

The Decision Making Individual Differences Inventory and guidelines for the study of individual differences in judgment and decision-making research

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Abstract

Individual differences in decision making are a topic of longstanding interest, but often yield inconsistent and contradictory results. After providing an overview of individual difference measures that have commonly been used in judgment and decision-making (JDM) research, we suggest that our understanding of individual difference effects in JDM may be improved by amending our approach to studying them. We propose four recommendations for improving the pursuit of individual differences in JDM research: a more systematic approach; more theory-driven selection of measures; a reduced emphasis on main effects in favor of interactions between individual differences and decision features, situational factors, and other individual differences; and more extensive communication of results (whether significant or null, published or unpublished). As a first step, we offer our database—the Decision Making Individual Differences Inventory (DMIDI; <http://www.sjdm.org/dmidi>), a free, public resource that categorizes and describes the most common individual difference measures used in JDM research.

Keywords: individual differences, decision making, judgment, inventory, measures.

1 Introduction

How much of human behavior (including judgments and decisions) is due to the “person” versus the “situation”? This question dates back to ancient Greece (e.g., Aristotle’s *tabula rasa* vs. Plato’s divinely preformed mind). Today the debate continues amid increasing evidence that the answer is neither one (the person, e.g., Allport, 1937; Digman, 1990) nor the other (the situation, e.g., Milgram, 1974; Zimbardo, 2004), but rather the two in combination (e.g., Mischel, 1968, 2004). Further evidence against simple, one-or-the-other approaches comes from the emerging field of epigenetics, which documents biochemical mechanisms through which environmental conditions regulate gene expression (e.g., Hyman, 2009). Nevertheless individual differences continue to be widely

used as explanatory variables, in everything from risk aversion in economics (Weber, 2001) to animal personality in biology (e.g., Herborn et al., 2010).

We argue that the persistent emphasis on a large range of individual differences as *main effects* in the field of judgment and decision making (JDM) is outdated. Thus, we propose four guidelines for the more productive pursuit of individual differences research within JDM: a more systematic approach, a shift toward theoretically relevant measures, a greater emphasis on interactions, and more extensive communication of results. We offer our Decision Making Individual Differences Inventory (DMIDI; <http://www.sjdm.org/dmidi>), a free online database, as a tool to help accomplish these aims. Before elaborating upon our guidelines, we will present an overview of common individual difference measures in JDM research.

1.1 Decision making by individuals

The decisions made by individuals are widely recognized as being affected by three sets of factors—decision features, situational factors, and individual differences (Einhorn, 1970; Hunt et al., 1989). Of these three, decision features, which are characteristics of the decision itself, are probably understood best. A wealth of research has demonstrated the impact of decision features such as the framing of choice options (see Kühberger, 1998, and Levin et al., 1998, for reviews), the ordering of choice options (e.g., Davis et al., 1984; Krosnick et al., 2004;

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Nadler et al., 2001), and the requirement of choice justification (see Lerner & Tetlock, 1999, for a review). Additionally, a consensus has emerged regarding the effects of many situational factors—characteristics of the situation in which the decision is faced—including time pressure (e.g., Dror et al., 1999; Verplanken, 1993), cognitive load (e.g., Drolet & Luce, 2004; Ebert, 2001), and social context (e.g., Nadler et al., 2001). In contrast, even though there has been a fair amount of research about the effects of individual differences—characteristics of the decision maker—on decision making, it is not clear that we as a field fully understand them. As a result, theory in judgment and decision making has focused on the construction of preferences as determined by decision features and situational factors (e.g., Lichtenstein & Slovic, 2006; Weber & Johnson, 2009), and not on the influence of chronic individual, group, or cultural differences, as noted by Weber and Morris (2010).

1.2 Individual differences and decision making

There are frequent calls to study the effects of individual differences on decision processes and outcomes in order to rectify what has been seen as an overemphasis on decision features and situation factors (e.g., Levin, 1999; Mohammed & Schwall, 2009; Scott & Bruce, 1995; Shiloh et al., 2001). Contrary to what these appeals suggest, there actually is a considerable amount of JDM research on the effects of individual differences. What is lacking, however, is consensus about the interpretation and significance of existing results and, thus, about the role of individual differences in decision making. Even a cursory review reveals a constellation of confusing and often contradictory results for many individual differences (for example, see Levin et al., 2002, and Shiloh et al., 2002, for contradictory results regarding cognitive style and framing effects; see Mohammed and Schwall, 2009, for a review).

There are multiple ways to improve this picture. A recent review by Mohammed and Schwall (2009) urges decision researchers to explore the topic in more detail (e.g., including more pre- and post-decision variables) and with more appropriate tools, such as experimental designs that minimize the power of the situation, which can overwhelm any impact of individual differences. We suggest a different and more comprehensive set of guidelines that addresses individual differences research from the study design stage through the publication stage. We believe that a change of approach can better our understanding of individual differences in JDM. To that end, we hope that our guidelines spur discussion about the importance of individual differences in JDM and encourage a more systematic approach to the topic. We also hope that the

DMIDI can aid in the efforts toward a more standardized and cumulative analysis of individual differences. Before we offer our recommendations, we turn to our overview.

2 Overview of individual difference measures

“Individual differences” is a broad term, covering any variable that differs between people, from decision style to cognitive ability to personality. Our overview highlights the most common categories of individual difference measures used in judgment and decision-making research. Because common measures change over time and also differ between subfields, our overview is representative rather than comprehensive. Information on other measures and their effects on judgment and choice can be found in the DMIDI, our extensive and continuously evolving online database, which we hope will serve as a dynamic forum for a more complete and cumulative analysis and discussion of individual difference measures.

We divide measures into seven categories: decision-making measures, risk attitude measures, cognitive ability measures, motivation measures, personality inventories, personality construct measures, and miscellaneous measures. Recognizing that there are probably as many categorization schemes as there are measures, we based ours initially on that of Mohammed and Schwall (2009) for consistency and then extended it based on conversations with other individual differences researchers. Other difficulties that we ran into when categorizing measures were fuzzy boundaries between constructs (e.g., cognitive style measures are often used as measures of decision style) and measures belonging to multiple categories (e.g., epistemic motivation measures which assess both motivation and cognition). In our overview and on the DMIDI, we have attempted to indicate the gray areas and to cross-list measures so that they can be found under any of their member categories.

2.1 Decision-making measures

Measures of individual differences in decision making can be divided into measures of style, approach, and competence. Under style measures, we include both decision style measures, such as General Decision-Making Style (GDMS; Scott & Bruce, 1995), and cognitive style measures, such as the Rational-Experiential Inventory (REI; Epstein et al., 1996; Norris et al., 1998). Although there is some disagreement as to whether decision style and cognitive style represent the same construct or not (e.g., Mohammed et al., 2007; Mohammed & Schwall, 2009; Thunholm, 2004), they can both be said to assess individuals’ methods of making decisions, or thinking more gen-

erally, and the extent to which they use a certain strategy or style (e.g., rational or intuitive). We also include here measures of epistemic motivation. As measures of motivated cognition (e.g., information processing, thinking, and judgment), they appear under both decision style and motivation. Measures of epistemic motivation include the Need for Cognitive Closure Scale (NFCS; Webster & Kruglanski, 1994) and the Need for Cognition Scale (NFC; short form by Cacioppo et al., 1984).

Measures of decision approach assess various aspects of individuals' management of decision making, both pre- and post-decision, and include such constructs as indecision (e.g., the Indecisiveness Scale by Frost & Shows, 1993), decision conflict (e.g., the Melbourne Decision Making Questionnaire by Mann et al., 1997), and regret (e.g., the Regret Scale by Schwartz et al., 2002).

Decision making competence refers to the ability or set of skills needed to make good decisions, based on normative models of decision making (see Bruine de Bruin et al., 2007, and Parker & Fischhoff, 2005, for more details). Decision competence measures, such as Adult Decision Making Competence (A-DMC; Bruine de Bruin et al., 2007) and the Decision Outcome Inventory (DOI; Bruine de Bruin et al., 2007), assess how well individuals make decisions and whether they tend to reach satisfactory outcomes. Measures of specific abilities, such as numerical ability (e.g., numeracy by Peters et al., 2007), contribute to decision making competence and are cross-listed here. Relatively new to the scene, decision competence measures are promising individual difference measures for JDM because of their ability to predict real-world decision performance (e.g., Bruine de Bruin et al., 2007; Parker et al., 2007). There is also evidence linking specific cognitive control abilities with specific dimensions of decision making competence (Del Missier et al., 2010). We will return to the potential utility of decision making competence measures in our guidelines.

2.2 Risk attitude measures

In economics, risk attitude is typically modeled as the shape of a decision maker's utility function. Other frameworks, including that of finance, model risk attitude as the tradeoff between perceived risks and returns (e.g., Weber et al., 2002). Across frameworks, measures of risk attitude generally assess decision makers' preferred levels of risk. Measures of risk attitude fall into three categories (see Weber & Johnson, 2008, for a review).

In one category are behavioral measures of risk where an individual's risk preferences are determined from actual choices made in games or scenarios, both real and hypothetical. The Balloon Analog Risk Task (BART; Lejuez et al., 2002), Columbia Card Task (CCT; Figner et al., 2009), Cups Task (Levin & Hart, 2003; Levin et al.,

2007), and Iowa Gambling Task (Bechara et al., 1994) are examples of behavioral measures of risk.

A second category assesses risk attitude using self-report questionnaires, such as the Choice Dilemmas Questionnaire (CDQ; Kogan & Wallach, 1964) and Risk-taking Propensity (Jackson et al., 1972), which directly question an individual about risky situations. Included in this category are measures that also assess decision makers' perceptions of risks and benefits in order to infer their preferred levels of risk (e.g., the Domain Specific Risk Task (DOSPRT), Weber et al., 2002).

A third category approaches risk attitude through individuals' self-reports of personality traits related to risk-taking and aversion. Because these measures assess relevant personality traits, such as impulsivity, some of them are also included as personality construct measures (e.g., Eysenck's Impulsivity Inventory by Eysenck & Eysenck, 1978) or represent a subset of a larger personality inventory (e.g., the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) by Zuckerman et al., 1993). Some measures are also listed under motivation (e.g., Need for Arousal by Figner et al., 2009).

Closely related to risk attitude measures are ambiguity attitude measures. Ambiguity can be conceptualized as "uncertainty about uncertainty" (Lauriola et al., 2007; e.g., the Ambiguity-Probability Tradeoff Task by Lauriola & Levin, 2001) or, more broadly, as a lack of sufficient probability information (e.g., Multiple Stimulus Types Ambiguity Tolerance by McLain, 1993).

2.3 Cognitive ability measures

Measures of cognitive ability assess decision makers' intelligence and/or capabilities. Cognitive ability measures can be divided into measures of global ability and measures of specific abilities or skills. Global ability, or overall intelligence, measures assess fluid intelligence and include Raven's Standard Progressive Matrices (SPM; Raven et al., 2003) and the Wechsler scales (e.g., Wechsler Adult Intelligence Scale (WAIS) by Wechsler, 1955, 1997).

Measures of specific abilities assess specific skills or competency areas, such as reading comprehension (e.g., the Nelson-Denny Reading Test by Brown et al., 1993) and numerical ability (e.g., objective numeracy by Peters et al., 2007). Some specific abilities, such as numeracy, contribute to decision making competence and are cross-listed there. Also included under specific measures of ability are subjective measures of ability, such as the Subjective Numeracy Scale (SNS; Fagerlin et al., 2007). While these measures rely on self-report and are not objective tests of ability, they are often used to complement objective measures.

2.4 Motivation measures

Individual differences in motivation are differences in the drives to engage or not engage in various behaviors. Motivation measures vary greatly in their target constructs. They can be partitioned into four groups based on what they assess. (1) Measures of motivated self-presentation, also known as social desirability, assess how individuals present themselves to others and include the Balanced Inventory of Desirable Responding (BIDR; Paulhus, 1991) and the Marlowe-Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1960). (2) Measures of motivated self-regulation during goal pursuit assess individuals' orientations to their goals (e.g., the Behavioral Inhibition Scale and Behavioral Activation Scale (BIS/BAS) by Carver & White, 1994, the Regulatory Focus Questionnaire (RFQ) by Higgins et al., 2001, and the Regulatory Mode Questionnaire (RMQ) by Kruglanski et al., 2000). (3) Measures of interpersonal motivation assess the drives underlying individuals' interactions with others and include such measures as the Ring Measure of Social Values (Liebrand & McClintock, 1988) and Self-Report Altruism (Rushton et al., 1981). (4) Lastly, there are measures assessing psychological needs and fears as motivations; these include Fear of Negative Evaluation (FNE; Leary, 1983), Need to Evaluate (Jarvis & Petty, 1996), and Consumers' Need for Uniqueness (short form by Ruvio et al., 2008). Some of these measures are also used to assess risk attitude (e.g., Need for Arousal by Figner et al., 2009). Within this fourth category (as well as under measures of decision/cognitive style), we place measures of epistemic motivation, which assess motivated cognition (e.g., information processing, thinking, and judgment) and include the Need for Cognitive Closure Scale (NFCS; Webster & Kruglanski, 1994) and the Need for Cognition Scale (NFC; short form by Cacioppo et al., 1984).

2.5 Personality inventories

Personality is another umbrella term. Personality refers to individuals' traits, or characteristics that are stable over time—although there is debate about whether traits are stable across situations (the trait model; e.g., Allport, 1937; Digman, 1990) or only within situations (the interactionist model; e.g., Mischel, 1968, 2004). We will return to this debate in our guidelines. We divide personality measures into inventories, which assess constellations of traits, and construct measures, which assess single traits.

Inventories can be distinguished by their underlying theory of personality. The most common of such theories is the Five Factor Theory of Personality ("the Big Five"), which posits five dimensions of personality: *openness*

(also called culture or intellect), characterized by originality and curiosity; *conscientiousness* (sometimes called dependability), characterized by orderliness and responsibility; *extraversion* (also called surgency), characterized by talkativeness and assertiveness; *agreeableness*, characterized by trust and being good-natured; and *neuroticism* (often reverse-scored and labeled emotional stability), characterized by being easily upset (Digman, 1990; Goldberg, 1992; John & Srivastava, 1999). Common Big Five measures include the Ten Item Personality Inventory (TIPI; Gosling et al., 2003), Trait Descriptor Adjectives (TDA; Goldberg, 1992), and the NEO Personal Inventory-Revised (NEO-PI-R; Costa & McCrae, 1992). There are also several inventories, such as the California Personality Inventory (CPI; Gough, 1987) and the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943), that stem from other theories that describe subsets, supersets, or non-overlapping sets of traits from those of the Big Five. Subsets of some of these inventories are also used to assess risk attitude (e.g., the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) by Zuckerman et al., 1993).

2.6 Personality constructs

Personality constructs abound, but JDM research tends to focus on a subset. These construct measures can be categorized into six groups: (1) measures relating to facets of the self, including self-esteem (e.g., the Coopersmith Self-Esteem Inventory by Coopersmith, 1967, 1981, and the Rosenberg Self-Esteem Scale by Rosenberg, 1965) and self-consciousness (e.g., the revised Self-Consciousness Scale by Scheier & Carver, 1985); (2) interpersonal measures assessing how individuals perceive and act toward others and including constructs such as empathy (e.g., the Interpersonal Reactivity Index (IRI) by Davis, 1980) and trust (e.g., the Trust Inventory by Couch et al., 1996); (3) measures of impulsiveness (i.e., the tendency to act without forethought), such as the Barratt Impulsiveness Scale (BIS; Patton et al., 1995), some of which are also used to assess risk attitude; (4) measures of cultural differences, which assess dimensions on which cultures are assumed to vary, such as individualism versus collectivism, power distance, and masculinity versus femininity (e.g., the Values Survey Module (VSM) by Hofstede, 2001); (5) measures of time orientation, which assess perceptions of time (e.g., Consideration of Future Consequences (CFC) by Strathman et al., 1994, and Future Time Orientation (FTO) by Gjesme, 1975); and (6) measures of perceived control which distinguish between perceptions of control as internal versus external (e.g., Spheres of Control by Paulhus, 1983).

2.7 Miscellaneous measures

Finally, there are measures that do not fall squarely into any of our major categories. These measures assess a wide array of individual differences, including attitudes (e.g., New Environmental Paradigm-Revised (NEP-R) by Dunlap et al., 2000) and emotions and moods (e.g., the Positive and Negative Affect Scale (PANAS) by Watson et al., 1988). While some or all of these constructs may evolve into their own categories over time, they are currently situated within our miscellaneous category.

3 Guidelines for future research

As our overview demonstrates, individual differences vary greatly in their theoretical underpinnings and their target constructs. Given this, one should not expect that all categories of individual differences would be important and significant main effects predictors in all domains, nor are they (see Bazerman et al., 2000; Kassarjian & Sheffet, 1991; Mischel, 2004; and Mohammed & Schwall, 2009, for reviews in the domains of negotiation, consumer behavior, personality, and JDM, respectively). Thus, the persistent use of such a wide range of individual difference measures within the domain of JDM may not be advisable. Instead, we suggest amending the ways in which individual difference effects are investigated in JDM. Specifically, we offer four recommendations that address the pursuit of individual differences research from measure selection through publication: (1) a more systematic approach to individual differences; (2) a shift toward theoretically relevant measures; (3) a shift from a search for direct effects of individual differences to an examination of individual differences in interaction with decision features, situational factors, and other individual differences; and (4) more comprehensive sharing of a wider range of results. We elaborate on each of these recommendations below.

3.1 A systematic approach to individual differences

The study of individual differences in JDM has been unsystematic, with different studies using different measures of the same individual difference construct or using the same measure but adapting it for their own needs. There is currently no standardized set of measures for use in JDM research. For each construct, such as decision style, there are a number of different measures that have been used in various contexts, and different effects have been found with different measures (see Mohammed and Schwall, 2009, for a review). Additionally, researchers

often modify existing measures by selecting a handful of questions or altering question wording. We recognize that it is sometimes necessary to develop a new measure or to modify an existing measure to fit the needs of a particular study. However, in many cases there exists an appropriate, validated measure of which the researchers are simply unaware because of the difficulties inherent in searching various literatures for suitable measures. In cases like these, we advocate using existing measures in their standard form (and we offer the DMIDI to facilitate the search process) because frequent creation and modification of measures leads to few studies using the same measures as predictors to investigate the same decision phenomena in similar experimental settings, which in turn means that a meta-analysis is impossible.

We argue that more standardization is required to allow results to accumulate and for a better understanding of the effects of individual measures on decision-making processes and outcomes. The selection and repeated use of a standard battery of measures (where appropriate) would provide data on the abilities and limitations of different scales. It would also allow cross-study comparisons (and even meta-analyses) to better establish when and how individual difference measures affect decision processes and outcomes.

We realize that scale selection can be difficult and time-consuming. Therefore, as a companion piece to this review we offer our DMIDI database as a free, public resource designed to encourage standardization of individual difference measures. By categorizing and describing the most common individual difference measures used in JDM research, the DMIDI can help the judgment and decision-making community share information about individual difference measures. The DMIDI can also host discussions about the relative merits of various individual difference measures and allow a consensus to build about the best measures for use in JDM. To jump start this process, each measure's entry in the DMIDI contains a brief description of the measure, a link to the original paper introducing the measure, and links to examples of published research using the measure. Where we have been given permission by measure authors, the entry also has the measure itself available for download. The DMIDI is intended to be a collaborative wiki-style endeavor. Consequently, its success is dependent upon the JDM community. We encourage researchers to support the DMIDI by adding additional individual difference measures as well as information on their experiences with measures. We also encourage researchers to contribute to discussions about various individual difference measures or even entire constructs.

3.2 Theory-based selection of individual difference measures

Beyond a more systematic approach to the study of individual differences, we also need to think carefully as a field about which individual difference measures are worth pursuing as predictors of decision making variables. It is all too common to add a long list of individual difference measures to a study in order to see what has predictive ability (known as the “kitchen sink” or “see what sticks” approach). Personality measures (e.g., the Big Five) are often included in questionnaire batteries as a matter of course rather than to test *a priori* predictions. This approach explains the heterogeneous array of individual difference measures that have been used, mostly with limited success, in JDM research. In lieu of the kitchen sink approach, we recommend that, for each study, researchers carefully select a limited number of measures that have clear theoretical relevance for the paradigm. The inclusion of measures with theory-driven hypotheses provides better tests of measures than random inclusion.

If any individual difference measures are going to bear fruit, measures with clear theoretical ties and proven domain relevance are the most likely to do so. For example, for research investigating decision-making outcomes, the direct theoretical ties with decision-related measures, such as decision making competence, cognitive ability, and risk attitude, suggest that these measures may hold the most promise for this research. In this area, Bruine de Bruin et al.’s (2007) A-DMC measure of decision competence is particularly promising because of the reliability and external validity of its components and because of evidence showing a link between executive functioning and elements of decision making competence (i.e., applying decision rules and consistency in risk perception) (Del Missier et al., 2010). High A-DMC scores are associated with more effective decision-making styles as well as better decision outcomes as measured by the Decision Outcomes Inventory (DOI) (Bruine de Bruin et al., 2007).

Another individual difference variable with some initial promise in predicting decision outcomes is numeracy, which has been shown to affect decision variables from susceptibility to framing (Peters et al., 2006) to understanding health risks (e.g., Black et al., 1995; Schwartz et al., 1997; although see Reyna et al., 2009, for a discussion of some shortcomings of recent research on numeracy and decision making). Such evidence from A-DMC and numeracy studies helps explain individual differences in certain decision tasks and points to ways in which people could be trained or decision presentations simplified to boost decision competence (for example, see Peters et al., 2007, for differences in how high- and low-numerate

people respond to different information displays in a hospital quality judgment task).

Going a step beyond general domain relevance, within a domain such as decision making, different dependent variables (e.g., decision outcomes, decision experience, and judgments) are explained by different underlying theories. Thus, different individual differences can be expected to drive effects for outcomes versus experience versus judgments. It is therefore important to select individual differences that are theoretically relevant to the dependent variable of interest specifically as well as the domain broadly. Once again, the DMIDI can be of service. By sharing information about what does and does not work and by fostering discussion about what should and should not be *expected* to work, the JDM community can create and continually refine sets of relevant individual difference measures. To wit, Reyna and colleagues (2009) point out that the decision competence construct of numeracy would benefit from a more refined definition and improved measure(s) to better account for its relationship with decision making outcomes.

3.3 Individual differences in interaction with other factors

The effects of individual difference measures are often contextual; measures are significant for one decision-making phenomenon and not for another. Thus, like others before us, we advocate a person-by-decision-and/or-situation interaction approach that examines how individual differences interact with other individual differences, with decision features, and with situational factors to influence behavior in a given context. The person \times situation approach has been fruitfully applied to other domains and its use has been previously advocated in consumer research (Kassarjian & Sheffet, 1991), in psychology generally (e.g., Cronbach, 1957, 1975; Lewin, 1943; Magnusson & Endler, 1977; Mischel, 1968, 2004; Ross & Nisbett, 1991), and in decision research specifically (Blais & Weber, 2006; Mohammed & Schwall, 2009). Mischel (2004) proposed that consistency arises across time within certain types of situations, which suggests that the interactions, rather than the direct effects, may be stable. In other words, a certain individual difference in the context of certain task features will have a reliable effect on decision-making behavior, but the effect depends on both the individual difference and the task features. Where possible, studies should be designed and analyzed with such interactions in mind.

Of course, one obstacle to investigating interactions with between-subject designs is the larger sample sizes required for adequate statistical power. Fortunately, within-subject designs offer a way to explore interactions with small sample sizes by looking for effects within indi-

viduals (see Baron, 2010, for a discussion of appropriate methods for such analyses). Researchers can also explore methodologies used to identify interactions in other domains, such as clinical psychology where it is common practice to look for individual differences in the difference between performance on two tasks (e.g., a control task and an experimental task) (see Baron & Treiman, 1980, for a discussion of how to overcome some of the difficulties inherent in this approach). We believe that, regardless of how they are pursued, interactions will be a real contribution of individual differences to JDM research. This argues further for standardization and the use of a repository like the DMIDI: If studies use the same measures and results are accessible, JDM can build cumulatively toward an understanding of individual differences in interaction with one another, with task features, and with situational factors.

3.4 More extensive communication of results

A final piece of the puzzle is the importance of reporting all results, whether significant or not. We believe that individual differences research currently suffers from a “file drawer problem” (Rosenthal, 1979, p. 638), meaning that reported results are only a fraction of the actual results (Bradley & Gupta, 1997; Howard et al., 2009; Pautasso, 2010; Rosenthal, 1979). Although this criticism can be justly applied to many fields, it may be particularly glaring for individual differences: For various reasons, researchers frequently employ a wide range of individual difference measures in a study, but report only those that are significant. At the same time, journals, with reason, are often reluctant to publish non-significant results. The result is that studies that find no significant relationships often do not get published. Studies that are well-designed and have adequate statistical power but nonetheless find non-significant results are not only worth reporting, they are a necessary part of a complete picture of individual differences.

The DMIDI can help fill this important gap. Reporting non-significant results online will help alleviate the file drawer problem and also reveal the real state of individual differences in JDM research. As a repository of information on the uses of individual difference measures and their effects on JDM variables, the DMIDI will centralize results and increase their accessibility. This will allow the JDM community to more easily assess the state of various measures in JDM research and to continually evaluate the utility of their pursuit. Thus, researchers are encouraged to share results (whether significant or non-significant, published or unpublished) as well as relevant reviews or meta-analyses for inclusion in the DMIDI.

4 Conclusion

Individual differences have long been a topic of interest in psychology generally as well as in JDM specifically, as evidenced by the wealth of individual difference measures commonly used. We suggest that this persistent interest would be better served by a change in approach—namely, a more systematic investigation that is more extensively communicated and that emphasizes both the theoretical selection of measures and the interactions between individual differences and task features, situational factors, and other individual differences. We believe that, by following these suggested prescriptions, we can better our understanding of individual differences in JDM. It is our hope that this overview and the DMIDI can serve together as first steps toward a more fruitful future for individual differences in judgment and decision-making research.

References

- Allport, G. W. (1937). *Personality: A psychological interpretation*. New York, NY: Holt.
- Baron, J. (2010). Looking at individual subjects in research on judgment and decision making (or anything) *Acta Psychologica Sinica*, *42*, 1–11.
- Baron, J., & Treiman, R. (1980). Some problems in the study of differences in cognitive processes. *Memory & Cognition*, *8*, 313–321.
- Bazerman, M. H., Curhan, J. R., Moore, D. A., & Valley, K. L. (2000). Negotiation. *Annual Review of Psychology*, *51*, 279–314.
- Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, *50*, 7–15.
- Black, W. C., Nease, R. F., & Tosteson, A. (1995). Perceptions of risk and screening effectiveness in women younger than 50 years of age. *Journal of the National Cancer Institute*, *87*, 720–731.
- Blais, A.-R., & Weber, E. U. (2006). A Domain-Specific Risk-Taking (DOSPRT) scale for adult populations. *Judgment and Decision Making*, *1*, 33–47.
- Bradley, M. T., & Gupta, R. D. (1997). Estimating the effect of the file drawer problem in meta-analysis. *Perceptual and Motor Skills*, *85*, 719–722.
- Brown, J. I., Fishco, V. V., & Hanna, G. (1993). *The Nelson-Denny reading test*. Itasca, IL: The Riverside Publishing Company.
- Bruine de Bruin, W., Parker, A. M., & Fischhoff, B. (2007). Individual differences in adult decision-making competence. *Journal of Personality and Social Psychology*, *92*, 938–956.

- Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment*, 48, 306–307.
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology*, 67, 319–333.
- Coopersmith, S. (1967). *The antecedents of self-esteem*. San Francisco, CA: Freeman.
- Coopersmith, S. (1981). *The antecedents of self-esteem*. Palo Alto, CA: Consulting Psychologists Press.
- Costa, P. T., Jr., & McCrae, R. R. (1992). *NEO PI-R Professional Manual*. Odessa, FL: Psychological Assessment Resources, Inc.
- Couch, L. L., Adams, J. M., & Jones, W. H. (1996). The assessment of trust orientation. *Journal of Personality Assessment*, 67, 305–323.
- Cronbach, L. J. (1957). The two disciplines of scientific psychology. *American Psychologist*, 12, 671–684.
- Cronbach, L. J. (1975). Beyond the two disciplines of scientific psychology. *American Psychologist*, 30, 116–127.
- Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology*, 24, 349–354.
- Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology*, 10, 85.
- Davis, J. H., Tindale, R. S., Nagao, D. H., Hinsz, V. B., & Robertson, B. (1984). Order effects in multiple decisions by groups: Demonstrations with mock juries and trial procedures. *Journal of Personality and Social Psychology*, 47, 1003–1012.
- Del Missier, F., Mäntylä, T., & Bruine de Bruin, W. (2010). Executive functions in decision making: An individual differences approach. *Thinking and Reasoning*, 16, 69–97.
- Digman, J. M. (1990). Personality structure: Emergence of the five-factor structure. *Annual Review of Psychology*, 41, 417–440.
- Drolet, A., & Luce, M. F. (2004). The rationalizing effects of cognitive load on emotion-based trade-off avoidance. *Journal of Consumer Research*, 31, 63–77.
- Dror, I. E., Busemeyer, J. R., & Basola, B. (1999). Decision making under time pressure: An independent test of sequential sampling models. *Memory and Cognition*, 27, 713–725.
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, 56, 425–442.
- Ebert, J. E. J. (2001). The role of cognitive resources in the valuation of near and far future events. *Acta Psychologica*, 108, 155–171.
- Einhorn, H. J. (1970). The use of nonlinear noncompensatory models in decision making. *Psychological Bulletin*, 73, 221–230.
- Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive-experiential and analytical-rational thinking styles. *Journal of Personality & Social Psychology*, 71, 390–405.
- Eysenck, S. B. G., & Eysenck, H. J. (1978). Impulsiveness and venturesomeness: Their position in a dimensional system of personality description. *Psychological Reports*, 43, 1247–1255.
- Fagerlin, A., Zikmund-Fisher, B. J., Ubel, P. A., Jankovic, A., Derry, H. A., & Smith, D. M. (2007). Measuring numeracy without a math test: Development of the Subjective Numeracy Scale. *Medical Decision Making*, 27, 672–680.
- Figner, B., Mackinlay, R. J., Wilkening, F., & Weber, E. U. (2009). Affective and deliberative processes in risky choice: Age differences in risk taking in the Columbia Card Task. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 35, 709–730.
- Frost, R. O., & Shows, D. L. (1993). The nature and measurement of compulsive indecisiveness. *Behavioral Research and Therapy*, 31, 683–692.
- Gjesme, T. (1975). Slope of gradients for performance as a function of achievement motive, goal distance in time, and future time orientation. *The Journal of Psychology*, 91, 143–160.
- Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment*, 4, 26–42.
- Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the big-five personality domains. *Journal of Research in Personality*, 37, 504–528.
- Gough, H. G. (1987). *California Psychological Inventory Administrator's Guide*. Palo Alto, CA: Consulting Psychologists Press, Inc.
- Hathaway, S. R., & McKinley, J. C. (1943). *Manual for the Minnesota Multiphasic Personality Inventory*. New York, NY: Psychological Corporation.
- Herborn, K. A., Macleod, R., Miles, W. T. S., Schofield, A. N. B., Alexander, L., & Arnold, K. E. (2010). Personality in captivity reflects personality in the wild. *Animal Behaviour*, 79, 835–843.
- Higgins, E. T., Friedman, R. S., Harlow, R. E., Idson, L. C., Ayduk, O. N., & Taylor, A. (2001). Achievement orientations from subjective histories of success: Promotion pride versus prevention pride. *European Journal of Social Psychology*, 31, 3–23.
- Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations*

- across nations (2nd Ed.). Thousand Oaks, CA: Sage Publications.
- Howard, G. S., Lau, M. Y., Maxwell, S. E., Venter, A., Lundy, R., & Sweeny, R. M. (2009). Do research literatures give correct answers? *Review of General Psychology, 13*, 116–121.
- Hunt, R., Krzystofiak, F., Meindl, J., & Yousry, A. (1989). Cognitive style and decision making. *Organizational Behavior and Human Decision Processes, 44*, 436–453.
- Hyman, S. E. (2009). How adversity gets under the skin. *Nature Neuroscience, 12*, 241–243.
- Jackson, D. N., Hourany, L., & Vidmar, N. J. (1972). A four-dimensional interpretation of risk taking. *Journal of Personality, 40*, 483–501.
- Jarvis, W. B. G., & Petty, R. E. (1996). The need to evaluate. *Journal of Personality and Social Psychology, 70*, 172–194.
- John, O. P., & Srivastava, S. (1999). The big-five trait taxonomy: History, measurement, and theoretical perspectives. In L. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research (2nd Ed.)*. New York, NY: Guilford.
- Kassarjian, H. H., & Sheffet, M. J. (1991). Personality and consumer behavior: An update. In H. H. Kassarjian & T. S. Robertson (Eds.), *Perspectives in consumer behavior* (pp. 281–303). Englewood Cliffs, NJ: Prentice Hall.
- Kogan, N., & Wallach, M. A. (1964). *Risk taking: A study in cognition and personality*. New York, NY: Holt, Rinehart, & Winston.
- Krosnick, J. A., Miller, J. M., & Tichy, M. P. (2004). An unrecognized need for ballot reform: The effects of candidate name order on election outcomes. In A. N. Crigler, M. R. Just & E. J. McCaffery (Eds.), *Rethinking the vote: The politics and prospects of American election reform*. New York, NY: Oxford University Press.
- Kruglanski, A. W., Thompson, E. P., Higgins, E. T., Atash, M. N., Pierro, A., & Shah, J. Y. (2000). To “do the right thing” or to “just do it”: Locomotion and assessment as distinct self-regulatory imperatives. *Journal of Personality and Social Psychology, 79*, 793–815.
- Kühberger, A. (1998). The influence of framing on risky decisions: A meta-analysis. *Organizational Behavior and Human Decision Processes, 75*, 23–55.
- Lauriola, M., & Levin, I. P. (2001). Personality traits and risky decision-making in a controlled experimental task: An exploratory study. *Personality and Individual Differences, 31*, 215–226.
- Lauriola, M., Levin, I. P., & Hart, S. S. (2007). Common and distinct factors in decision making under ambiguity and risk: A psychometric study of individual differences. *Organizational Behavior and Human Decision Processes, 104*, 130–149.
- Leary, M. R. (1983). A brief version of the fear of negative evaluation scale. *Personality and Social Psychology Bulletin, 9*, 371–375.
- Lejuez, C. W., Read, J. P., Kahler, C. W., Richards, J. B., Ramsey, S. E., Stuart, G. L., et al. (2002). Evaluation of a behavioral measure of risk taking: The Balloon Analogue Risk Task (BART). *Journal of Experimental Psychology: Applied, 8*, 75–84.
- Lerner, J., & Tetlock, P. E. (1999). Accounting for the effects of accountability. *Psychological Bulletin, 125*, 255–275.
- Levin, I. P. (1999). *Why do you and I make different decisions? Tracking individual differences in decision making*. Presidential address at the 21st annual meeting of the Society for Judgment and Decision Making, Los Angeles, CA.
- Levin, I. P., Gaeth, G. J., Schreiber, J., & Lauriola, M. (2002). A new look at framing effects: Distribution of effect sizes, individual differences, and independence of types of effects. *Organizational Behavior and Human Decision Processes, 88*, 411–429.
- Levin, I. P., & Hart, S. S. (2003). Risk preferences in young children: Early evidence of individual differences in reaction to potential gains and losses. *Journal of Behavioral Decision Making, 16*, 397–413.
- Levin, I. P., Schneider, S. L., & Gaeth, G. J. (1998). All frames are not created equal: A typology and critical analysis of framing effects. *Organizational Behavior and Human Decision Processes, 76*, 149–188.
- Levin, I. P., Weller, J. A., Pederson, A. A., & Harshman, L. (2007). Age-related differences in adaptive decision making: Sensitivity to expected value in risky choice. *Judgment and Decision Making, 2*, 225–233.
- Lewin, K. (1943). Defining the “field at a given time”. *Psychological Review, 50*, 292–310.
- Lichtenstein, S., & Slovic, P. (2006). *The construction of preference*. New York, NY: Cambridge University Press.
- Liebrand, W. B. G., & McClintock, C. G. (1988). The ring measure of social values: A computerized procedure for assessing individual differences in information processing and social value orientation. *European Journal of Personality, 2*, 217–230.
- Magnusson, D., & Endler, N. S. (1977). Interaction psychology: Present status and future prospects. In D. Magnusson & N. S. Endler (Eds.), *Personality at the crossroads: Current issues in interactional psychology*. Hillsdale, NJ: Erlbaum.
- Mann, L., Burnett, P., Radford, M., & Ford, S. (1997). The Melbourne Decision Making Questionnaire: An instrument for measuring patterns for coping with de-

- cisional conflict. *Journal of Behavioral Decision Making*, 10, 1–19.
- McLain, D. L. (1993). The MSTAT-I: A new measure of an individual's tolerance for ambiguity. *Educational and Psychological Measurement*, 53, 183–189.
- Milgram, S. (1974). *Obedience to authority*. New York, NY: Harper & Row.
- Mischel, W. (1968). *Personality and assessment*. New York, NY: Wiley.
- Mischel, W. (2004). Toward an integrative science of the person. *Annual Review of Psychology*, 55, 1–22.
- Mohammed, S., Lim, A., Hamilton, K., Zhang, Y., & Kim, S. (2007, April). *Individual differences in decision making: The measurement of decision styles*. Poster presented at the 22nd annual meeting of the Society for Industrial/Organizational Psychology, New York, NY.
- Mohammed, S., & Schwall, A. (2009). Individual differences and decision making: What we know and where we go from here. *International Review of Industrial and Organizational Psychology*, 24.
- Nadler, J., Irwin, J. R., Davis, J. H., Au, W. T., Zarnoth, P., Rantilla, A. K., et al. (2001). Order effects in individual and group policy allocations. *Group Processes and Intergroup Relations*, 4, 99–115.
- Norris, P., Pacini, R., & Epstein, S. (1998). The Rational-Experiential Inventory, short form. Unpublished inventory. University of Massachusetts, Amherst, MA.
- Parker, A. M., Bruine de Bruin, W., & Fischhoff, B. (2007). Maximizers versus satisficers: Decision-making styles, competence, and outcomes. *Judgment and Decision Making*, 2, 342–350.
- Parker, A. M., & Fischhoff, B. (2005). Decision-making competence: External validation through an individual-differences approach. *Journal of Behavioral Decision Making*, 18, 1–27.
- Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology*, 51, 768–774.
- Paulhus, D. (1983). Sphere-specific measures of perceived control. *Journal of Personality and Social Psychology*, 44, 1253–1265.
- Paulhus, D. L. (1991). Measurement and control of response bias. In J. P. Robinson, P. R. Shaver & L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (pp. 17–59). San Diego, CA: Academic Press.
- Pautasso, M. (2010). Worsening file-drawer problem in the abstracts of natural, medical and social science databases. *Scientometrics*, 85, 193–202.
- Peters, E., Dieckmann, N. F., Dixon, A., Hibbard, J. H., & Mertz, C. K. (2007). Less is more in presenting quality information to consumers. *Medical Care Research and Review*, 64, 169–190.
- Peters, E., Västfjäll, D., Slovic, P., Mertz, C. K., Maz-zocco, K., & Dickert, S. (2006). Numeracy and decision making. *Psychological Science*, 17, 407–413.
- Raven, J., Raven, J. C., & Court, J. H. (1998). *Manual for Raven's progressive matrices and vocabulary scales*. Oxford, UK: Oxford Psychologists Press.
- Reyna, V. F., Nelson, W. L., Han, P. K., & Dieckmann, N. (2009). How numeracy influences risk comprehension and medical decision making. *Psychological Bulletin*, 135, 943–973.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
- Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, 86, 638–641.
- Ross, L., & Nisbett, R. E. (1991). *The person and the situation: Perspectives of social psychology*. New York, NY: McGraw-Hill.
- Rushton, J. P., Chrisjohn, R. D., & Fekken, G. C. (1981). The altruistic personality and the self-report altruism scale. *Personality and Individual Differences*, 2, 293–302.
- Ruvio, A., Shoham, A., & Brenčić, M. M. (2008). Consumers' need for uniqueness: Short-form scale development and cross-cultural validation. *International Marketing Review*, 25, 33–53.
- Scheier, M. F., & Carver, C. S. (1985). The self-consciousness scale: A revision for use with general populations. *Journal of Applied Social Psychology*, 15, 687–699.
- Schwartz, B., Ward, A., Monterosso, J., Lyubomirsky, S., White, K., & Lehman, D. R. (2002). Maximizing versus satisficing: Happiness is a matter of choice. *Journal of Personality and Social Psychology*, 83, 1178–1197.
- Schwartz, L. M., Woloshin, S., Black, W. C., & Welch, H. G. (1997). The role of numeracy in understanding the benefit of screening mammography. *Annals of Internal Medicine*, 127, 966–972.
- Scott, S. G., & Bruce, R. A. (1995). Decision-making style: The development and assessment of a new measure. *Educational and Psychological Measurement*, 55, 818–831.
- Shiloh, S., Koren, S., & Zakay, D. (2001). Individual differences in compensatory decision-making style and need for closure as correlates of subjective decision complexity and difficulty. *Personality and Individual Differences*, 30, 699–710.
- Shiloh, S., Salton, E., & Sharabi, D. (2002). Individual differences in rational and intuitive thinking styles as predictors of heuristic responses and framing effects. *Personality and Individual Differences*, 32, 415–429.
- Strathman, A., Gleicher, F., Boninger, D. S., & Edwards, C. S. (1994). The consideration of future conse-

- quences: Weighing immediate and distant outcomes of behavior. *Journal of Personality and Social Psychology*, 66, 742–752.
- Thunholm, P. (2004). Decision-making style: Habit, style or both? *Personality and Individual Differences*, 36, 931–944.
- Verplanken, B. (1993). Need for Cognition and external information search: Responses to time pressure during decision-making. *Journal of Research in Personality*, 27, 238–252.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality & Social Psychology*, 54, 1063–1070.
- Weber, E. U. (2001). Personality and risk taking. In N. J. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 11274–11276). Oxford, UK: Elsevier Science Limited.
- Weber, E. U., Blais, A. R., & Betz, N. E. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making*, 15, 263–290.
- Weber, E. U., & Johnson, E. J. (2008). Decisions under uncertainty: Psychological, economic, and neuroeconomic explanations of risk preference. In P. Glimcher, C. Camerer, E. Fehr & R. Poldrack (Eds.), *Neuroeconomics: Decision making and the brain* (pp. 127–144). New York, New York: Elsevier.
- Weber, E. U., & Johnson, E. J. (2009). Mindful judgment and decision making. *Annual Review of Psychology*, 60, 53–85.
- Weber, E. U., & Morris, M. W. (2010). Culture and judgment and decision making: The constructivist turn. *Perspectives on Psychological Science*, 5, 410–419.
- Webster, D. M., & Kruglanski, A. W. (1994). Individual differences in need for cognitive closure. *Journal of Personality & Social Psychology*, 67, 1049–1062.
- Wechsler, D. (1955). *Manual for the Wechsler Adult Intelligence Scale*. New York, NY: The Psychological Corporation.
- Wechsler, D. (1997). *Wechsler Adult Intelligence Scale—3rd Edition (WAIS-3®)* San Antonio, TX: Harcourt Assessment.
- Zimbardo, P. G. (2004). A situationist perspective on the psychology of evil: Understanding how good people are transformed into perpetrators. In A. G. Miller (Ed.), *The social psychology of good and evil* (pp. 21–50). New York, NY: Guilford Press.
- Zuckerman, M., Kuhlman, D. M., Joireman, J., Teta, P., & Kraft, M. (1993). A comparison of three structural models for personality: the big three, the big five, and the alternative five. *Journal of Personality and Social Psychology*, 65, 757–768.