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Clearing Up Some Misconceptions About the Quad Model

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I thank the authors of the commentaries for giving their time to think about what I wrote and for providing some very thoughtful views on the Quad Model. It is an impressive collection of respondents, and I found the commentaries to be constructive, well reasoned, and thought-provoking. My goal in this response is to try to clarify some misconceptions about the Quad Model that appeared among the commentaries. The fact that some of these issues appeared in multiple commentaries suggests that I failed to make certain aspects of the model clear in my original piece, and I welcome the opportunity to repair the situation. In other instances, I simply disagree with what someone wrote, and I explain why. I address four broad issues: (a) assumptions about the automaticity/controllability of the processes represented in the model; (b) assumptions about the temporal sequence and relationships among the processes in the model; (c) the generality of the model, both in terms of task applicability and process identity; and (d) the bases for choosing among different process dissociation models.

Assumptions About Automaticity/Controllability

In their excellent analysis, Moors and De Houwer (this issue) describe a number of ways in which process models confound the categories of processes with the criteria for categorization. The Quad Model is described as a model that confounds *functional processes* with the *conditions* under which such processes can take place. In particular, the Quad Model is described as confounding the automatic versus controlled nature of a process with the identity of the process (e.g., guessing, overcoming bias). Given my description of the Quad Model, it is easy to see how these authors would mistakenly draw this conclusion, despite my explicit efforts to disavow such a notion (as mentioned in Moors & De Houwer's footnote 2). Indeed, after rereading my original target article, I wished that I had been much more clear on this matter. I was tempted to rewrite sections of my target article after the fact to avoid such confusion, but I suppose that would not have been fair to the respondents!

So I want to take this opportunity to state clearly and unequivocally that the Quad Model does not assume a priori that association activation (AC) and guessing (G) are automatic processes, whereas discrimination (D) and overcoming bias (OB) are controlled process. It is true that the four components of the Quad Model were derived from dual-process models that frequently treat these processes as categorically automatic or controlled. It also is true that I used the distinctions found among these dual-process models to provide a useful framework within which to describe the components of the Quad Model. However, none of this implies that the Quad Model assumes or requires that AC and G be automatic, whereas D and OB be controlled. As I wrote in the target article, it is important to distinguish between *categories* of processes and *features* of processes. There I argued that automaticity and control should be considered features of qualitatively distinct processes rather than as categories that subsume many qualitatively distinct processes. More recently, we have made the distinction between the *intrinsic* nature and *extrinsic* features of the processes (Sherman, Gawronski, Hugenberg, & Groom, 2006). Intrinsic natures refer to the qualitatively distinct identities of different processes (e.g., What does the process do?). For example, in the Quad Model, the intrinsic nature of activation processes has to do with the action of activating associations or response tendencies; discrimination processes are defined by their actions of discriminating among possible responses; OB processes are defined by their actions to suppress associations or response tendencies; and G processes are defined by their actions in producing response biases. In contrast, extrinsic features refer to aspects of the processes that may vary and that are not inherent to the fundamental nature of the process. For instance, some processes may require more cognitive effort, whereas others require less effort; some processes may be accompanied by conscious awareness, whereas others may occur outside of conscious awareness; some processes may be elicited intentionally, whereas others are elicited unintentionally; finally, some processes may be controllable, whereas others might be uncontrollable (Bargh, 1994). Though extrinsic features are important for understanding the conditions that influence a given process, they do not specify what exactly the process is doing, and they may or may not accompany any given intrinsic process.

In the target article I argued that it would be most appropriate for researchers to specify the intrinsic nature of important processes and to then examine empir-

ically extrinsic aspects of the processes, such as the extent to which they possess the features of relatively automatic versus controlled processes (e.g., Is the process effortful, intentional, controllable, subject to awareness?). To reiterate, we regard questions about the extrinsic features of processes as empirical questions. In the case of the Quad Model, the AC and G parameters of the Quad Model have been empirically demonstrated to behave as relatively automatic processes, whereas the D and OB parameters have been empirically demonstrated to possess aspects of controlled processes (at least within the domains in which they have been tested). However, theoretically, the Quad Model does not view these relationships among the intrinsic and extrinsic aspects of the processes as necessary. For example, D or OB may acquire features of automaticity (e.g., may become more efficient) as a function of enhanced practice, and G clearly may be either conscious and controlled or unconscious and relatively automatic (see Wyer's commentary). Thus, most certainly, the confounding of intrinsic natures and extrinsic features of processes is not a "central assumption" of the Quad Model, as Moors and De Houwer conclude.

Moskowitz and Li also make points relevant to this issue. For example, they claim that none of the three models described in the target articles discuss the possibility that implicit processes are subject to capacity constraints. To the contrary, one of the central points of the Quad Model is that responses on implicit measures (which are typically assumed to be direct reflections of implicit processes) are subject to control and, therefore, also are subject to disruption. As just described, the Quad Model further assumes that any of its four component processes may possess relatively few or many features of automatic/controlled processes. Thus we are certainly in agreement with Moskowitz and Li that self-regulation processes (such as OB) may be automatized. In fact, one of the major advantages of the Quad Model is that it is able to distinguish between automated self-regulation and simple lack of activation. In contrast, research that relies on behavioral differences on implicit measures to make claims about "automatic inhibition" cannot rule out the possibility that nothing was ever activated in the first place.

Temporal Sequence and Relationships Among the Quad Model Processes

A number of respondents (Moskowitz & Li, Pryor & Reeder, Wyer) questioned the Quad Model's assumptions about the sequential nature (or lack thereof) and interdependence (vs. independence) of the different component processes. I try here to clarify these points. In considering these matters, it is important to distinguish between the model's theoretical assumptions about the onset and conclusions of the processes and the mathematical implementation of the model. It also is important to distinguish between the conditional nature of the processes and their mathematical independence.

Temporal Sequence and Process Independence

Theoretically, the model assumes that all four processes may be initiated simultaneously and interact in an ongoing fashion. Thus, it is conceivable, for example, that respondents may attempt to overcome (OB) subjectively expected biases (e.g., AC; Martin, 1986; Wegener & Petty, 1997) even if those biases do not exist or have yet to be activated. Attempts to overcome bias also may occur at the same time that participants are actively engaged in determining correct and incorrect responses (D). Response biases (G) may be activated immediately and may exert influence on behavior at the same time that the other processes are unfolding. Thus, in Wyer's terms, the components all may interact throughout a processing sequence and not simply at the output stage.

However, the mathematical implementation of the model can only reveal the actions of the different processes in conditional circumstances. Both theoretically and mathematically, the AC and D parameters are interchangeable. There is no conditionality between these two parameters. In contrast, the mathematical implementation dictates that efforts at OB will be seen only on incompatible trials, and only in cases in which AC and D both have occurred. Similarly, the model reveals influences of G biases only when AC and D have failed. Thus, although theoretically OB and G may occur from the moment of stimulus onset, the model is equipped only to detect the influence of these processes in particular conditional cases. If one wished to examine, for instance, OB processes that occur from the onset of stimulus presentation, regardless of the occurrence of AC or D, then one would need to construct a different tree model with different conditional relationships among the parameters. Note, however, that in the practice of multinomial modeling, so long as the new tree contained the same four parameters as the old tree, they might both be described as members of the same model "family" (Batchelder & Riefer, 1999). Thus, there is a hypothetical "family tree" of the Quad Model that includes different possible conditional relationships among the parameters.

Two additional points are worth noting here. First, the fact that measurable OB and G processes are conditional upon AC and D does not mean that the components are not independent. That is, although the ability to measure OB is dependent upon successful AC and D, the specific level of OB reported by the model is independent of the specific likelihoods of AC and D, as-

suming each is greater than 0. More generally, given that the parameter estimates are constrained to be greater than 0 and less than 1, the probability estimates of each of the parameters are independent of one another. Second, the types of conditional mathematical constraints just described are not unique to the Quad Model but apply to all process dissociation (including Jacoby's models, discussed next) and multinomial models that rely on categorical data. As such, users of these models must always be cognizant of precisely what the models' parameters represent, in light of the conditional constraints of a given model. Thus, OB in the Quad Model specifically represents overcoming bias, given that a bias has been activated, that a correct response has been determined, and that the correct response is incompatible with the bias. I address this issue in more detail next.

Can Automatic Processes Be Conditional Upon Control?

Another issue related to the relationships among the Quad Model parameters has to do with whether it is logically possible for relatively automatic processes to be conditional upon more controlled processes. Wyer (this issue) and Crano (this issue) suggest that automatic processes necessarily influence responses and that, at best, they may be overcome by more controlled processes. This calls into question the logical standing of the "late" automatic processes represented by the Quad Model's G parameter and the familiarity component of Jacoby's (1991) recollection-accessibility-bias (RA) model, both of which influence behavior only in the wake of failed control. Here again, however, it is important to distinguish between the conditions under which an automatic process, such as an unconscious response bias or a familiarity effect, is engaged and the conditions under which the effects of such a process may be observed. Certainly, it is conceivable that response biases or familiarity may influence behavior even when control succeeds. However, these particular influences of response bias and familiarity would not be revealed by the Quad Model or Jacoby's (1991) RA model, respectively. In effect, the models are interested only in the role of these processes following failed control. Most important, these models are able to demonstrate the influence of these processes when that influence is restricted to cases in which control already has failed. Thus it is possible to measure the influence of these processes under particular conditions and independently of any assumptions about serial onset and conclusion. This does not preclude the possibility of "earlier" influences of response biases or familiarity that would occur regardless of control; however, measuring those influences would require a different model.

The Generality of the Model

Another set of issues raised by some respondents has to do with the generality of application of the Quad Model. There were two main concerns: the generality of the tasks to which the model may be applied and the generality of the meaning of the processes in the model across different content domains of research.

Task Generality

A number of commentary authors suggest that a limitation of the Quad Model is that it can be applied only to a narrow range of measurement tasks. For example, Wyer (this issue) notes that the model requires tasks that involve numerous dichotomous responses. Pryor and Reeder (this issue) similarly point out that the model demands tasks with correct and incorrect responses. Crano (this issue; see also Albarracín, Noguchi, & Earl, this issue) suggests that the model relies on "esoteric research operations" and a narrow range of tasks that lack mundane realism (Crano, this issue).

Though Wyer and Pryor and Reeder are largely correct in their assessments of appropriate tasks for the model, the list of tasks that meet those requirements is not small and includes tasks that are very heavily used across domains of social (and nonsocial) psychology.[1] For example, many priming measures (e.g., lexical decision tasks, affective priming tasks that require "good" and "bad" responses), the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998), the Stroop task (Stroop, 1935), the Shooter Task (Correll, Park, Judd, & Wittenbrink, 2002), and many others vary the compatibility of potentially competing processes and require dichotomous responses that are either correct or incorrect. Common explicit measures that do not require judgments measured in milliseconds also are appropriate for modeling. For example, standard persuasion paradigms in which the influence of heuristic cues (e.g., the attractiveness of the target) is either compatible or incompatible with the objective (i.e., pretested) quality of persuasive arguments may be easily adapted for application of the Quad Model by simply requiring a dichotomous judgment (e.g., Is this a strong argument or a weak argument?). Similarly,

[1]Technically, the Quad Model does not require tasks that have objectively correct and incorrect (in a factual sense) responses. However, the model does require tasks that include responses that a participant would always choose to provide on a given trial, given perfect ability to discriminate the response (D) and perfect ability to overcome conflicting associations or behavioral tendencies (OB). For example, there is nothing factually correct about responding in a nonhostile fashion to a partner's provocation. However, given that this is the preferred response, then tasks that pit this response against competing impulses are appropriate for testing with the Quad Model.

standard stereotyping versus individuation methods in which the trait implications of a target's stereotyped category are either compatible or incompatible with the objective trait implications of an individuating behavior may be modeled.

Burke and Uleman (2006) recently used the Quad Model to unravel the processes involved in spontaneous trait inferences. Other possible applications include any recognition memory task or other judgment task in which there are correct and incorrect responses, such as judgments of fame (e.g., Jacoby, Kelley, Brown, & Jasechko, 1989). With a little creativity, it is not difficult to construct a wide range of tasks to which the model may be applied. It is true that one challenge in designing and using such tasks is to ensure that there are a sufficient number of trials to permit modeling. Sufficient trials may be achieved either by implementing a large number of trials per subject or by collecting data from many participants (in the event that it is impossible to present many trials for each participant). However, this is no different than the situation commonly faced by researchers seeking reliable reaction time measures.

I found it surprising that the implicit measures to which the Quad Model already has been applied were characterized as narrow or esoteric. These measures are now used in almost every area of social psychology to reveal presumably "pure" automatic processes. It is strange that these measures apparently are perceived as somehow more limited when a modeling technique is applied to them so that their meaning may be made more clear. It also is strange that these measures should be considered more esoteric than the rating scales or questionnaires that are commonly used in social psychological research. For example, behavioral performance on the Shooter Task (e.g., Correl et al., 2002) would appear to be have much greater mundane realism (see Crano, this issue) as a measure of bias than a number circled on a piece of paper in response to a hypothetical impression target or an item on a questionnaire.

Process Generality

The second issue raised about the generality of the Quad Model has to do with the generality of the meaning of the processes in the model. For example, Pryor and Reeder (this issue) ask whether the model "aspires to describe some general social cognitive processes or is it a model of the psychological processes involved in how research participants perform some very specific laboratory tasks?" (p. 233). In a related manner, Moskowitz and Li (this issue) question whether the self-regulation and association activation processes are too narrow. In fact, the Quad Model is meant as a general model of impulse and impulse control that may be applied across many different content domains (Sherman et al., 2006). For example, in the context of aggressive behavior, the model can be used to help disentangle the roles of aggressive impulses, the ability to determine appropriate behavior, and the ability to regulate aggressive impulses when they are inappropriate (e.g., Finkel & Campbell, 2001). The model can similarly be applied to understanding the influence of automatic emotional reactions on judgment, decision making, and behavior (e.g., Beer, Knight, & D'Esposito, 2006; Eisenberg, Sadovsky, Spinrad, Fabes, & Losoya, 2005; Tice, Bratslavsky, & Baumeister, 2001). In the context of phobias, the model can be used to disentangle the strength of phobic associations from the ability to determine rational responses from the ability to overcome phobic associations when necessary (e.g., Beck & Clark, 1997). As a final example, in the domain of addictions, the model can be used to separate the extent to which addictive behavior is influenced by automatic impulses or associations, the ability to discern appropriate action, and the ability to regulate impulse (e.g., Jentsch & Taylor, 1999; Sayette & Hufford, 1994; Tiffany, 1990).

In this regard, it is important to note that the specific meaning of each of the components of the model will depend on the particular content domain and task in which the model is being applied. Thus, the AC parameter may represent the activation of evaluative or semantic associations, a habit (e.g., reading in the Stroop task) or goal (e.g., to form an impression), impulsive aggressive tendencies, unwanted influences of emotions on judgments, and so on, depending on the specific nature of the task and content. Similarly, D may represent the ability to determine whether an object is a gun or a tool, the ability to identify the color of ink, the ability to determine the quality of an argument or the meaning of a behavior, or the ability to ascertain an appropriate response during a heated social interaction, depending on the task. The same principles also are true of the OB and G parameters. The Quad Model may be applied to many different tasks and within many different content domains of research. The specific meanings of the general parameters will vary accordingly. Thus, to answer the critique of Moskowitz and Li (this issue), the Quad Model is well able to accommodate many different types of goals and self-regulatory processes.[2]

A separate issue is the extent to which the Quad Model's component processes (regardless of their specific meanings within specific tasks) are related to other important domain-relevant behaviors. To what

[2]Moskowitz and Li are correct in their assertion that the Quad Model assesses self-regulation only when there is a conflict between two processes. We do not deny that self-regulatory processes may be important in other conditions that would not be revealed by the model. We would once again, however, remind the reader that the Quad Model is not meant to be an exhaustive model of all possible mental processes.

extent are differences in prejudicial behavior, aggressive behavior, emotional behavior, or addictive behavior related to each of the model parameters (see Wyer's commentary)? In each case, success and failure may be due primarily to the strength of a given association or impulse, the ability to detect a correct response, the ability to regulate impulses when necessary, the use of response biases, or some combination of processes. To answer these questions, estimates of the different processes can be used to predict outcomes on behavioral measures. The relevant behavior may be performance on the task from which the parameters were derived or any other type of behavioral observation.

For example, in our application of the model to race bias on the IAT (Greenwald et al., 1998), we used the parameter estimates derived from correct and incorrect responses to predict the extent of reaction time bias demonstrated on the task (Conrey, Sherman, Gawronski, Hugenberg, & Grrom, 2005, Experiment 4). In other cases, the parameter estimates derived from an experimental task may be used to predict behavior in another context altogether. For instance, parameter estimates from a cognitive task designed to elicit evaluations of cigarettes may be used to predict how frequently participants smoke, how long they have smoked, how many times they have tried to quit smoking, or the success of such attempts to quit. In a similar fashion, parameter estimates could be related to aggressive interpersonal behavior, emotional biases in decision making, or phobic reactions. Clearly, an important determinant of the Quad Model's success will be its ability to predict such behaviors. Of course, the same is true of all measures of attitudes/behavioral tendencies. The advantage of the Quad Model is that it allows researchers to predict behavior both independently and simultaneously from each of the four component processes without having to rely on content or task confounds (see the target article).

Which Model to Use?

The final issue I want to address concerns the bases for choosing among different process dissociation models. I am most certainly in accord with Payne and Jacoby's (this issue) emphasis on the value of quantifying models. Indeed, one of the most important features of the Quad Model is that it goes beyond a mere narrative description of its processes, providing a mathematical implementation that provides independent quantitative estimates of the processes.

Questions of Model Fit

In choosing among different models, there are a variety of factors to consider. One consideration is model fit: If the model cannot adequately fit the data, it cannot be used. In this regard, Payne and Jacoby make an important point about the relationship between the number of parameters in a model and model fit, describing how in a number of studies using the Weapons Identification Task (WIT; Payne, 2001) the two-component RA model provided better model fit than did the Quad Model (see also Crano's commentary). However, though the RA model may have provided better fit for WIT data than the Quad Model (in this case), the Quad Model may provide better fit for other tasks. Indeed, one impetus for developing the Quad Model was the fact that neither the RA model nor the Inhibition-Deficit (ID) model (Lindsay & Jacoby, 1994) provided adequate fit for the IAT in our early attempts to model that task. It is too early to provide a comprehensive assay of the different models' ability to account for data across a broad range of tasks. However, in regards to the two tasks to which both the RA model and Quad Model have been applied, the Quad Model has provided consistently good fits to both tasks, whereas the RA model has not (the ID model typically fits neither the IAT nor the WIT).

Construct Validity and Prediction

The second issue raised about choosing among models concerns the validity of the models' parameters. As noted by Payne and Jacoby (this issue), model fit is necessary for applying a given model but is not at all sufficient to recommend that model's use. In particular, the construct validity of a model's parameters is much more important than is overall model fit. The question is, Do the parameters, in fact, measure the processes that they are meant to measure? There are many ways to establish the construct validity of a model's parameters, and the Quad Model's parameters have been well validated (e.g., Conrey et al., 2005; Sherman, in press). As noted by Payne and Jacoby, one important means for establishing construct validity is by examining the extent to which a model's parameters are able to predict behavior. As previously described, the parameters of the Quad Model have proven effective in explaining the behavioral bias on the IAT. The Quad Model also has proven effective in explaining individual differences in WIT bias (Sherman & Amodio, 2006). In the case reported in Payne and Jacoby's commentary, the Quad Model's parameters were said to predict personality impressions less well than did the RA model's parameters.

However, there are problems with this conclusion. First, it is important to consider the many consequences of model complexity. As observed by Payne and Jacoby, greater model complexity may lead to exaggerated advantages in model fit. But greater complexity also has its costs. In particular, when data are

spread across four rather than two parameters, the parameter estimates are necessarily less reliable and will be less likely to effectively predict another measure. This is particularly the case here, in which the RA model is essentially a restricted version of the Quad Model. Therefore, the statistical advantage of complex models noted by Payne and Jacoby is offset by a critical statistical cost that they do not acknowledge. As such, it is not surprising that the parameters of the two-parameter RA model would better predict other measures than would the parameters of the four-parameter Quad Model. In fact, having inspected these data, the beta weights for the relevant parameter predictions are as strong in the Quad Model as in the RA model, yet the Quad parameters are not reliable predictors. This does not imply that the RA model is more accurate, that its parameters are more valid, or that it provides a better explanation of the data than does the Quad Model.

The Most Important Factor in Model Choice Is Theoretical Relevance

Model fit and parameter construct validity are important factors in determining the applicability of a given model to a set of data. However, the most important concern in choosing a particular model is the theoretical purpose for which the model will be used. The two-factor process dissociation models and the Quad Model represent much more than merely different ways to measure the same processes. The A (automatic) and C (controlled) components in the two process dissociation models (RA and ID) measure very different things. None of these components tap any of the four processes in the Quad Model. Thus, choosing among these models (or others) should be based on a careful, a priori, theoretical consideration of which processes are of greatest interest in a particular study.

Consider the RA model (the model that Payne and his colleagues and others have applied to the WIT). In this model, the A parameter represents a constrained automatic process that influences behavior only when control has failed. The C parameter represents the ability to detect and provide an accurate response. If a researcher is interested in an automatic process that captures attention and influences behavior regardless of whether or not control succeeds, then the RA model would not be appropriate. For example, researchers interested in automatic stereotypes or attitudes that influence social perception regardless of perceivers' attempts at control should not use the model, as it is not mathematically equipped to estimate such automatic processes. Similarly, if a researcher is interested in a controlled process that overcomes the influence of such automatic processes, then the RA model would not be appropriate. As such, researchers interested in how people may override automatically activated attitudes and stereotypes should not use the model because it is not mathematically equipped to provide estimates of such controlled processes. Thus, when applying this model, researchers must understand clearly exactly what type of automaticity and what type of control the model estimates, and should interpret their results accordingly. Results pertaining to the A and C parameters should not be interpreted as reflecting automatic activation or overriding that activation, respectively (e.g., when applying the model to the WIT or IAT).

Now consider the ID model. In this model, the A parameter represents an automatic association or habit that captures attention and determines the behavioral response.[3] The C parameter represents a constrained type of control (the ability to determine and provide an accurate response) that influences behavior only when there is no automatic habit/activation.[4] According to this model, an automatic process, once activated, may not be influenced *at all* by attempts at control. Thus, in a Stroop task, if the automatic habit to read the word is engaged, then, mathematically, controlled efforts to name the color of the ink will have no influence on responses.

As such, if, for a given research question, it is theoretically important to distinguish between cases in which an automatic association is not activated at all from cases in which the association is activated but is overcome, then the ID model would not be appropriate. For example, on the Stroop task, people do indeed provide correct responses on most trials despite the fact that they have an automatic habit to read the word. It would appear that, in these cases, the habit is overcome. In contrast, a child who knows colors but cannot read will make few errors simply because she or he has no reading habit to overcome in the first place. The ID model cannot distinguish between these two cases: the adult's and the child's processing would be seen as identical by the model. Likewise, on implicit measures of attitude, the ID model cannot distinguish between a

[3]Although the A parameter in the ID model is similar to the AC parameter in the Quad Model, they are different in a very important way. In the ID model, the A parameter represents the likelihood that an automatic association/habit will be activated and that it will determine the response. In contrast, in the Quad Model, the AC parameter represents the likelihood that an association/habit is activated but does not represent the likelihood that the association also will determine the response. Thus, in the Quad Model, the activation of an association/habit does not guarantee that that association/habit will determine behavior: AC may be overcome.

[4]Although the C parameter in the RA and ID models is similar to the D parameter in the Quad Model, they are different in important ways. Most critically, in the Quad Model, the likelihood of D does not depend on the presence or absence of automatic processes (in contrast to the ID model). In addition, in the Quad Model, D represents the likelihood of detecting a correct response but not also the likelihood of providing a correct response (in contrast to both the RA and ID models). In the Quad Model, whether or not a correct response will be given is additionally dependent on AC and OB.

person who is able to overcome a strong automatic bias and a person who has no bias in the first place. If this distinction is important in a study, then the ID model should not be used. Again, when applying this model, researchers should be careful to interpret the meanings of the A and C parameters appropriately.

To summarize, if a researcher is interested in people's ability to override automatic biases, neither the RA nor the ID model can identify those processes, regardless of the particular experimental task. If a researcher is interested in measuring the extent of activation independently from the ability to overcome activation, neither the RA nor the ID model can help. The two models may well provide adequate fits to the data, but they will not provide the critical process information. Likewise, the parameter estimates of the two models may well predict other behaviors effectively. However, the parameters that are predicting the behaviors have specific definitions and may not represent the processes that are of central interest. Moreover, in the case of the A parameter, it will not be possible to infer the extent to which different possible components of the parameter (extent of activation vs. extent of overcoming activation) are critical. Obviously, if one is interested in the simultaneous effects of the four components of the Quad Model, then neither the RA nor ID model will suffice. Also, obviously, if one is interested in processes that are not captured by the Quad Model, then other means will be necessary. The point is that, assuming adequate model fit and parameter validity, the paramount concern in choosing a model should be theoretical: Which processes are theoretically relevant to the research?

Notes

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