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15

A Meta-Analysis of the Theory of Reasoned Action and the Theory of Planned Behavior: The Principle of Compatibility and Multidimensionality of Beliefs as Moderators

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Summary

Secondary analyses were conducted using 27 primary studies to assess the magnitude of relationships of intentions, attitudes, subjective norm, perceived behavioral control and their antecedents in the theory of reasoned action (Fishbein & Ajzen, 1975) and theory of planned behavior (Ajzen, 1985). As one of the purposes of these secondary analyses, the structure of belief components was explored for multidimensionality and the compatibility of the models' components was reliably assessed. The results were subsequently integrated under the random effects approach of meta-analysis. The magnitude of effects found in the theory of reasoned action fitted well within the context of hitherto published meta-analyses

and showed strong overall relationships. Perceived behavioral control as a component of the theory of planned behavior was not found to be an important predictor of intentions in the present sample of studies, for which possible explanations are discussed. Moderator analyses of the compatibility of components resulted in consistent but somewhat low magnitude of effects. The dimensionality of belief components was of more importance for the relationships. Multidimensional representations have been shown to add approximately 10% of variance explained in attitude and subjective norm from belief based measures in comparison to traditional unidimensional measures. In contrast, the expectancy-value component could not contribute significantly to variance explanation of contiguous model components. The results are discussed in light of recent approaches in attitude structure and attitude–behavior research.

15.1 INTRODUCTION

Judgments of the utility of attitudes as a psychological concept have often been based on the relationship between attitudes and social behavior (Eagly & Chaiken, 1993, 1998). Whereas early approaches to an evaluation of the concept were quite optimistic (e.g., Allport, 1935), subsequent reviews questioned its utility as a predictor of overt human behavior and even suggested to abandon it as a scientific concept if consistency between attitudes and behavior could not be demonstrated (Wicker, 1969). This latter narrative review, in which it was concluded that there existed at most a slight relationship between attitude and behavior, has had a profound effect on the psychological research of attitudes. In the first half of the 1970s, attitudinal research was characterized by attempts to find explanations for the low correlations between attitudes and behavior reported in the review by Wicker (1969). Apart from methodological explanations, which we will address in the present study, new theoretical considerations have contributed to the question of when and how attitudes relate to overt behavior. One of the most important contributions of this type is the theory of reasoned action, introduced by Fishbein and Ajzen (1975).

15.1.1 The Theory of Reasoned Action and the Theory of Planned Behavior

The theory of reasoned action (TRA; Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980) connects attitude and its antecedents as well as its consequences in a systematic way and thus represents both a prediction and explanation model of overt volitional human behavior. In this model, depicted in Figure 15.1, variability in behavior is directly explained through intention, whereas the latter is predicted through attitude toward behavior and subjective norm. Simply put, the TRA stipulates that a person's behavior (B) is a direct (linear) function of her intention to act (I). As a consequence, overt behavior is considered as volitional in the TRA. Attitude toward behavior (A_B) exerts its assumed directive and dynamic influences mediated through intentions to act on behavior. Like-

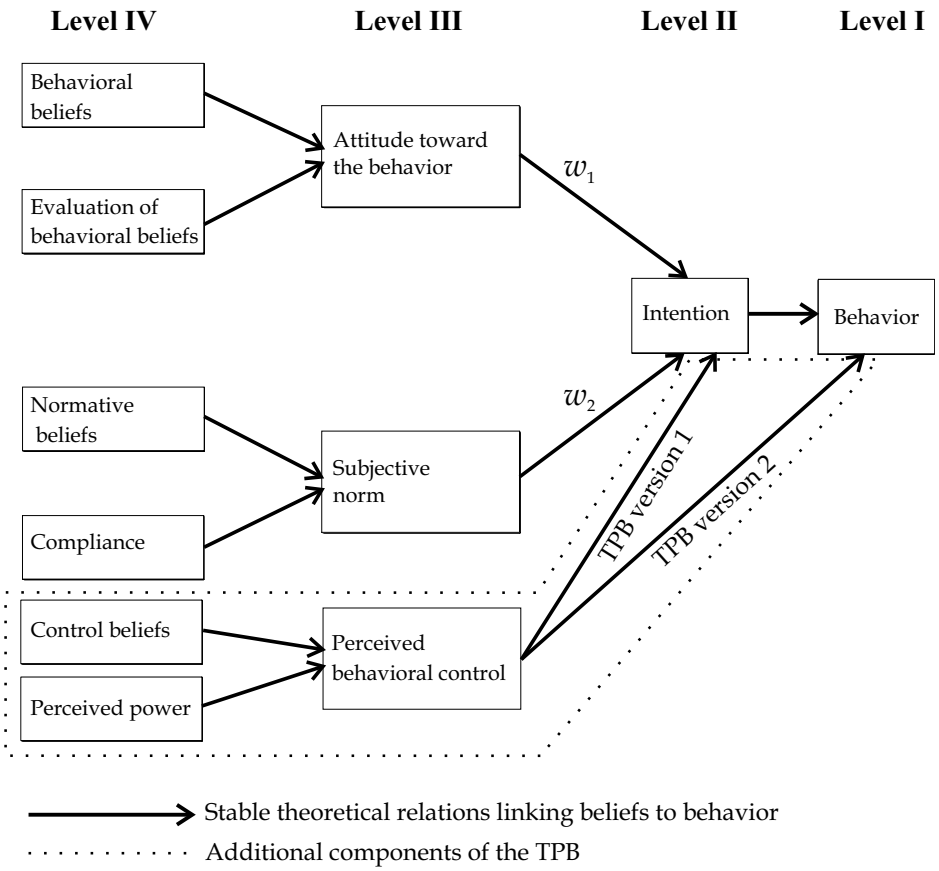

Figure 15.1 The theory of reasoned action and the theory of planned behavior. Adapted from Ajzen and Fishbein (1980, p. 84).

wise, the impact of subjective norm (SN), which represents the influence of important others on a person's behavior is also mediated through intentions. The relationship between the components on levels I to III can be formally represented as (Fishbein & Ajzen, 1975, p. 301)

$$B \sim I = (A_B)w_1 + (SN)w_2,$$

where w_1 and w_2 represent the appropriate weights attached to A_B and SN, respectively. In practice, these relationships are ordinarily assessed by estimating the parameters of two OLS-regression equations separately. First, numerical indices of behavior are regressed on measurements of intentions, and second, a separate multiple regression of intention on attitude and subjective norm is performed to estimate w_1 and w_2 (for examples, see Ajzen & Fishbein, 1980; Fishbein, 1980). In the latter case, measures of overall predictive accuracy (R^2) are usually considered to judge the quality of the model.

On a fourth level, the TRA specifies the determinants of the level III components. Attitude toward behavior is conceived as a function of behavioral beliefs about consequences of the behavior in question and their evaluations, while subjective norm is a function of normative beliefs about important ref-

erents and the motivation to comply with these referents. By basing level III components on beliefs, according evaluations, and compliance, respectively, the TRA emerges as a model of *reasoned* action because behavior is ultimately founded in beliefs as cognitive aspects associated with behavior, its consequences, and important referents. There are several important points to note in the context of attitude formation and the formation of subjective norms. First, for a given attitude and person who holds this attitude, only *salient* behavioral beliefs are considered as determinants of attitudes, that is, beliefs that are accessible when an attitude object is encountered (Ajzen & Sexton, 1999). Due to limits of working memory capacity, a set of salient beliefs might be comprised of approximately five to nine beliefs on an individual level (Ajzen & Fishbein, 1980, p. 63). Pilot studies in which persons from the target population have to elicit their salient beliefs in free response format are common in applications of the TRA. The beliefs elicited in these pilot studies are often structured according to common sense criteria by the researcher and have ordinarily also to be reduced to a set of modal salient beliefs (Ajzen & Fishbein, 1980) that is intended to represent the set of beliefs salient in a given population. Secondly, for the prediction of level III components behavioral beliefs and evaluations as well as normative beliefs and compliance are thought to combine in a multiplicative form (Ajzen, 1996; Fishbein, 1963). This so-called expectancy-value model can be expressed as

$$A_B \propto \sum_{i=1}^{l} b_i e_i,$$

where the belief b_i represents the subjective probability that the attitude target is associated with a certain attribute. When the purpose of applying the TRA in a given situation is prediction of a specified behavior, the attitude target is an action and the attribute is a consequence of performing this behavior. The evaluation term e_i, in turn, can be thought of as the person's attitude toward the specified behavioral consequence. Thus, it is expressed on an evaluative continuum like good–bad. All products of beliefs and their evaluation are summed in the expectancy-value model to form a single composite which is used to predict the overall attitude in the TRA. This form of combining beliefs and evaluations is also applied to normative beliefs (nb_j) and compliance (co_j) as components of the TRA. A normative belief represents the subjective probability that a *specific* important referent thinks a person should perform a given behavior in question. The summed product of normative beliefs and motivation to comply with the behavioral prescriptions of specific others is used as a predictor of the according component on level III of the TRA:

$$SN \propto \sum_{j=1}^{m} nb_j co_j.$$

The TRA has been subject of debates and criticism over the past twenty years from various perspectives (for overviews, see Eagly & Chaiken, 1993; Jonas & Doll, 1996). Whereas one line of criticism addresses the conceptual-

ization of components in the model, like intention as subjective probabilities of future behavior (e.g., Bagozzi & Kimmel, 1995), the main focus of most suggestions for improvements addressed the sufficiency of the model and thus centered around extending the set of variables in the TRA. One of these modifications is the Theory of Planned Behavior (TPB) (Ajzen, 1985), which attempts to extend the applicability of the TRA to behaviors in specific contexts, namely those in which behavior is not under volitional control (for a review, see Ajzen, 1991). In Figure 15.1, both the TRA and the TPB are depicted. The difference between these two theories lies in perceived behavioral control (PBC), control beliefs, and perceived power as additional components in comparison to the TRA. Perceived behavioral control is thought to reflect the perception of a person that a certain behavior is easy or difficult to perform. This perception might be routed in valid appraisal of external factors such as situational constraints that further or hinder the performance of behavior and may also concentrate on factors internal to a person, like necessary abilities or skills required for performance. Analogous to attitude and subjective norm, the antecedents of PBC are located on level IV of the model. Control beliefs are conceptualized as subjective probabilities about the presence of control factors that are of potential importance to perform a certain action or the strength of their association with a person. Again, these components are combined according to the expectancy-value model for the prediction of the level III component.

The influence of PBC on behavior is specified in two variants of the TPB (Ajzen & Madden, 1986). One path of influence is mediated through intentions to act and the other is directly headed to behavior. The influence on intentions reflects the tendency of persons to intend to engage in behaviors that are perceived to be under control over and above the directive effects of attitude and subjective norm. That is, persons intend to do things they perceive as easy to perform or past experience and anticipated obstacles, thought to be reflected in PBC, are in favor of performing the behavior (Ajzen, 1991). In another line of reasoning the direct influence of PBC on behavior in addition to a person's intention is interpreted as reflecting actual control over a behavior in question. The question of when and how these two paths of predicting behavior through PBC are theoretically and empirically supported is still a subject of attitude research (Ajzen, 1991; Eagly & Chaiken, 1993; Sutton, 1998).

15.1.2 Meta-Analyses of the TRA and the TPB

Both the TRA and TPB have received much attention and continue to stimulate most attitude–behavior research (Petty, Wegener, & Fabrigar, 1997). Table 15.1 provides an overview of mean effect sizes for various relationships reported in meta-analyses on these theories (see also Six & Eckes, 1996).

Although the comparison between these meta-analyses can only be qualitative because of partly overlapping study samples, the overall support for the relationships between model components reported in Table 15.1 is apparent and impressive. In addition to these meta-analyses, there are also traditional empirical reviews of the theories, some of which focus on specific research

Table 15.1 Meta-Analyses on the Theory of Reasoned Action and Theory of Planned Behavior With (Multiple) Correlations as Mean Effect Sizes

	Relationship under investigation			
Study	I – B	I – A	I – A + SN	A – B
Eckes and Six (1994)	.41 (96)	.42 (206)	—	.39 (396)
Farley, Lehman, and Ryan (1981)	—	—	.71 (37)	—
Godin and Kok (1996)[a]	.46 (26)	.46 (58)	—	—
Hausenblas, Carron, and Mack (1997)[b]	.47 (32)	.52 (23)	—	.39 (16)
Kim and Hunter (1993)	—	—	—	.47 (138)
Kraus (1995)	—	—	—	.38 (88)
Notani (1998)	.41 (45)	.45 (63)	—	.21 (19)
Randall and Wolff (1994)	.45 (98)	—	—	—
Ryan and Bonfield (1975)	.44 (35)	—	.60 (35)	—
Sheeran and Taylor (1999)[c]	—	.45 (32)	—	—
Sheppard, Hartwick, and Warshaw (1988)	.53 (87)	—	.66 (87)	—
van den Putte (1991)[d]	.62 (58)	.60 (88)	.68 (70)	—

Note. Number of studies in brackets. B = Behavior; I = Intention; A = Attitude; SN = Subjective norm.

[a]Only studies that focused on health-related behaviors were included. [b]Only studies that focused on exercise were included. [c]Only studies that focused on intentions to use condoms were included. [d]As cited in Eagly and Chaiken (1993).

fields like exercise research (Blue, 1995) or health behaviors (Conner & Sparks, 1996), and there are meta-analyses of the attitude–behavior relationship in related fields like advertising research as well (e.g., Brown & Stayman, 1992). All the reported and additional studies support the notion of very strong effects in the prediction of behavior and intention. Furthermore, reviews and meta-analyses on the behavior–PBC and intention–PBC relationships have also been published. For example, Godin and Kok (1996) report an average overall correlation between intention and PBC of .46 and a correlation with behavior of .39 on the basis of 58 and 26 studies, respectively. Despite this high overall correlation with behavior, only approximately 50% of the studies reviewed reported a significant incremental proportion of variance explained in behavior over and above the effect of intention. For the significant studies only, the mean incremental variance explained by PBC was 11.5%. The following stud-

ies also reported mean effect sizes on the relationships of PBC with intention and behavior, the number of studies reviewed is given in brackets: Hausenblas et al. (1997) behavior–PBC = .45 (8), intention–PBC = .43 (10); Notani (1998) behavior–PBC = .24 (45), intention–PBC = .31 (63); Sheeran and Taylor (1999) intention–PBC = .35 (24).

In sum, the TRA and TPB have received strong overall empirical support for important relationships of model components. Although it has been repeatedly shown that mean effect sizes are strong for the various relationships it must be added that most meta-analyses also reported heterogeneous effects. Moderator analyses have therefore also been performed to test for the moderating effect of miscellaneous variables. Some of these potential moderators stemmed from psychological reasoning, like attitude accessibility, strength or certainty (e.g., Kraus, 1995), but there have also been methodological considerations to explain correlational differences between studies not only in the attitude–behavior relationship but also in the relationships of the components of the models in general. We will turn to two specific moderators that are addressed in the present study after extensions of the theories have been outlined in the following section.

15.1.3 Extensions of the TRA and the TPB

The sufficiency of the TPB and the TRA has been repeatedly questioned and additional important variables have been proposed, at least in specific contexts (for a review, see Conner & Armitage, 1998). Moral norm and self-identity seem to play a major role here, as evidenced by their inclusion in the attitude–behavior composite model of Eagly and Chaiken (1993, 1998) or the theoretical framework of Triandis (1980), for example.

Moral norm on the one hand is concerned with the perception of a person that a certain behavior or its consequences are inherently wrong or right apart from judging it with respect to personal utility (behavioral beliefs) or social influences (normative beliefs). A person may thus feel a moral obligation to perform a behavior according to internalized moral standards. Consequently, this component has been added to the TRA by several researchers and was found to add to the prediction of intention in addition to attitude and subjective norm in most applications (for a review, see Manstead, 2000). In contrast to this relatively consistent research evidence, there is considerable heterogeneity as far as the location of moral norms in the TRA or TPB is concerned. Whereas initially personal norms were conceptualized as a second dimension of normative influences on behavior (Fishbein, 1967) on level IV of the TRA and therefore not necessarily qualitatively different from social norms, they are usually introduced in applications as a component on level III in addition to attitude and subjective norm (e.g., Gorsuch & Ortberg, 1983). This "shift" resulted from a re-conceptualization of personal norms that is more sharply focused on the moral implications of a behavior in question. Accordingly, these personal moral and ethical standards were more precisely termed moral norms. Despite this focus on moral aspects, it is neither theoretically nor em-

pirically clear whether this component should be regarded as an antecedent variable of attitude or as an addition to it (cf. Sparks, Shepherd, & Frewer, 1995; Parker, Manstead, & Stradling, 1995).

Self-identity is another component that has been added to the TRA and TPB to enhance their explanatory and predictive power of behavior. The following two examples illustrate the meaning and varying emphasis placed in definitions of this concept: According to Sparks (2000, p. 35), self-identity is defined as a person's self-concept, that is, relatively enduring characteristics that a person ascribes to herself, whereas Conner and Armitage (1998, p. 1444) define self-identity as the "salient part of an actor's self which relates to particular behavior". Furthermore, Sparks (2000) pointed to the fact that expressions of self-identity may also incorporate moral norms. The two components added to the TRA and TPB are therefore not clearly distinct. Despite these conceptual difficulties self-identity has a relatively fixed hypothesized position in the TRA and TPB. It is mostly assumed to be associated with attitude in the TRA and TPB, and has also shown to influence intention in addition to attitude and subjective norm (for reviews, see Conner & Armitage, 1998; Eagly & Chaiken, 1993; Sparks, 2000).

15.1.4 Multidimensionality of Beliefs

In the context of the expectancy-value model the summation of beliefs and according evaluations, for example, includes all modal salient beliefs determined in a pilot study and involves no weighting of these parts of the composite. This amounts to a highly restrictive unidimensional model with equal component loadings of all parts to be summed that has only occasionally been explicitly tested in applications of the TRA and TPB. The potential failure to map a multidimensional belief structure in appropriate components may cause serious consequences for the relationship between level IV and level III components, which have been judged as relatively low and "somewhat disappointing" (Ajzen, 1991, p. 192).

In fact, alternatives to an unidimensional representation have been repeatedly proposed, even in an early statement of the TRA (Fishbein, 1967). Another early approach can be seen in the work of Scott (1969) who introduced measures of structural properties of cognitions, one of which was dimensionality, thought to represent "the space utilized by the attributes with which a person comprehends the domain" (Scott, 1969, p. 263).

Perceived behavioral control is one example of a potentially multidimensional component. There is considerable theoretical debate about the subdivision of PBC into self-efficacy and controllability. There is also empirical evidence that these subcomponents can be successfully represented in a two-dimensional model as well as that they differentially predict intention to act and behavior (Armitage & Conner, 1999; Conner & Armitage, 1998; Sparks, Guthrie, & Shepherd, 1997; Terry & O'Leary, 1995). Furthermore, normative beliefs and compliance may also be of a multidimensional structure. It seems quite possible, for example, that normative beliefs associated with fam-

ily members as opposed to normative beliefs associated with friends form different components and these two belief sets might contribute independently and differentially to the prediction of other model components. Burnkrant and Page (1988) have in fact shown that a two-factor structure with more closely related referents like friends and spouses loading on one factor and parents as well as employers on the other hand loading on another factor shows a significant improvement in fit of the model and an improved prediction of contiguous model components (see also Grube, Morgan, & McGree, 1986). Most research on multidimensionality of beliefs has been conducted on the dimensionality of behavioral beliefs as the basis of attitudes (Bagozzi, 1981a, 1981b; Grube et al., 1986). From a theoretical viewpoint, Schlegel and DiTecco (1982) argue that multidimensionality may be more prevalent in domains that can easily be described by many characteristics and where persons under investigation have a differentiated knowledge structure. As a consequence, single representations like the expectancy-value model are supposedly not capable to map such a differentiated structure in a single score. Indeed, for a study on marijuana use they provided evidence that the dimensionality increased with more experience and presumably more knowledge about marijuana in different user groups. In another large study on non-medical drug use they replicated this finding and, more important, they showed that the multiple correlations of unidimensional representations with behavioral intention and behavior were lower as for the multidimensional case. This effect was even more pronounced for users with more experience, that is, those with a more complex representation of attitude (Schlegel & DiTecco, 1982).

In sum, there are theoretical reasons as well as empirical evidence that the exploration and testing of multidimensionality of the components of the TRA and TPB is a promising route to better understand and predict level III components and ultimately behavior. Normative and behavioral beliefs can be regarded to represent multiple (two) dimensions or domains of beliefs themselves that are separated for theoretical and practical reasons. As has been shown, these dimensions may also be composed of a set of subdimensions. Normative beliefs can be partitioned into groups of persons that differentially predict the overall perception of normative influences on intentions. Behavioral beliefs can also be subdivided into context specific belief sets or more general groups of beliefs that map different facets of utilities. Whereas utility frequently is associated with more instrumental or material outcomes of behavior, from the multidimensional perspective it might encompass several dimensions from solely material outcomes to outcomes of ideational value, moral relevance or whatever dimension of worth is prevalent in a given context. Especially in domains in which differentiated knowledge is prevalent for a given sample, multiple differentiable dimensions are expected to emerge. It is suggested that these different dimensions may all be represented and employed to predict behavior and its antecedents.

The potential benefits of a multidimensional approach are therefore manifold. First, it is explicitly tested or explored whether one dimension is sufficient to represent the belief structure in a given context and multiple dimensions

are regarded as alternative representations if a unidimensional measurement model fails to fit. Second, in the case of more than one dimension the results can reveal *what* distinguishable dimensions of worth are relevant in a given context, where the contrast between instrumental and moral beliefs is only one possibility. Third, with multiple dimensions it is possible that persons actually have an inconsistent belief basis that would go unrecognized in a composite score. A multidimensional approach at least offers the chance to uncover such inconsistencies. Fourth, if multiple dimensions are given, then the prediction of attitude or intention may be enhanced by this approach or the failure to successfully predict intention and behavior through level III components may be explained by structural properties of the belief basis.

15.1.5 The Principle of Compatibility

Although one of the results in the influential review by Wicker (1969) was the often cited low correlation between attitude and behavior, it should be noted that he also presented some explanatory factors that were hypothesized to influence this relationship. With reference to the work of Fishbein, he introduced the specificity of attitudes as one of these factors, which is one aspect of the *principle of compatibility*[1]. He argued that for different levels of specificity of attitudes and behavior, only low correlations are expected whereas with equal specificity he anticipated high correlations. The prototypical case of a specificity mismatch is seen in a measure of global attitudes and a specific behavior. For example, the low attitude–behavior relationships in the often cited study of LaPiere (1934) was ascribed to such a mismatch of levels of specificity (Stroebe, Eagly, & Ajzen, 1996).

Fishbein and Ajzen (1974, 1975) elaborated on this moderator and presented a systematic approach to construct more general measures of behavior which they termed multiple act criteria in contrast to the more specific single act criteria of behaviors. Multiple acts are, in essence, aggregates of single acts that consist of specific behaviors, performed in various contexts and points in time. Furthermore, they did not only specify principles for the construction of multiple act criteria but also stated different compatibility characteristics with respect to which components of their models could match or mismatch. More specifically, Fishbein and Ajzen (1975) distinguished four dimensions: Target, action, context and time (TACT), where components have to match as a prerequisite for strong relationships. The target in this classification system is the object at which a behavior is directed, action is the behavior itself, context and time are the environment in which the behavior takes place and the point in time when the behavior is shown, respectively. Although most treatments of the principle of compatibility focus on the attitude–behavior relationship, all the components from level I to IV of the TRA and TPB can be characterized by

[1]Originally (Fishbein & Ajzen, 1975) termed "principle of correspondence". In accordance with Ajzen (1988) and Eagly and Chaiken (1993) the term "principle of compatibility" is used here.

the TACT-dimensions. Since level II to IV components are of utmost importance for the present study, we focus on these components in the following.

To illustrate the principle of compatibility more concisely, imagine an attitude toward eating low-fat food in the next two weeks measured with the semantic differential technique. Here, the action is eating which is targeted towards low-fat food. Whilst eating is a rather specific action, low-fat food is a category of food that includes a great deal of products like skimmed milk, salads, fruits and the like. The situations and circumstances under which eating takes place are not specified, so the context component is regarded as general whereas the time component is restricted. Here, the attitude should be related to eating taking place within the next two weeks. Now imagine a set of beliefs that is intended to be compatible to this attitude. Ideally, this set should be restricted to beliefs that address the personal consequences of eating low-fat food in the next two weeks. The time period should therefore be specified in exactly the same way as in the attitude measure, just as the action component. For the more general attitude components of target and context, there are at least three variants to specify these in the formulation of belief items. First, it is possible not to formulate anything about these components, so that they are as general as in the attitude measurement. Second, there is the possibility to specify many specific exemplars in the formulation of belief items as long as the set of items encompasses all conceivable contexts in which the behavior can be performed or all targets a behavior is directed to. Finally, prototypical contexts and targets may be chosen. Although the latter two options may in principle be realized, it is obvious that in individual cases it is very difficult to decide whether a given set of belief items is indeed prototypical or general enough to be compatible with an unspecified TACT-aspect in another component of the model. As a consequence, it is argued that the question of match or mismatch of components is actually a *matter of degree* and not a matter of kind. It should furthermore be noted that as a consequence, the assessment of compatibility is not at all an easy or trivial task. For a valid assessment of the compatibility of the TACT-dimensions it seems necessary to consider *all* items used in a study and assess their level of specificity.

From the first extensive formulation of the TRA in 1975 on, Fishbein and Ajzen advocated the principle of compatibility as one of the most important moderators of the relationships between model components and especially the attitude–behavior relationship. Not only does its fundamental idea have implications for attitude research, but it is also relevant for research in the psychology of personality (Ajzen, 1988; Sherman & Fazio, 1983). Moreover, the principle can also be taken as a methodological tool for successful validation and modeling strategies in general (Kirkpatrick, 1997; Nesselroade & McArdle, 1997; Wittmann, 1988).

Notwithstanding its general nature and many successful applications, the principle of compatibility has occasionally been regarded as a merely methodological tool and it has been stated that "it is not very exciting from a psychological point of view" (Millar & Tesser, 1992, p. 278), and that "it was formulated without much attention to the underlying psychological mechanisms"

(Ajzen & Sexton, 1999, p. 130). There are, however, elaborated accounts of the principle's theoretical underpinnings. A first approach can be seen in the work of Millar and Tesser (1986, 1992). They proposed the mismatch-model in which it is stated that the prediction of behavior from attitudes will be poor if the focus on affect versus cognition in attitude formation and during performance of behavior is different. Accordingly, they proposed and empirically demonstrated that high relationships between these components can be observed under matching conditions. In a similar vein, Ajzen (1996) introduced the notion of belief equivalence during the expression of attitude and behavior, which was extended to the so-called principle of belief congruence (Ajzen & Sexton, 1999). But perhaps the most elaborated approach was recently presented by attitude representation theory (Lord & Lepper, 1999), which shows remarkable similarities to the principle of compatibility. In sum, all these theories demonstrate the substantial psychological basis of the principle.

Empirical tests of the principle of compatibility have mainly focused on general attitudes and their failure to predict single act criteria (for examples, see Ajzen & Fishbein, 1977; Jaccard, King, & Pomazal, 1977). Evidence from two meta-analytical studies (Kim & Hunter, 1993; Kraus, 1995) suggests that compatibility of attitude and behavior is an important moderator of the attitude-behavior relationship. However, there are a few shortcomings with these meta-analyses. For example, it is not clear how compatibility of measures was assessed in the Kim and Hunter meta-analysis. Usually, only few examples from the questionnaires or interviews used in the original studies are reported. The categorization into low, moderate and high match groups as done in the Kim and Hunter meta-analysis can only be based on the examples reported. In the face of the difficulties in assessing compatibility of components outlined above, this can be regarded as a very crude measure. Results reported in Kraus' meta-analysis were based only on a very small subset of studies (8 out of 88), which directly investigated the effect of compatibility of attitudes and behaviors. In sum, though consistent empirical support was presented for the principle of compatibility, a stringent meta-analytical test of the hypothesized moderating effect of compatibility, based on a reliable measure that maps the various TACT-dimensions in one or several scores, is not yet available.

15.1.6 Aims of the Study

In the present study, we pursue several objectives. First, we will evaluate the TRA and TPB through the use of meta-analysis after performing secondary analyses of original data. The relationships between several model components will be assessed and compared with respect to published meta-analyses (see Section 15.1.2). The results will give some indication whether the effects of unpublished studies do actually differ in comparison to the results of published studies as assumed in the file-drawer hypothesis (Rosenthal, 1979, 1991). Second, we will assess the potential multidimensionality of components on level IV of the models and PBC. In addition, we will give some indication on what dimensions emerged in the assessment of multidimensionality

and assess their predictive power for other components in comparison to unidimensional representations. Third, compatibility of the components will be employed as a predictor to explain the variability of effect size variances under the random effects model of meta-analysis. In contrast to other meta-analytical tests of this moderator, we will not only focus on the attitude–behavior correspondence and compatibility, but test whether the potential moderating effect also extends to the relationship of other components of the TRA and TPB, an effect we expect from the generality of the principle.

15.2 METHOD

The present study represents a mixture of secondary analyses and a meta-analysis. In a first step, secondary analyses were performed on all available data sets in order to check the quality of the data. For example, we explored the distributional properties of the variables, and computed the relevant statistics for the subsequent meta-analytical step. Every step of the secondary analyses, presented in more detail in Section 15.2.2, applies to every single study whereas the following meta-analytical steps serve to integrate the results.

15.2.1 Selection of Studies

All analyzed data sets pertain to heretofore unpublished studies submitted as diploma theses at a German University and had to meet the following criteria:

1 A complete report of the study, including all measurement instruments, had to be available.

2 Raw data of all studies had to be available in order to perform all the steps of the secondary analyses.

3 The TRA or the TPB had to serve as theoretical background for the studies.

The pool of studies was not systematically sampled from a population of unpublished studies. Generalizations to unpublished studies on the Fishbein and Ajzen models are therefore not warranted, albeit the results will at least shed some light on the effects to be expected of so-called file-drawer studies.

The final sample included 27 studies with a total number of 4499 respondents. Selected study characteristics are reported in Table 15.2. The overall mean age for respondents is 24.8 and the mean number of respondents per study is 166.6. Fifteen of the studies investigated PBC as an additional component and were therefore classified as implementing the TPB. In all studies the semantic differential technique was used as measurement instrument to directly assess the respondents' attitudes. In addition, item forms and wordings for the other model components were used as recommended by Ajzen and Fishbein (1980) for the TRA and by Ajzen (1991) as well as Ajzen and Madden (1986) for the TPB. The adherence to the recommendation for the TPB led to a

Table 15.2 Selected Study Characteristics

Study	N	Mean age	Attitude topic	Attitude toward	Theory
1	157	30.2	Taking on a higher position in a company	Act	TPB
2	176	23.5	Moving to East Germany after passing the exam	Act	TRA
3	298	27.0	Participating on a training course in a company	Act	TPB
4	210	22.4	Having an abortion	Act	TPB
5	112	24.4	Pursuing a career after having a baby	Act	TPB
6	180	43.5	Becoming a teacher	Act	TPB
7	98	35.9	Eating health food	Act	TPB
8	232	27.1	Specific German company from heavy industry	Object	TRA
9	300	34.2	Credit cards	Object	TRA
10	157	25.6	Assessment Center	Object	TPB
11	110	25.6	Having vocational education after the exam	Act	TRA
12	88	24.1	Making a decision concerning the statutory basis of the German Reunion	Act	TRA
13	212	24.5	Right of asylum	Object	TPB
14	144	14.6	Doing "something against" foreigners	Act	TPB
15	121	25.3	Jobs in East Germany	Object	TRA
16	343	15.7	Various disciplines taught in school	Object	TRA
17	111	26.3	Participating on a training course in a company	Act	TPB
18	191	25.0	The study at university with respect to practical applications	Object	TPB
19	85	18.4	Going to a vocational school	Act	TRA
20	112	20.6	Working with the computer	Act	TRA
21	106	38.2	Paying with credit cards	Act	TPB
22	42	17.1	Work experiences	Object	TRA
23	269	19.3	Serving in the army	Act	TRA
24	114	21.5	Deciding to become a career women vs. housewife	Act	TRA
25	104	20.7	Participating on a demonstration	Act	TPB
26	167	18.5	Studying at university	Act	TPB
27	260	21.1	Studying at university	Act	TPB

Note. N = total sample size, TRA = Theory of Reasoned Action, TPB = Theory of Planned Behavior.

mixture of controllability and self-efficacy items in 9 of the 15 studies that employed the TPB (see Section 15.1.4). The remaining 6 studies employed only fewer than 3 items to assess perceived behavioral control, all of which were controllability items. In every study a specific set of items was constructed, first pretested in a pilot study for applicability to a larger pool of subjects from the same population. Modal salient beliefs were also determined in these pilot studies to assure relevance of the belief items for the respective sample of respondents. As only two studies reported results on the relationship of the model components to overt behavior, this aspect of the models will be left out in the following sections. This also applies to control beliefs and perceived power, which were assessed in only two studies.

15.2.2 Secondary Analyses

The first step was to adjust the data from the studies under investigation to the recommendations proposed by Ajzen and Fishbein (1980). This included rescaling of items and computation of expectancy-value components, if necessary. Since the issue of unipolar versus bipolar scaling is still under debate (Eagly & Chaiken, 1993; Sparks, Hedderly, & Shepherd, 1991), items were scored as proposed by Ajzen and Fishbein (1980) to provide a fair test of the theories.

In order to keep the number of variables to analyze in subsequent steps at a reasonable level and to assess potential multidimensionality of the components, items were compressed via principle component analyses with one and multiple factor solutions, if indicated. All components of the TRA and TPB were subjected to this procedure, apart from components which were assessed with fewer than four items. Component scores were thereby calculated for all subjects for further computations. The one-factor solutions correspond to unweighted sum variables of multiple item scales usually employed in analyses of TRA and TPB applications, but are superior in the sense that they preserve a maximum of variance of the items to be aggregated. In addition to the one-factor principle component analyses, multiple factor solutions were explored and implemented in cases where conventional statistical criteria like the eigenvalue-greater-than-one-rule and the scree-plot indicated that more than one component could be extracted. Moreover, attention was also paid to the psychological significance of the solutions. All multiple component solutions were rotated after extraction with varimax rotation to achieve simple structure of the loading matrices. One exception from the outlined procedure was the case of attitude measurement with the semantic differential technique, which was employed in all studies. Here, multiple components were always extracted to obtain scores for only the evaluative dimension that represents attitudes (Fishbein & Ajzen, 1975). In all studies factored separately, this evaluative dimension clearly emerged after rotation of the components.

As reliability estimates for the components we used a formula based on the eigenvalues given by Cliff (1988) which he also criticized for its strong assumptions. Since no reliability estimates of the single items were available, we were

not in a position to perform reliable component analyses for better estimates of reliability (see Cliff, 1988; Cliff & Caruso, 1998). The mean reliabilities we computed were acceptable and well above .75 for all components except PBC. For the studies under review, PBC showed a mean reliability estimate of .63, which, though not unacceptable, is well below the reliabilities for the other components.

The results of multiple component analysis revealed several results worth mentioning. First, intentions and subjective norm, as operationalized according to the recommendations of Ajzen and Fishbein (1980), consistently showed only one component in all studies. This was mainly due to a focus on specific behaviors in the various studies in the case of intentions, and mostly few or only one item to measure subjective norm. In contrast, 9 of 15 TPB-studies employed a mixture of controllability and self-efficacy items which resulted consonantly in two components for all these studies. This result stands in agreement with similar attempts to separate these two components (Conner & Armitage, 1998; see Section 15.1.4). Second, multiple component solutions of behavioral beliefs and according evaluation of behavioral beliefs showed remarkable similarities in structure which also mirrored the structure of multiple component analyses of the according expectancy-value product terms that were factored separately from the former. Despite the fact that some evaluation of behavioral belief items loaded highly on one component and the according behavioral belief items did not load as equally high on the respective component in a separate analysis of behavioral beliefs and vice versa, this did not vitiate the similarity of structure as far as the interpretation of the components is concerned. The structure of beliefs that emerged was partly specific for the behavioral domains addressed in the studies, like several stress and strain effects of participating in an assessment center (study 10) or various specific health consequences of consuming health food (study 7), for example. On the other hand, there were also noteworthy similarities of interpretation of factors *across* studies. These similarities pertain to principle component analyses of behavioral beliefs that lead to partitioning of beliefs in economic/material, moral, and self-related beliefs in most of the studies. The economic components consisted of mainly utilitarian beliefs in the sense of monetary consequences of certain behaviors like earning or saving more money when moving and working to West or East Germany (e.g., studies 2 and 15), for example. Another facet was found in the more ideational or moral aspects of the utility of behavioral consequences by the participants. Here, beliefs can be exemplified by the violations of ethical rules through discrimination of ethnic minorities (e.g., studies 13, 14 or 25) or burdening of future generations through environmental pollution (e.g., study 8). The last facet of self-related beliefs is comprised of beliefs that deal with self-realization or self-esteem, that is, beliefs about behavioral consequences that touch upon a person's needs, interests, or self-esteem. This latter component did emerge in all studies with more than two components and most concisely in studies on behaviors in a learning environment like universities or training departments of a company (e.g., studies 1, 3, 26, 27), but differs somewhat in meaning from the notion of self-identity

outlined in Section 15.1.1. The components of this facet extracted from the studies in the secondary analyses focused in meaning more on outcomes that enhance or undermine self-esteem (e.g., the feeling of pride as a behavioral consequence) and to a far lesser extend on issues of personal or social identity. In sum, subjective probabilities and evaluations of behavioral consequences as well as expectancy-value components showed a similar component structure supplemented by domain specific components that differed between studies. Remarkably, the independent components found across studies resemble components that have been added to the TRA and TPB (see Section 15.1.1) to enhance explanation and prediction of behaviors in certain domains.

The next step of the secondary analyses was to compute the linear relationships of the components using multiple regression, where R^2 was recorded as effect size. Since R^2 is a biased estimate of the coefficient of determination in the population and standard errors were needed for subsequent steps, a bootstrap procedure was applied to compute a bias-corrected R^2 and according standard errors using 300 bootstrap resamples in each study (for details of this procedure, see Efron & Tibshirani, 1993). Furthermore, in order to detect violations of the model assumptions hierarchical regressions were computed. Following the recommendations of Evans (1991), expectancy-value components were added to behavioral beliefs and their evaluations. Incremental variance explained by these components was recorded and tested for significance with hierarchical F tests. To test the significance of explained variance through additional components, resulting significance levels from the hierarchical F tests were integrated as described by Rosenthal (1991).

15.2.3 Assessment of Compatibility

To assess the compatibility of the models' components, three undergraduate psychology students rated all items of contiguous components on the compatibility dimensions on a five point scale in the last step of the secondary analyses. Students were trained beforehand to become acquainted with the TACT-dimensions. The training consisted in thorough reading and discussion of an extensive manual on the theoretical background of the principle of compatibility. The manual summarized the relevant literature on this topic (e.g., Ajzen & Fishbein, 1977, 1980; Fishbein & Ajzen, 1975) and explained the principle with prototypical examples of items, which resembled but were not identical to the items of the studies under investigation. Apart from the more theoretically oriented part of the training a manual of rules was also prepared which explained how response option of the ratings should be used by the raters. All rules were explicitly stated, illustrated with concrete examples, and verbally explained. This manual of rules was subdivided into the following four parts, which matched the tasks to be fulfilled to rate the compatibility of the components:

1 Rules for ratings of the specificity of a single component on the TACT-dimensions.
2 Rules for ratings of the compatibility of two model components.

3 Rules for ratings of the joint specificity of two model components.

4 Rules for ratings of the compatibility of two combined model components.

As can be seen by the structure of the four parts, raters had to rate the specificity of the items first. This step was introduced to force focus on the specificity of the model components on every TACT-dimension separately before compatibility ratings were conducted. This step was of special importance for components that were assessed with several items in all studies, like behavioral beliefs for example. In these cases, the specificity rating of the target, for example, applied to the whole group of behavioral belief items. The ratings of the second step were only conducted after the first step was applied to both components to be rated. Steps 3 and 4 were only applicable to level III and IV components and served to structure ratings of the compatibility of two components of level IV, behavioral beliefs and according evaluations or normative beliefs and compliance, and one component on level III, namely attitude and subjective norm, respectively.

In addition, several aspects of the rules of compatibility ratings are worth mentioning. First, the ratings for the components which were assessed with a set of items and were therefore subjected to principal component analysis focused only on items loading higher than .30 on the respective component. This rule was introduced to prevent ratings to be influenced by items that do not substantially contribute to the components scores to be used in the regression analyses. Second, in cases where, for example, the context of action was not specified when measuring attitude with the semantic differential technique and many behavioral belief items were specific with respect to the context of action, there was sometimes disagreement between raters. The cause for these disagreements was the difficult decision task for raters to judge whether the ensemble of specified contexts in behavioral belief items was broad enough to be compatible to an unspecified attitude. No objectively determinable criteria were available to resolve such disagreements, so a final discussion session was held with all raters to focus on and discuss such disagreements. Finally, it is important to note that the raters were, at the time of rating the questionnaires, not knowledgeable of any result of the studies, to prevent ratings to be influenced by such knowledge.

The degree of agreement of the raters in the final ratings was assessed as intraclass reliability coefficients with raters as fixed and studies as random factors (Shrout & Fleiss, 1979). The reliability estimates for overall average ratings of compatibility for the three raters are presented in Table 15.3. With few exceptions, all intraclass coefficients for the specificity ratings not reported in Table 15.3 were at least .65, with more than 60% of these coefficients above .80. The exceptions were ratings for context and time specificity of evaluation of behavioral beliefs and compliance, context specificity of behavioral beliefs, subjective norm, and normative beliefs, as well as time specificity of perceived behavioral control. For all these components zero reliability estimates resulted from missing variance in the ratings, which actually indicates *perfect* agree-

Table 15.3 Reliabilities of Overall Compatibility Ratings

Relationship	Reliability estimate
Intention – Attitude	.86
Intention – Subjective Norm	.73
Intention – PBC	.88
Attitude – BB	.70
Attitude – EBB	.90
Attitude – BB + EBB	.79
Subjective Norm – NB	.23
Subjective Norm – CO	.93
Subjective Norm – NB + CO	.67

Note. The number of studies is given in brackets. Reliabilities were computed as intraclass coefficients on the basis of the ratings from three raters. PBC = Perceived behavioral control; BB = Behavioral beliefs; EBB = Evaluation of behavioral beliefs; NB = Normative beliefs; CO = Compliance.

ment between the raters. As a consequence, this missing variance will also lead to an exclusion of these ratings from the moderator analyses.

As can be seen in Table 15.3, reliabilities were acceptable with the exception of the compatibility ratings between subjective norm and normative beliefs. This result can be traced back to a highly restricted range of compatibility ratings for these components. Although intraclass coefficients were well above .80 for the specificity ratings of subjective norm and normative beliefs, the compatibility between these components was essentially rated as nearly perfect for all studies. On the five-point scale from 1 (no compatibility) to 5 (perfect compatibility) more than 50% of the studies showed scores of 5 and the remaining studies had mean scores equal to or above 4. As a result, the compatibility of these components could not be employed as a moderator in subsequent analyses.

15.2.4 Meta-Analytical Procedures

In all previous meta-analyses concerning the TRA and TPB relationships between the components of the models were assessed by the Pearson product-moment coefficient r. Reported multiple correlations in the original studies to be synthesized have usually been treated as if they were r. From a statistical viewpoint, this is inappropriate since these statistics have different sampling distributions and standard errors. In order to use a common effect size estimate, the coefficient of determination R^2 was chosen in the present study. Although R^2 and similar measures of variance explained have been criticized as effect size estimates because these measures do not indicate the sign of an effect (Hedges & Olkin, 1985), this criticism does not apply in the context of the TRA and TPB, as long as linear prediction is not accomplished through counterintuitive effects. If, for example, a favorable attitude towards having an

abortion were negatively related to the intention of actually having an abortion, R^2 would be misleading as an indicator of the effect. Special care was given to detect such counterintuitive effects, but none were encountered in any of the secondary analyses. Another problem with measures of variance explained like R^2 lies in the estimation of its standard error, which plays an important role in meta-analysis as a component of the weights for the studies. In the present study we have used the bootstrap estimates of the standard error for the R^2s that were computed in the secondary analyses.

Another decision to be made in the present meta-analysis pertains to the assumption of a fixed versus random effects model. The distinction between these models is an important one for meta-analytical methods, as evidenced in several chapters of this book. In the fixed effects approach it is hypothesized that all studies under investigation estimate a common effect size but in the random effects model true differences in effect sizes between studies are assumed (Hedges, 1983; Hedges & Vevea, 1998). As a consequence, the observed variance in estimates of effect size parameters is attributed to errors of estimation in the fixed effects model, whereas in the random effects model the observed variance of effect sizes is partitioned into variance due to true differences in effect sizes on one hand and variance due to errors of estimation on the other. Strong arguments have been put forward in the recent literature on meta-analysis in favor of the random effects model (e.g., Erez et al., 1996; Raudenbush, 1994). Since it is quite unreasonable in face of the vast literature on the TRA and TPB to assume a common effect size for all studies, the random effects model is used in the present study. All computations followed the procedures as described by Shadish and Haddock (1994) for the integration of effect size estimates.

For moderator analyses we performed weighted regression analyses with effect sizes as dependent and compatibility ratings as independent variables. The weights in these regressions included estimates of random effects variances which had to be estimated in a two-step procedure (method of moments) as detailed in Raudenbush (1994).

15.3 RESULTS

15.3.1 Overall Relationships

In Figure 15.2, overall bivariate relationships for the components of the models are depicted. Except where indicated, results are based on one-factor solutions of principle component analyses. Please note that in the following the effect size measure is the coefficient of determination and not the (multiple) correlation coefficient. Effect sizes might thus look small even though they were quite substantial apart from few exceptions.

In 15 of the studies it was hypothesized that the action under consideration is influenced by factors not under volitional control. The overall effect of only .04% of explained variance shows that perceived behavioral control was

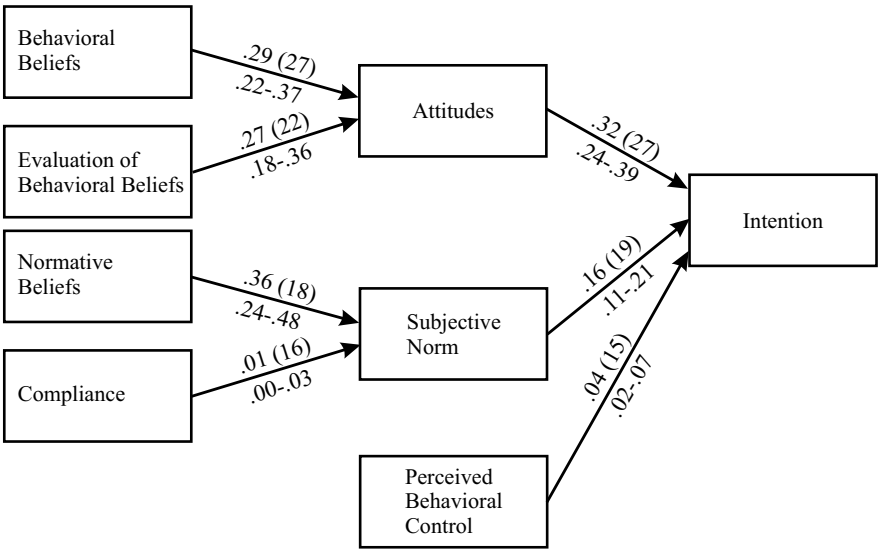

Figure 15.2 Mean effects (R^2) of bivariate relationships (number of studies in brackets and 95% confidence interval below arrows).

not of much importance to predict intention to act, although the 95% confidence interval in Figure 15.2 indicates that this effect is significantly different from zero. To test whether the effect is of importance in the context of attitude and subjective norm, the F tests of the individual studies were integrated and revealed no significant incremental variance explained through this component ($p > .05$). The overall mean effect size for the prediction of intention from attitude, subjective norm and perceived behavioral control in 11 studies was .43 with a 95% confidence interval ranging from .35 to .52. The incremental variance explained through subjective norm in the context of attitude was significant ($p < .01$), as might be expected by the predictive power of 16% through subjective norm alone. The overall mean effect size for the prediction of intention from attitude and subjective norm in 19 studies was .38 with a 95% confidence interval ranging from .30 to .45. In sum, as far as the relationship between level II and III components is concerned, strong overall effects on the basis of one-factor solutions were found which are analogous to the bivariate relationships on the basis of unweighted aggregates of items usually reported in applications of the TRA and TPB.

The level III and IV components also showed strong bivariate linear relationships with the exception of subjective norm and compliance. The finding of an absence of a strong effect between these latter components is not unique to the present study but is also reported elsewhere (e.g., Ajzen, 1991, p. 196). Before we provide more details on these relationships in the next subsection, it is interesting to note that the expectancy-value components alone also showed strong bivariate relationships with level III components. The aggregate R^2 for the relationship between the principle component scores of behavioral beliefs and their evaluation expectancy-value products and attitude based on 22 studies was .31 with a 95% confidence interval ranging from .23 to .40. The mean R^2

between subjective norm and the level IV component expectancy-value products was .34 with according confidence interval limits of .27 and .41 on the basis of 16 studies. We will now turn to the results from multiple regressions to assess the incremental value in prediction these single components provide.

15.3.2 Belief Based Measures, Expectancy-Value Components and Multidimensionality

Supplementary to the bivariate results reported, the results from multiple regression of attitude and subjective norm on their antecedent components on level IV of the models are reported in Table 15.4. The values of the homogeneity test based the *Q*-statistic are omitted from the table. They are significant for all the relationships reported in the present study.

Table 15.4 Mean Effects (R^2) and 95% Confidence Intervals for Overall Relationships

Relationship	Mean effect (N)	95% confidence interval
Attitude – BB + EBB	.40 (22)	.31 - .49
Attitude – BB + EBB + EV	.43 (22)	.35 - .51
Attitude – BB + EBB (multi)	.51 (22)	.45 - .58
Attitude – BB + EBB + EV (multi)	.53 (22)	.46 - .59
Subjective norm – NB + CO	.38 (16)	.32 - .44
Subjective norm – NB + CO + EV	.41 (16)	.34 - .47
Subjective norm – NB + CO (multi)	.47 (16)	.40 - .51
Subjective norm – NB + CO (multi)	.49 (16)	.43 - .54

Note. The number of studies with valid data for the relationships is given in brackets. BB = Behavioral beliefs; EBB = Evaluation of behavioral beliefs; NB = Normative beliefs; CO = Compliance; EV = Expectancy-value product; (multi) = multidimensional representation.

To test the impact of combined behavioral beliefs and evaluation of beliefs on attitude, results on the influence of the components and their expectancy-value product are reported in Table 15.4. One way to combine these components is a simple additive combination, which serves as a baseline to test the additional expectancy-value component. As can be seen, the explanatory variance added through the latter is only three percent in the case of a unidimensional and two percent in the case of a multidimensional representation of the components and can be regarded as negligible. Again, results from hierarchical *F* tests for both representations were integrated and showed no significant effect of the expectancy-value component ($p > .05$) in either case. Analogous results emerged with normative beliefs and compliance as predictors of subjective norm. Here, the influence of compliance alone is not significantly different from zero and the expectancy-value component does not add much variance in the context of subjective norm either ($p > .05$). In contrast to the failure

Table 15.5 Results of Random Effects Moderator Analyses for Compatibility as Moderator

Relationship	B	β	SE	$t(df)$	p
Intention – Attitude	.08	.30	.05	1.61 (25)	.06
Intention – SN	.02	.11	.05	.46 (17)	.32
Intention – PBC	.00	.03	.03	.12 (13)	.45
Attitude – BB	.04	.11	.08	.56 (25)	.29
Attitude – EBB	.02	.09	.04	.41 (20)	.34
Attitude – BB + EBB	.07	.18	.09	.41 (20)	.21
SN – CO	.00	.01	.02	.03 (16)	.49

Note. SN = Subjective norm; PBC = Perceived behavioral control; BB = Behavioral beliefs; EBB = Evaluation of behavioral beliefs; B = unstandardized regression coefficient; β = standardized regression coefficient.

of expectancy-value terms to add much variance in prediction of subsequent components, the impact of a multidimensional representation of beliefs and their evaluations is pervasive. For both the prediction of attitude as well as subjective norm, the increase in mean effect sizes is approximately 10%. As multidimensional representations contain overlapping information with unidimensional ones, no test of significance is available.

15.3.3 The Moderating Effect of Compatibility on the Relationships of Components

Table 15.5 reports the results of moderator analyses under the random effects model with mean compatibility ratings from the three raters as independent variables. The computations were performed according to the procedures detailed in Raudenbush (1994).

Descriptively, all regression coefficients are positive, indicating a relationship between compatibility and effect sizes estimates that would be expected from the principle of compatibility with highly compatible components showing higher effect size estimates, and vice versa. As the significance tests reported in the last two columns of Table 15.5 reveal, none of the relationships is significant according to conventional criteria. For significance tests under the random effects approach it is important to bear in mind that they are more conservative than alternative tests under the fixed effects approach which are mostly applied (Hedges & Vevea, 1998). Furthermore, as the relatively large non-significant coefficients for the relationships between intention and attitude show, the number of studies in the present meta-analysis might not be sufficient to achieve high levels of statistical power. In addition to the estimation and tests of regression parameters, the residual variances after taking the predictors into account were tested for significance. These analyses revealed that for all relationships reported in Table 15.5 significant variances remained to be explained.

Table 15.6 Results for Attitude Toward Object vs. Attitude Toward Behavior

Relationship	Attitude toward behavior		Attitude toward object	
	Mean effect (N)	95% confidence interval	Mean effect (N)	95% confidence interval
Intention – Attitude	.38 (19)	.32 - .44	.17 (8)	.01 - .33
Attitude – BB	.32 (19)	.23 - .40	.24 (8)	.07 - .42
Attitude – EBB	.27 (17)	.17 - .37	.27 (5)	.03 - .50
Attitude – BB + EBB	.41 (17)	.32 - .49	.38 (5)	.11 - .67

Note. The number of studies with valid data for the relationships is given in brackets. BB = Behavioral beliefs; EBB = Evaluation of behavioral beliefs.

An alternative classification for high vs. low compatibility groups in the context of attitude assessment was undertaken following the suggestions of Eckes and Six (1994). They argued that following the principle of compatibility attitude toward an object is always less compatible to other components than attitude toward behavior, because the action element is missing and the other dimensions of compatibility are usually left unspecified. The mean effect sizes for a comparison of these groups are reported in Table 15.6.

The results replicate the findings of Eckes and Six (1994) that attitude toward an object showed lower relationships with other components in the models than attitude toward behavior. Despite this clear trend of decline of explained variance for low compatibility groups, the confidence intervals for all effects were again overlapping, so overall the differences between these two groups were not significant. Additionally, it should be emphasized that the tests for homogeneity in all groups were still significant, thereby calling for more or alternative moderators to explain observed variances in effect sizes within these groups. In sum, for both approaches the compatibility between model components showed consistent but non-significant and partly small effects as predictors of effect size variance.

15.4 DISCUSSION AND CONCLUSIONS

The present study investigated the relationships of the components of the TRA and TPB in a series of hitherto unpublished studies. For these studies would not have been published without the present study, this can be regarded as a "grasp into the file-drawer" (Rosenthal, 1979). In contrast to the expectations of critics of meta-analysis, strong effects were found in the file-drawer. The results of the present study fit well within the context of other meta-analyses (see Section 15.1.2), thereby re-emphasizing the importance of attitude as a psychological construct for the explanation and prediction of behavior and the utility of the TRA and TPB in general. For there are no remarkable differences between the effects of published meta-analyses and the results reported here,

this is interpreted as support for the hypothesis that the unpublished studies under review do not markedly differ from published studies. It might nevertheless be suspected that these studies, though not different in effects, are characterized by other features that serve as alternative explanations of the effects reported. Here, it might be added and reiterated that first, the persons who conducted the studies were not aware of the fact that a meta-analysis will be performed on their data at the time of conducting their study. Second, they chose their field of application at their own discretion and were only influenced by the second author of the present article as to make them follow the recommendations by Ajzen and Fishbein (1980). This was reviewed during realization of the studies and in the secondary analyses. Third, as might be suspected, this influence did not result in extremely homogeneous study effects. To the contrary, effect size variances were all significant, even under the random effects model. Fourth, the raters of compatibility were not aware of any result of the studies, so a potential influence by this knowledge influence was precluded. In sum, we argue that it might be implausible to attribute our findings to special characteristics of our study sample.

One of our findings was that PBC has not emerged as an important determinant of intentions to act. This might be due to several possible causes. As has been indicated, the reliability of this component was lower than the reliability of all other components and this might have contributed to a reduced relationship with intention. Next, PBC may be an important predictor in our studies for behavior but not for intentions, although this is somewhat implausible against the background of the results referred to in Section 15.1.2. In face of these mixed results it is not warranted to renounce perceived behavioral control as a predictor of intentions or behavior but it obviously did not always have an influence on intentions when expected by the primary researchers. Therefore, we agree with Petty et al. (1997) in that research that goes beyond speculations of the influence of contextual factors is needed to clarify circumstances under which PBC is an essential predictor.

Another finding of the present study was that expectancy-value components did not add significantly to the prediction of subsequent components, an aspect not considered in previous meta-analyses. Incremental variance explained not only was insignificant, the magnitude of the effect was also quite small. As a result, one is left with a good prediction model consisting of an additive combination of level IV components which might not make much sense in psychological terms (Eagly & Chaiken, 1993). The difficult situation here is that psychologically meaningful scaling of belief items results in psychometrically meaningless or arbitrary correlations with other components, while proper methods from the viewpoint of measurement theory may lead to psychologically meaningless results (Bagozzi, 1984). Although this difficult subject has been addressed quite often (e.g., Orth, 1986; Sparks et al., 1991), it is not recognized by all primary researchers (Evans, 1991).

In addition, the issue of multidimensionality of belief structures has been of special concern in the present study. It was also Bagozzi who pointed out that "If people at times form multidimensional attitudes or if one desires to

learn which beliefs and evaluations are most important, then the Fishbein model may not be useful and may even mislead the researcher" (Bagozzi, 1984, p. 301). The results from the present study underscore the importance of this issue. In all twenty-two studies, which provided data for behavioral beliefs and their evaluations, it was impossible to determine at least two different meaningful dimensions and these contributed substantially to the prediction of the attitude component. This calls into question the assumption of unidimensional belief structures, leading to both a better prediction and explanation model of attitudes.

But what are the costs and benefits of representing the level IV components as multidimensional in general? It is admitted that parsimony of the TRA and TPB may be regarded as sacrificed for a questionable gain of enhanced prediction. Even the danger of excessive "data fitting" may be seen in an approach that advocates the exploration of multidimensional structures. To be clear, it is not advisable to subdivide level IV variables in as much components as possible. We instead propose to explicitly test measurement models for all components of the model where possible. Only in cases where a multidimensional structure clearly emerges and is theoretically sensible there is the potential to enhance prediction and, at least as equally important, understanding of the formation of components on different levels of the model. These benefits are achieved through the specification of distinguishable dimensions in the domains of behavioral consequences, normative influences, and control. Moreover, these dimensions are tested for their differential impact on other components of the model by estimation of the dimensional weights so that the formation of attitude in a particular application, for example, can be more clearly traced back to specific antecedents. How these weights are to be interpreted is not definitely clear yet. One possible interpretation is that they represent importance weights of the dimensions for the formation of attitudes (for a review on this issue, see van der Pligt, de Vries, Manstead, & van Harreveld, 2000). That is, these weights can be interpreted as an "empirical filter" for characteristics represented in the items of level IV components that are not predictive (or important) of attitudes. Another possible interpretation is that the weights function to pronounce more accessible dimensions in contrast to less accessible dimensions. In either way, the empirical results reported by van der Pligt et al. (2000) that items selected for importance correlate more highly with attitude and behavior/intention than nonselected items is in accordance with our results and lends support to the notion of these weights as importance factors. Indeed, in most but not all cases, weights for the multiple dimensions on level IV were not all significant but variance explained in attitudes increased in all cases, even as measured by adjusted R^2. Unfortunately, we could not integrate these results in our meta-analyses for technical reasons, so we did only report them here descriptively.

A final benefit of a multidimensional representation is that it offers the possibility to assess whether an inconsistent belief basis may exist or even prevail in a certain context. Such an inconsistent belief basis can result in attitudinal ambivalence at least for some persons, a phenomenon of attitude structure that

is known in attitude research for quite a long time (Scott, 1966, 1969) and has attracted remarkable research activities in recent years (e.g., Cacioppo, Gardner, & Berntson, 1997; Jonas, Diehl, & Brömer, 1997). Since attitudinal ambivalence has also been shown to moderate the attitude–behavior relationship (Jonas et al., 1997), the exploration of multidimensional belief structures seems to be a useful tool to assess whether attitudinal ambivalence is of relevance in a given study. In our view, inconsistencies of beliefs are not limited to behavioral beliefs but may also occur with normative beliefs.

The second major issue of the present study was testing the principle of compatibility as a moderator in applications of the TRA and TPB where we extended the application of this principle to all model relationships. Most of the previous meta-analyses in Table 15.1 attempted to account for observed variability in effect sizes but there has not yet emerged a small set of moderators potent enough to give an explanation of this variability. Nearly all of the attempts to account for variability – like the present study – focused on seemingly methodological explanations of which the principle of compatibility seemed to be the most interesting one, because it was supposed to give an answer to the challenge of attitude as a psychological construct put forward by Wicker (1969). The present study showed that indeed part of the variability of effect sizes in the TRA and TPB could be explained by differences between studies concerning compatibility of components, but overall, the explanatory effect of compatibility was somewhat low and disappointing. This result may indicate that the principle does not necessarily work with the force ascribed to it or that it does not do so for all relationships of the TRA and TPB. Whereas initially the principle of compatibility was confined to a methodological characteristic, it has recently been tied to more psychologically meaningful interpretations (Ajzen & Sexton, 1999). The authors argue that if beliefs accessed in the attitudinal and behavioral context are the same, high correlations can be expected. This match in beliefs might be facilitated through a match of components on the TACT-dimensions, although they note that biases in belief elicitation in the different contexts can also lead to low correlations despite highly compatible components. Tracing the roots of the principle of compatibility down to belief congruence and linking it to theoretical approaches like the attitude representation theory (Lord & Lepper, 1999) seems to be a promising approach for further research because it illuminates how the principle actually works in psychological terms and when it may fail to work.

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