formed by this information may lead to a more favorable attitude toward eating a low-fat diet. However, it may also suggest to the individual that doing so would gain the approval of his wife and physician, producing a more supportive subjective norm; and it may convince him that he is capable of adhering to a low-fat diet, strengthening perceived behavioral control. Of course, his attitude, subjective norm, and perception of control with respect to eating a low-fat diet will also be influenced by other considerations, but all else equal, this item of information would tend to produce some degree of correlation among the three predictors of intention.

2.12 | Can the TPB be used to study behavioral categories?

We are often interested in predicting, explaining, or changing a set or category of behaviors, such as exercising, studying, conserving energy, or accepting new technology—not any single action. Note, first, that going from a single behavior to a behavioral category simply involves generalizing the action element in the definition of the behavior. Thus, for example, instead of defining the behavior as "installing energy-efficient light bulbs in my home in the next six months," an investigator interested in reduced energy consumption could define the behavioral criterion as "taking measures in the coming six months to reduce energy consumption in my home."

To apply the TPB to such a behavioral category, the investigator must first present research participants with an explicit definition of the category in question. This can often be done by listing the kinds of actions that are representative of the category as a whole. Returning to the above example, participants could be told that among the measures that can be taken to reduce energy consumption are lowering thermostats in the winter and raising them in the summer, turning off lights when not needed, installing energy-efficient light bulbs, taking shorter showers, and turning off computers when they are not in use. All TPB constructs are then assessed with respect to the behavioral category, as defined: attitude toward taking measures to reduce energy consumption, subjective norms with respect to taking such measures, and so forth.

As to assessing the behavior itself, it would obviously be impractical if not impossible to secure observations of each energy-saving behavior participants could possibly perform over a six-month period. Instead, the investigator can re-interview participants after 6 months and ask them to rate the extent to which they had, overall, reduced their energy use over the previous 6 months. Alternatively, and perhaps less subject to bias, the investigator could make a list of possible energy-saving behaviors and ask participants to indicate which of these behaviors they had performed over the previous 6 months, and how frequently they had done so. The responses are aggregated to

obtain a measure of behavior representing the behavioral category. The more behaviors the participants performed, and the more frequently they did so, the higher their energy-saving score.

Note that a measure of behavior obtained in this way may not be appropriate for all behavioral categories. For example, in the case of physical activity, a person need not engage in many different exercise behaviors to be considered physically active. Frequent performance of one or two activities (e.g., jogging, weightlifting, biking, swimming, walking on a treadmill, aerobics) is sufficient. In this case, it is possible to define the behavioral category without listing particular exemplars. For instance, participants could be told that we are interested in vigorous exercise defined as 30 min or more of physical activity that produces a sweat, at least three times a week. The TPB constructs, as well as the self-reported behavior, are then assessed in relation to vigorous exercise (as defined).

2.13 | Can the TPB be used to predict behavior in a choice situation?

Although not always acknowledged, every behavior involves a choice among alternative courses of action even if the only alternative to performing a given behavior is not to perform it. Attitude, subjective norm, and perceived behavioral control are postulated to produce a behavioral intention with respect to each of the behavioral options. As a decision-making model, the TPB predicts that the option toward which the individual has the strongest behavioral disposition, that is, the option that is associated with the strongest intention, will be chosen (see Ajzen & Fishbein, 1969 for empirical support).

In some cases, beliefs about not performing a behavior are largely mirror images of beliefs about performing it. In those cases, we can simply assess the TPB constructs in relation to performing the behavior. However, sometimes different beliefs are readily accessible in relation to the behavioral alternatives. For example, if we are interested in travel-mode choice, the considerations that come readily to mind with respect to using public transportation may not simply be mirror images of the considerations that guide using one's car. By the same token, attitudes, subjective norms, perceptions of control and intentions with respect to the two alternatives may also not stand in perfect inverse relation to each other. In this case, it is recommended that, if practically feasible, all TPB constructs be assessed in relation to both options under consideration. Doing so will provide a more complete account of the factors that guide the decision and thus improve prediction of intentions and behavior (see Ajzen & Sheikh, 2013).

2.14 | Can a measure of intention be used as a proxy for a measure of behavior? Or why is my measure of intention a poor predictor of actual behavior?

It is well-known that people do not always act on their intentions. Indeed, meta-analytic syntheses have found that intentions account, on average, for only about 25% of the variance in behavior (see e.g., Sheeran, 2002; Winkelnkemper et al., 1919). It follows that a measure of intention will not necessarily predict actual behavior, and that a change in intentions will not necessarily be followed by behavior change. How closely linked they are is an empirical question. We may be able to justify using intention as a proxy for behavior if we have independent evidence for a strong intention-behavior correlation in the population, context, and time period under investigation. In the following list, I briefly summarize some of the conditions that can imperil the intention-behavior correlation (see Fishbein & Ajzen, 2010, pp. 53–68, for a more comprehensive discussion).

- *Restriction of range*. If intentions or behaviors in the research population exhibit little variance, correlations between the two will tend to be low. Imagine, for example, a study designed to explore whether smokers who are diagnosed with cardio-vascular disease quit smoking. A strong correlation between quitting intentions and behavior cannot be expected if most participants express an intention to quit and/or if most participants actually quit smoking.
- *Lack of compatibility*. When measures of intention and behavior fail to observe the principle of compatibility, intentions will tend to be poor predictors of behavior. Compatibility can be impaired in two ways. (a) The measure of intention may fail to correspond to the behavior in terms of the target, action, context, and time elements that define the behavior. For example, we would not expect a strong intention-behavior correlation if the behavior to be predicted was adoption of a novel accounting software, but the investigator measured intentions to adopt technology in general (a much broader target element). (b) Even when compatibility is strong in terms of the behavioral elements, intention-behavior correlations can decline if measures of the variables lack scale compatibility (see Courneya, 1994). Intentions are usually assessed by means of probabilistic scales while the behavior may be measured in terms of frequency. For example, we may ask participants whether they intend to go to the gym in the next 3 months, using such scales as *likely—unlikely* and *definitely—definitely not*, but then measure behavior by recording how often they actually went to the gym in the course of the 3 months. The lack of scale compatibility can cause the correlation to be lower than the correlation that might have been obtained if intentions had also been assessed on a frequency scale, that is, how often participants intended to go to the gym in the next 3 months.
- *Forgetting*. Some behaviors, such as going to a doctor's appointment or picking up milk after work, are performed at a particular point in time. People who expressed an intention to perform the behavior may fail to do so if they forget to act on their intentions. It is for this reason, of course, that many doctors' offices send out timely reminders of upcoming appointments. An easy intervention that can alleviate this problem is elicitation of an implementation intention. After expressing their intentions to perform a particular behavior, participants are asked to indicate when, where, and how they plan to implement them (see Gollwitzer, 1999). Doing so

tends to increase the likelihood that people will act on their intentions.

- *Change of mind*. Intentions can of course change over time. New information that becomes available after people have expressed their intentions may change some of their behavioral, normative, and control beliefs and, as a result, change their intentions. The original intentions would then no longer be predictive of their later behavior. This implies that the intention-behavior correlation will be the strongest when intentions are assessed just prior to observation of the behavior. A case in point is the prediction of voting behavior. Predictions based on voting intentions become more accurate as the date of the election nears. Consistent with this line of reasoning it has been shown that the correlation between intention and behavior tends to decline as the time interval between measurement of intention and behavior increases, presumably because there is a greater potential for intervening events to produce changes in beliefs (see Randall & Wolff, 1994 for a meta-analysis of this research and Fishbein & Ajzen, 2010, p. 56, for a discussion).
- *Low control over the behavior*. Made explicit in the TPB is the proposition that the correlation between intention and behavior depends on the extent to which people have control over behavioral performance. A low intention-behavior correlation may be an indication that people lack effective behavioral control. From a behavior-change perspective, this would imply that it is not sufficient to strengthen intentions to perform the desired behavior. In addition, it would also be necessary to provide people with the means to act on their intentions.
- *Hypothetical bias*. As a general rule, intentions tend to be biased in a socially desirable direction. For example, in a review of six studies dealing with condom use, cancer screening, and physical exercise, Sheeran (2002) found that among participants who expressed an intention to engage in these behaviors, only about 50% actually did. Similarly, in contingent value measurement where people are asked how much money they would be willing to spend on a worthwhile public good that is not traded in the marketplace, the intended amount of money tends to greatly exceed the actual amount given. This hypothetical bias arises because the beliefs that are readily accessible in memory when intentions are assessed differ substantially from the beliefs that are readily accessible in the behavioral context (see Brown, Ajzen, & Hrubes, 2003). Specifically, people's behavioral, normative, and control beliefs with respect to a socially desirable behavior tend to be more favorable when performing the behavior is considered in the abstract than when confronted with actually engaging in the behavior.

2.15 | What is the role of knowledge in the TPB? Or are people assumed to be rational?

Knowledge in the sense of correct factual information plays no direct role in the TPB. To be sure, attitudes, subjective norms, and perceptions of behavioral control are assumed to be based on the beliefs people hold regarding the behavior's consequences, the normative expectations of others, and the factors that may facilitate or impede behavioral performance. Although these beliefs represent the information people have in relation to a given behavior, whether this information is factually correct or incorrect is immaterial. In fact, people's beliefs are usually based on incomplete information and may well be misguided, biased, paranoid, self-serving, or irrational in other ways. What matters in the TPB is whether the beliefs a person holds encourage or discourage performance of the behavior. Thus, people are not assumed to be rational; only that their intentions and behaviors follow reasonably from their beliefs.

Consider, for example, a homeowner who believes that installing solar panels will obviate the need to draw power from the grid and pay for itself in a matter of 2 or 3 months. Although factually incorrect, these items of "knowledge" would tend to encourage the person to have solar panels installed. Behavior is thus consistent with beliefs held, but there is no necessary relation between the veracity of beliefs and performance of a behavior.

2.16 | Can the TPB be falsified?

A great deal of research has provided empirical support for the predictive validity of the TPB. However, the theory's propositions may seem to be self-evident. After all, it makes sense that people who hold more favorable attitudes and subjective norms with respect to performing a behavior should also be more likely to form a favorable intention; and people who intend to perform the behavior should also be more likely to actually do so than people who do not intend to engage in the behavior. Because the theory's propositions are intuitively reasonable, its falsifiability is sometimes questioned. The argument is made that the theory's self-evident predictions will mostly be confirmed and in the relatively rare cases when they are not, we are apt to blame the study's methodology.

Note first that there is nothing wrong with a theory that is intuitively reasonable. While there certainly is room for theories and research that explore unexpected phenomena, when formulating a general theory of behavior, we are unlikely to find many counter-intuitive propositions that stand up to empirical test. More to the point, the TPB contains many not so obvious propositions that can be submitted to empirical test. Among other things it predicts a number of mediating and moderating processes: (a) intention mediates the effects of attitude and subjective norm on behavior; (b) perceived behavioral control moderates the effects of attitude and subjective norm on intention; (c) actual control (or its proxy perceived behavioral control) moderates the effect of intention on behavior; (d) beliefs influence intentions and behavior *indirectly* by their effects on attitudes, subjective norms, and perceived behavioral control; (e) background factors (e.g., personality traits, values, demographic characteristics, etc.) influence behavior only *indirectly* by their effects on beliefs; and (f) the TPB includes expectancy-value models specifying the way in which behavioral beliefs influence attitude toward the behavior, normative beliefs influence subjective norm, and control

beliefs influence perceived behavioral control. Methodically sound empirical research that disconfirms these various propositions would tend to falsify the theory.

2.17 | How does the technology acceptance model compare with the TPB?

Interested in the acceptance of computer-related technology in the workplace, Davis (1989) adapted constructs from the TPB to develop the technology acceptance model. Specifically, according to the technology acceptance model, intention to accept a given technology (e.g., videoconferencing in the workplace) is a function of its perceived *usefulness* and its perceived *ease of use*. The instrument developed by Davis to assess perceived usefulness has to do with the extent to which acceptance of the technology is viewed as increasing job productivity, effectiveness, and speed; while perceived ease of use is measured in terms of how easy it is to learn and control the technology. It can be seen that perceived usefulness deals with possible consequences of accepting the technology and hence has some relation to attitude toward the behavior whereas perceived ease of use is allied with the concept of perceived behavioral control.

In contrast to the technology acceptance model, which is content-specific, applying mainly to the acceptance of technology, the TPB is formulated at a very general level. Its constructs are content-free, assumed to be applicable to any behavior of interest to social and behavioral scientists. The specific content or substance is provided in the process of applying the theory to explain or change a given behavior or course of action. Thus, an investigator trying to understand the prevailing determinants of using videoconferencing technology in the workplace would elicit accessible beliefs about the consequences of this behavior, about the expectations of significant referent individuals or groups, and about facilitating or inhibiting factors that may affect control over performance of the behavior. Examination of the most frequently listed considerations provides a picture of the behavior's fundamental determinants. This information helps to explain attitudes, subjective norms, and perceptions of control with respect to using videoconferencing and it can be used to predict intentions to adopt this technology and actual adoption as well as to devise effective behavior-change interventions.

As a content-specific model, the technology acceptance model has its advantages and disadvantages. On the positive side, it provides advance information about the kinds of factors that must be considered in order to understand technology acceptance. Specifically, it stipulates that technology is likely to be accepted if it is viewed as useful and as easy to use, and instruments are available to obtain reliable and valid measures of these constructs. In contrast to the TPB, no formative research is required to ascertain the important considerations that guide people's acceptance of the technology in question, nor is it necessary to construct an original survey instrument.

The disadvantages of the technology acceptance model are also related to the fact that it promises to provide advance information about the factors that influence the acceptance of new technology. Several possible pitfalls of this approach can be identified.

- By focusing on the perceived usefulness of adopting a given technology, the model may fail to take into account other factors that can influence attitudes toward this behavior. For instance, if we elicited readily accessible beliefs about using videoconferencing on the job, we might find that in addition to listing its usefulness, many people also mention that they feel uneasy about speaking on camera and that using this technology permits the employer to record their interactions with coworkers and judge their performance. A complete assessment of readily accessible behavioral beliefs may thus reveal a much more ambivalent attitude than would be measured in terms of perceived usefulness alone. Moreover, the perceived outcomes and experiences that determine attitude toward technology acceptance are likely to vary from one type of technology to another. This possibility cannot be captured by the technology acceptance model, which assumes that the same outcomes determine attitudes toward acceptance of each and every technology.
- The same considerations apply to the perceived ease of use assessed in terms of how easy it is to learn and control the technology under consideration. Perceived behavioral control could also be affected by beliefs about the availability of technical assistance, the amount of time allowed to get used to the new technology, people's beliefs about their tech savviness, and so forth. Again, control beliefs can vary across different kinds of technology. By foregoing elicitation of control beliefs and simply relying on predetermined aspects of control, the investigator risks misjudging people's perceptions of how much control they have over the behavior.
- By specifying in advance what factors are likely to influence behavior in a given domain, content-specific models like the technology acceptance model risk overlooking important additional determining variables. Indeed, as originally formulated, the technology acceptance model failed to consider the impact of perceived social norms. The extent to which accepting a technology is seen as a job requirement and as approved of by one's supervisor (i.e., injunctive normative beliefs) and expectations as to whether coworkers are likely to accept it (a descriptive normative belief) may be important determinants of subjective norms and hence of behavioral intentions. Recognizing this deficiency, the technology acceptance model has been extended to include perceived social norms (Schepers & Wetzels, 2007; Venkatesh & Davis, 2000).

3 | CONCLUSIONS

In their efforts to understand, predict, or change behavior, investigators are well advised to rely on an established, empirically

validated theoretical framework. As Kurt Lewin (1952) famously observed, "…there is nothing more practical than a good theory" (p. 169). Consistent with this argument, a meta-analysis of behavior-change interventions delivered online (Webb, Joseph, Yardley, & Michie, 2010) showed that interventions based on a theoretical framework were more effective in changing health-related behavior than non-theory-based interventions. The TPB, in particular, stood out as an effective framework for guiding the design of a behavior-change intervention (see also Steinmetz, Knappstein, Ajzen, Schmidt, & Kabst, 2016).

The TPB is characterized by several features that may help explain its widespread use as a model for the prediction and change of behavior. First, unlike many other theories in the social and behavioral sciences it is focused squarely on the determinants of behavior and, as discussed above, it can be applied to any behavior of interest to the investigator. Second, the TPB is accompanied by a set of well-established methodological tools that can be used to obtain reliable and valid measures of its theoretical constructs. Third, the theory offers a clearly specified structural model, which provides a conceptual framework for thinking about the determinants of the behavior under consideration and which can be submitted to empirical test by means of multiple regressions or structural equation modeling. Finally, of course, the theory has received considerable support in a large number of empirical investigations (see Fishbein & Ajzen, 2010). Nevertheless, trying to apply this conceptual framework in their own research, investigators have encountered a variety of theoretical and practical issues. It is hoped that by addressing these issues, the present article can contribute to a better understanding of the approach offered by the TPB.

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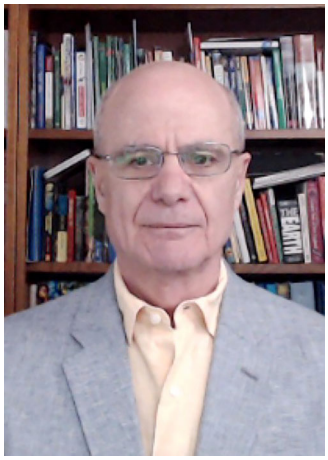

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