

The Melbourne Decision Making Questionnaire: An Instrument for Measuring Patterns for Coping with Decisional Conflict

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ABSTRACT

A study was conducted to examine the factorial validity of the Flinders Decision Making Questionnaire (Mann, 1982), a 31-item self-report inventory designed to measure tendencies to use three major coping patterns identified in the conflict theory of decision making (Janis and Mann, 1977): vigilance, hypervigilance, and defensive avoidance (procrastination, buck-passing, and rationalization). A sample of 2051 university students, comprising samples from Australia ($n = 262$), New Zealand ($n = 260$), the USA ($n = 475$), Japan ($n = 359$), Hong Kong ($n = 281$) and Taiwan ($n = 414$) was administered the DMQ. Factorial validity of the instrument was tested by confirmatory factor analysis with LISREL. Five different substantive models, representing different structural relationships between the decision-coping patterns had unsatisfactory fit to the data and could not be validated. A shortened instrument, containing 22 items, yielded a revised model comprising four identifiable factors — vigilance, hypervigilance, buck-passing, and procrastination. The revised model had adequate fit with data for each country sample and for the total sample, and was confirmed. It is recommended that the 22-item instrument, named the Melbourne DMQ, replace the Flinders DMQ for measurement of decision-coping patterns. © 1997 by John Wiley & Sons, Ltd.

KEY WORDS decision-making instrument; conflict; coping

INTRODUCTION: JANIS AND MANN'S CONFLICT THEORY OF DECISION MAKING

In this article we describe and evaluate an instrument for measuring decision-coping patterns identified in Janis and Mann's (1977) conflict theory of decision making. Janis and Mann begin with the

assumption that stress engendered by decisional conflict is a major determinant of failure to achieve high-quality decision making. The psychological stress arising from decisional conflict stems from at least two sources: a concern about the severe personal, material, and social losses that might be incurred whatever the chosen alternative; and a concern over loss of reputation and self-esteem if the decision goes wrong. According to the conflict model, there are five basic patterns of coping with the stress generated by a difficult, potentially threatening decision:

- *Unconflicted adherence*. The decision maker ignores information about the risk of losses and decides, complacently, to continue the present course of action.
- *Unconflicted change*. The decision maker uncritically adopts whichever new course of action is most salient or most strongly recommended.
- *Defensive avoidance*. The decision maker escapes conflict by procrastinating, shifting responsibility to someone else, or constructing wishful rationalizations to bolster the least objectionable alternative. Each of these expressions of defensive avoidance is associated with incomplete and often biased evaluation of information, leading in turn to faulty decisions. Defensive avoidance is associated with high stress.
- *Hypervigilance*. The decision maker searches frantically for a way out of dilemmas. Due to time pressure, the decision maker impulsively seizes upon hastily contrived solutions that seem to promise immediate relief. The full range of consequences of choices are overlooked because of emotional excitement, perseveration, and limited attention. In its more extreme form, hypervigilance is a 'panic'-like state in which the decision maker vacillates between unpleasant alternatives. Hypervigilance is associated with severe emotional stress.
- *Vigilance*. The decision maker clarifies objectives to be achieved by the decision, canvasses an array of alternatives, searches painstakingly for relevant information, assimilates information in an unbiased manner, and evaluates alternatives carefully before making a choice. Vigilance is associated with a moderate level of psychological stress. According to the conflict model, vigilance is the only coping pattern that allows sound and rational decision making.

Janis and Mann's (1977) conflict model is essentially a social psychological theory of decision making in which the presence or absence of three antecedent conditions are held to determine reliance on a particular coping pattern. The three conditions are: (1) awareness of serious risks about preferred alternatives, (2) hope of finding a better alternative, and (3) belief that there is adequate time to search and deliberate before a decision is required. Vigilance, for example, is dependent upon the fulfilment of the above three conditions, whereas defensive avoidance is triggered by the pessimistic belief that there is little prospect of finding a good solution to the dilemma.

It is assumed that the same patterns are in the repertoire of every decision maker, although there will be individual differences in the tendency to rely generally on the range of non-vigilant coping patterns (defensive avoidance and hypervigilance) to avoid or escape conflictful decisions. It is recognized that personality variables and other characteristics of the decision maker, such as trait anxiety, habitual coping style, and information-processing capability, have a major influence on predisposition to use one or other of the patterns and frequency of usage (Janis and Mann, 1977, p. 71; Janis, 1982, pp. 332–3). We would also expect that individual differences in tolerance for psychological stress, predisposition to optimism/pessimism (cf. Scheier and Carver, 1985) and sensitivity to time pressure will lead decision makers to depend more often on particular overlearned coping patterns when facing difficult decisions. This observation constitutes the rationale for measuring and examining individual differences in reported usage of the major decision-coping patterns.

THE FLINDERS DECISION MAKING QUESTIONNAIRE

The Flinders Decision Making Questionnaire (Mann, 1982) purports to measure the person's preferred coping patterns or strategies for dealing with decisional conflict. Based on Janis and Mann's (1977) conflict model of decision making, the DMQ measures three of the five decision-coping patterns identified in the theory (vigilance, hypervigilance, and defensive avoidance).

Mann (1982) developed the DMQ on the basis of definitions, descriptions, and examples of the major coping patterns contained in Janis and Mann's (1977) book *Decision Making*. The DMQ consists of a vigilance scale, e.g. 'When making decisions I like to collect lots of information', a hypervigilance scale, e.g. 'I feel as if I'm under tremendous pressure when making decisions', and a defensive avoidance scale e.g., 'I avoid making decisions'. In addition, there are three scales to measure different aspects or expressions of defensive avoidance, namely procrastination ('I put off making decisions'), buck-passing ('I prefer to leave decisions to others') and rationalization ('After a decision is made I spend a lot of time convincing myself it was correct').

Several studies have employed the DMQ scales to examine the relationship between personality variables and decision making style. For example, Radford, Mann, and Kalucy (1986) found a significant positive relationship between scores on the hypervigilance and defensive avoidance scales and severity of psychiatric disturbance in a sample of hospitalized psychiatric patients. Beswick and Mann (1994) reported a significant relationship between scores on the procrastination scale and a measure of state-orientation (Kuhl, 1985), the tendency to focus on past, present, or future states rather than on plans for action. The DMQ scales have also been used to measure changes in self-reported tendencies to employ different decision-coping patterns. For example, Mann *et al.* (1989) found that participants in a workshop to improve decision-making skills showed a significant reduction in scores on the non-vigilance scales in the 3 months following the workshop.

Several studies have examined the validity of the DMQ scales as measures of the tendency to use vigilant or non-vigilant decision-coping styles. Beswick, Rothblum, and Mann (1988) found significant positive relationships between university students' scores on the procrastination scale and time taken to submit a term paper and self-reported frequency of procrastination. Ferrari (1991) found a significant positive relationship between scores on Lay's (1986) general procrastination scale (which measures self-reported tendencies to procrastinate on everyday tasks) and scores on the DMQ procrastination scale in a sample of adults. Burnett, Mann, and Beswick (1989) employed three DMQ scales — vigilance, hypervigilance, and defensive avoidance — in a study of competence of students' course planning and satisfaction with course. They found a significant positive relationship between decision vigilance and course planning and satisfaction in two samples of university students. Fletcher and Wearing (1992), in a study of the decision of mature age adults to return to university study, found that decision vigilance was associated with detailed planning, while the other styles were associated with superficial planning and post-decision regret. However, White, Wearing, and Hill (1994), in a study of women's decisions to have a pap smear test, a screening test for cervical cancer, found little association between scores on the DMQ scales and screening status.

In sum, while previous research indicates that the DMQ scales have some validity, the evidence is neither extensive nor uniformly positive. In addition, while it is assumed that the main DMQ scales — vigilance, hypervigilance, and defensive avoidance — measure separate facets of decision-making style, there has been no attempt to test or validate the factorial structure of the DMQ as an instrument. It is apparent that there are high intercorrelations between hypervigilance, defensive avoidance, and the three scales pertaining to aspects of defensive avoidance (Radford, 1982). Indeed, in several studies employing the DMQ, for example Mann *et al.* (1989), responses to the non-vigilance items were summed to create a single 25-item scale, labelled 'maladaptive coping' pattern, thus treating hypervigilance, defensive avoidance, procrastination, buck-passing, and rationalization as a single construct.

SUBSTANTIVE MODELS

Five substantive models can be postulated from Janis and Mann's conflict model of decision making. The three main coping patterns — vigilance, hypervigilance, defensive avoidance — and the three forms of defensive avoidance (procrastination, buck-passing, and rationalization) can be grouped theoretically into the following models:

- *Model 1* is a two-factor model, comprising vigilance as one factor and the remaining coping patterns as the other. The logic of this model derives from Janis and Mann's description of vigilant information processing as the only adaptive way to make decisions, while the remaining patterns are bracketed together as defective and maladaptive coping patterns (cf. Mann *et al.*, 1989).
- *Model 2* is a three-factor model comprising vigilance, hypervigilance, and the remaining defensive avoidance patterns together (cf. Burnett *et al.*, 1989). The logic underlying this model is that vigilance and hypervigilance are two distinctly different ways of taking decisions, whereas the defensive avoidance tendency in its various forms (procrastination, buck-passing, and rationalization) constitutes a single construct.
- *Model 3* is a six-factor model in which each of the six scales makes a separate and unique contribution to the construct of decision coping. The implication of this model is that the distinction between procrastination, buck-passing, and rationalization is justified as they, like vigilance and hypervigilance, constitute specific factors.
- *Model 4* is an extension of Model 1. In this model, vigilance stands alone as one factor, while maladaptive decision style is a second- or higher-order factor into which hypervigilance and the various forms of defensive avoidance all feed.
- *Model 5* is an extension of Model 2. In this model, which corresponds with Janis and Mann's designation of three primary modes of coping with conflict (vigilance, hypervigilance, and defensive avoidance), vigilance and hypervigilance stand alone as separate factors, while defensive avoidance is a higher-order factor with procrastination, buck-passing, and rationalization as first-order factors.

All five models, while ranging from simple structures (Model 1) to complex ones (e.g. Model 5), are consistent with decision-conflict theory because the set of coping patterns can be conceptualized as:

- (1) Adaptive versus maladaptive strategies (hence Models 1, 4)
- (2) Decision-taking versus decision-avoiding strategies (hence Models 2, 5)
- (3) Specific distinctive and alternative strategies for dealing with conflict (hence Model 3).

The main aim of the present study is to examine the factorial validity of the DMQ by testing the above five substantive models and determining which one provides a best fit for the empirical data. A second aim is to evaluate the suitability of the instrument for research on decision-making processes in samples drawn from different countries. So far, published research utilizing the DMQ has been limited to Australia (e.g. Burnett *et al.*, 1989), the USA (Burnett, 1991) and Spain (Barbero *et al.*, 1993). The validity of the instrument is also a function of the extent to which it is demonstrably suitable for usage across a wide range of countries. In sum, the present study sets out to examine the factorial validity of the Flinders DMQ as an instrument for measuring self-reported decision-coping patterns. This will be done by evaluating which of the five measurement models best fit the data collected from large samples of respondents from six countries who completed the DMQ.

OTHER MODELS, OTHER INSTRUMENTS

There are, of course, a variety of models and instruments for describing and measuring decision-making behaviour. We do not propose to examine the conflict model and DMQ in relation to other models and instruments. However, it is important to point to parallel and overlapping approaches to the measurement of individual differences in decision making in order to place the DMQ in context. We do this before describing the methodology of our study.

Most constructs and measures of individual differences in decision making fall into one of three categories: motivational processes; cognitive styles; personality dimensions and traits. It will be recognized that some models, including the conflict model itself, span several categories.

Motivational processes

The decision maker depicted in Janis and Mann's conflict theory has been characterized as a psychologically stressed individual grappling with powerful motivational and emotional forces. Abelson and Levi (1985), using literary licence, refer to Janis and Mann's decision maker as 'a slave to motivational forces'. The conflict model's analysis of decision-coping strategies has close parallels in work on the problem-solving and coping strategies used by people to deal with stress. Janis (1982) refers to Goldstein's (1959) distinction between copers and avoiders in reaction to threatening communications. The conflict model also draws on Lazarus's (1966) pioneering work in describing coping processes that help people to deal with the deleterious effects of stress. Lazarus and Folkman (1984) distinguish between problem-focused strategies (aimed at modifying the source of stress) and emotion-focused strategies (efforts to regulate emotions, for example by alleviating the fear and anxiety aroused by the stressor). Problem-solving strategies, in which the person makes a plan of action and follows it, are comparable to Janis and Mann's construct of vigilance, which posits a decision maker who clarifies objectives, considers alternatives, evaluates consequences, and thinks through how to implement chosen options. Emotion-focused strategies, such as denial and distancing to reduce the worry, have parallels in the construct of defensive avoidance.

Larrick (1993) argues that important motivational factors are typically ignored or under-emphasized in the standard cognitive and economic models of decision making under risk. Larrick points to several motivational and emotional consequences of making a decision, including feelings that stem from learning that a decision has turned out poorly, such as failure, regret, and disappointment, feelings that arise from publicly made decisions, such as embarrassment and pride, and feelings that arise from how outcomes are distributed among people, such as envy and gloating. Larrick maintains that people focus on two goals when they make decisions. One goal is to maximize their expected outcomes; the other is to maintain a positive self-image. Motivational forces to protect self-image, i.e., one's competence and self-esteem as a decision maker, lead to more defensive behaviour as the threat from a situation increases, or as the person's ability to maintain a sense of competency decreases (p. 448). Surprisingly, Larrick overlooks Janis and Mann's (1977) conflict model and Rogers's (1983) protection-motivation theory in his analysis of motivational factors in decision making.

Rogers's (1983) protection-motivation theory distinguishes between adaptive coping strategies, such as rational problem solving (seeking out more information, analysing the problem, and making an effective plan) and a host of maladaptive strategies such as avoidance (attempts to evade or deny the threat), wishful thinking (resort to unrealistic solutions), fatalism (complacency and resignation in the face of danger), and hopelessness (feelings of uselessness). Miller (1987) describes and measures responses for coping with threat on two dimensions — monitoring and blunting. Monitoring is about information-seeking; people are classified as high or low monitors (information seekers). Blunting is

about turning away from threatening cues; again, people can be classified as high or low blunTERS. Miller has found that information avoidance and blunting can be adaptive in protecting the person from everyday stress.

Research on coping has focused, traditionally, on strategies for dealing with health-related and personally threatening stressors. Work on coping has been extended recently to the analysis and measurement of general coping ability in response to everyday frustrations and hassles. Epstein and Meier's (1989) concept of constructive thinking is an example of an individual difference variable for describing patterns of habitual everyday thoughts, such as naive optimism, for dealing with negative events and outcomes.

Thus, Janis and Mann's contrast between adaptive coping patterns (vigilance) and maladaptive coping patterns (the remainder) in decision making relates directly to an extensive research literature on coping across many domains. That literature, although grounded in the psychology of emotion and motivation, has a clear connection with cognitive psychology and the psychology of personality. It will be recognized that vigilant decision making is a highly cognitive activity.

Cognitive styles

The burgeoning field of cognitive psychology has spurred a strong interest in different cognitive styles associated with attention to information, processing of information, and evaluation of information. While the coping patterns relate to strategies for dealing with threat and stress, cognitive style pertains to modes of encoding and processing information. Many of the constructs developed under the rubric of cognitive style belong to a dimension that contrasts openness versus closedness to new information and alternative possibilities. Examples of these constructs include intolerance of ambiguity, cognitive complexity, need for cognition, and need for cognitive closure.

The concept of intolerance of ambiguity was first discussed by Frenkel-Brunswick (1949) and the construct was measured by Eysenck (1954). Bieri (1966) described and measured cognitive complexity, the capacity to interpret problems in a multidimensional way and use a greater number of dimensions in making judgements. Cacioppo and Petty (1982) postulate a need for cognition, the extent to which the person engages in and enjoys thinking. People with high need for cognition tend to process information in a more elaborate manner and tend to expend greater effort in working on decision tasks (Verplanken, 1993). Webster and Kruglanski (1994) describe need for cognitive closure, a preference for order and structure. People with high need for cognitive closure look for an answer (often any answer) to put an end to ambiguity and confusion.

Johnson, Corscarelli, and Johnson (1982) developed a Decision Making Inventory which measures two types of information-gathering style — spontaneous (intuitive trial and error) and systematic (careful weighing and evaluation of options) — as well as two types of information-analysing style — internal (using one's own ideas as a referent) and external (considering the opinions of others as a referent). It will be recognized that some of these constructs, such as cognitive complexity, need for cognition, and a systematic information-gathering style, resemble Janis and Mann's vigilant decision maker. Other constructs, such as intolerance of ambiguity, need for cognitive closure, and an intuitive trial-and-error style, resemble Janis and Mann's hypervigilant decision maker.

Personality dimensions and traits

Undoubtedly there are large individual differences in personality relating to tolerance of prolonged decisional conflict and ways of resolving conflict (Janis and Mann, 1977, pp. 431–2). The search for a set of reliable personality differences in decision-making style and behaviour has, however, been elusive.

Jung's theory of personality provides the foundation of a well-known but controversial model of decision-making style. The Myers–Briggs Type Indicator (Myers, 1962) divides people into 16 personality types, based on their scores on four scales: extraversion–introversion; sensation–intuition; thinking–feeling; judging–perceiving. One of the dimensions, sensing–intuition, pertains to how information is gathered; another dimension, thinking–feeling, pertains to how decisions are made. For example, the sensing type gathers information through the senses, whereas the intuitive type gathers information through the unconscious, through hunches, and possibilities. Again, the thinking type decides by process of logic and impersonal objective analysis, whereas the feeling type decides on the basis of personal values and subjective impressions. There is an obvious appeal to a simple classification of information-gathering and decision-making style linked to a theory of personality. However, the psychometric validity of the MBTI and similar measures based on Jungian personality theory (e.g. Nutt, 1989) is unresolved. There are doubts about the value of the MBTI for predicting decision-making performance (Ruble and Cosier, 1990), although Davis, Grove, and Knowles (1990) report that sensing types performed more efficiently than intuiting types on a series of decision tasks.

Rowe and Mason (1987) postulate a model of decision style based on two dimensions, the first relating to the person's tolerance for ambiguity, the second to his or her value orientation — human/social concerns versus task/technical concerns. The model describes four basic decision styles, as measured by the Decision Style Inventory — the Analytical, the Conceptual, the Directive, and the Behavioural. Analyticals and conceptuels have high tolerance for ambiguity, whereas directives and behaviourals have low tolerance. The analytical and conceptual styles are most prevalent in the general population and among senior executives. Again, there is some evidence to support the typology, but it is far from conclusive.

Several researchers have taken the approach of identifying particular personality traits related to specific decision behaviours. Autonomy-dependence is a personality dimension that is related to tolerance for delay and other aspects of decision making style. Brim *et al.* (1962) found that dependent individuals considered fewer outcomes when evaluating alternatives and were less consistent in their preference. We would expect decision makers with dependent personalities to be habitual practitioners of defensive avoidance (buck-passing). Other cognitive-personality traits associated with decision style include locus of control (Rotter, 1966), optimism/pessimism (Scheier and Carver, 1985), anxiety (Spielberger, Gorsuch, and Lushene, 1974), and self-efficacy (Bandura, 1982).

Lopes (1987) offers a two-factor theory of risky choice that is identified as a motivational approach to decision making but is based on a personality dimension. She draws a contrast between people who have a need for security (i.e. are risk averse) and those who are motivated to seek or exploit potential (i.e. risk seekers). Risk-averse individuals pay most attention to the worst outcomes in a distribution of alternative possibilities, whereas risk-seeking individuals focus on the best outcomes. A second factor, level of aspiration, is a situational variable that reflects opportunities ('what can I get?') and constraints ('what do I need?'). Lopes (1987) speculates that the personality (security/potential) factor interacts with the situational (aspiration level) factor in making risky choices. She postulates that security-motivated people tend to set more modest aspiration levels than potential-motivated ones. Larrick (1993) points out that Lopes' (1987) model is not a comprehensive motivation theory of decision making because of its narrow or limited personality mechanism. The classification of people as risk averse or risk seeking is also narrow, based on selection of people who fill out a brief questionnaire asking for their preference in five choice pairs containing a positive two-outcome gamble and a sure-thing of equal expected value (Schnieder and Lopes, 1986). The security/potential personality factor is of limited status as long as it is measured and applied narrowly in the domain of risky choices.

Beattie *et al.* (1994) have defined the construct of 'decision attitude', the propensity to make (or avoid making) decisions. Decision attitude entails a preference to make decisions even if the decision

leads to the same outcome that would have been offered anyway (decision seeking) or a preference to obtain the better of two options through fiat (decision aversion). The status of decision attitude as an individual difference variable is still unclear, although decision aversion resembles Janis and Mann's concept of defensive avoidance.

Ferrari, Johnson, and McCown (1995) argue that procrastination is an important individual difference variable, and that the tendency to procrastinate on everyday tasks, including decisions, is explainable within a model of personality. They review seven self-report measures of procrastination, including the DMQ procrastination scale. They provide evidence that decision procrastination is significantly related to procrastination on everyday tasks and on academically related tasks. The status of decision procrastination as a separate cognitive/personality factor awaits investigation.

To summarize, we have overviewed several models, constructs, and measures in the areas of motivational processes, cognitive style, and personality that bear on decision-making behaviour. It is clear that aspects of the conflict model and the DMQ have points of contact with work on stress-coping patterns (motivational processes), open- versus closed-mindedness, and systematic versus non-systematic information processing (cognitive style), and individual differences on personality dimensions, such as dependence, optimism/pessimism, and self-efficacy. Nevertheless, the conflict model holds a distinctive position in the area of decision-making theory and research. It is the only model that specifies the causes and describes the characteristics of major coping patterns for dealing with decisional conflict. Accordingly, the present study on the factorial validity of the DMQ is an opportunity to extend knowledge about individual differences in self-reported tendencies to rely on the different coping patterns.

METHOD AND PROCEDURE

Sample characteristics

A total of 2051 people (63% female) from six different countries participated in the study. They were undergraduate students in first-year psychology/behavioural science courses in prominent universities in six countries, the USA, Australia, New Zealand, Japan, Hong Kong, and Taiwan.

- USA — Ohio University, 475 students (180 male, 295 female)
- Australia — The Flinders University of South Australia, 261 students (98 male, 163 female)
- New Zealand — University of Auckland, 257 students (92 male, 165 female)
- Japan — Gakushuin University and Tokyo Christian Women's University, 358 students (140 male, 218 female)
- Hong Kong — Chinese University of Hong Kong, 277 students (95 male, 182 female)
- Taiwan — National Taiwan University, 399 students (143 male, 256 female).

The samples were intact classes from the seven participating universities. The universities were included on the basis of access obtained through the institutional affiliation of the authors and overseas collaborators.

Procedure

The Flinders Decision Making Questionnaire (or translations of the questionnaire in Japan, Hong Kong, and Taiwan) was administered in testing sessions to large groups of students. The questionnaire was translated into Japanese, Mandarin, and Cantonese using the 'back translation' and 'group translation' methods (Brislin, Lonner, and Thorndike, 1973). Subjects were told that the questionnaire measures the way people usually approach decision making and, therefore, the answer that is true for them is the correct answer.

Instruments

The Flinders Decision Making Questionnaire is shown in the Appendix. The questionnaire consists of six scales. Vigilance — 6 items (Sample item: ‘When making decisions I like to collect lots of information’) Each of the six vigilance items relates to a step in sound decision making, such as defining goals, collecting information, considering alternatives, and checking alternatives; Hyper-vigilance consists of 5 items (sample item: ‘I feel as if I’m under tremendous pressure when making decisions’). Defensive avoidance consists of 5 items (sample item: ‘I avoid making decisions’). The remaining three scales, each comprising five items, measure different aspects of defensive avoidance, i.e. rationalization (‘After a decision is made, I spend a lot of time convincing myself it was correct’), buck-passing (‘I prefer to leave decisions to others’), and procrastination (‘I put off making decisions’). The respondent responds to the items by checking ‘True for me’ (score 2), ‘Sometimes true’ (score 1), or ‘Not true for me’ (score 0). A second Decision Making Questionnaire (DMQ 1), which is a six-item scale for measuring decision-making self-esteem, was not used in this study.

Analytical procedure

Confirmatory Factor Analysis (CFA) is a model-testing procedure used to examine the goodness-of-fit between an hypothesized model or structure and sample data composed of observed measurements (Byrne, 1987). In this way the researcher imposes a theoretically derived structure on the data by forcing it to fit a substantive model and then assesses how well it fits. The goodness-of-fit of the data to the model can be assessed using a number of indicators: the Goodness-of-Fit Index (GFI), the Adjusted Goodness-of-Fit Index (AGFI), the Root-Mean-Square Residual (RMSR), and Chi-Square/Degrees of Freedom (χ^2/df) ratio. Convention dictates that a good fit of the data to the model requires an AGFI above 0.90 (Reynolds and Walberg, 1991), a RMSR below 0.05 (Coover, Penner, and McCallum, 1990) and a χ^2/df ratio less than 5 (Marsh and Hocevar, 1985).

RESULTS

Evaluation of the models

The five hypothesized models were evaluated through a confirmatory factor analysis using the LISREL 7 program within SPSS 4.1 (Joreskog and Sorbom, 1989). The measurement models were derived using maximum likelihood estimation (MLE) with polychoric correlation matrices as input, as designed for ordinal data. We then computed goodness-of-fit indices for the five models:¹

- *Model 1*: vigilance items as one factor and the remaining (non-vigilance) items as a second factor
- *Model 2*: vigilance, hypervigilance, and defensive avoidance (incorporating the remaining items) as three separate factors

¹ Joreskog and Sorbom (1989) and Muthen (1993) suggest that with non-normal variables (e.g. ordinal data, or skewed distributions) more accurate estimates of overall model fit are obtained using asymptotic covariances of polychoric correlations with weighted least squares estimation (WLS) rather than maximum likelihood estimation. However, the WLS method requires a very large sample size to provide an accurate computation of the asymptotic variance–covariance matrix, which usually makes its use impractical (Muthen, 1993). We did not use WLS in the model derivation to allow for unconfounded comparisons of parameters and overall model fit between the derivation samples and the country samples. Our samples also contained too few subjects to use WLS. Muthen (1993) recommends at least 1000 subjects with a very small number of variables (e.g. 5–10) to ensure accurate estimation whereas our study began with 31 variables. The sample sizes for each country were clearly too small to warrant use of WLS.

- *Model 3*: vigilance, hypervigilance, defensive avoidance, procrastination, buck-passing, and rationalization items as six separate factors
- *Model 4*: vigilance as one factor and the remaining items comprising one higher-order factor (non-vigilance) and several first-order factors
- *Model 5*: vigilance and hypervigilance as two factors and defensive avoidance as a higher-order factor bracketing several first-order factors.

The analysis was carried out on a sample of 1976 students who completed all 31 items of the DMQ.² Exhibit 1 presents tests of goodness-of-fit for each of the five competing models. As Exhibit 1 shows, Models 1 and 2, and their extensions (Models 4 and 5) provided poor fits to the data. Model 3, the six-factor model, provided the best fit to the data among the five competing models. However, the GFI and the AGFI values for this model (0.87 and 0.85) were lower than the recommended 0.90 criterion, the RMSR was inadmissible, and the χ^2/df ratio (9.7) was too large. Computation of the fit indexes for each country separately revealed that none of the five models was consistent with the data. However, as Model 3, the six-factor model, fitted the data better than the other four models, further analysis was undertaken to improve upon this.

Exhibit 1. Goodness-of-fit indices for the five substantive models ($n = 1976$)

Model	GFI	AGFI	RMSR	χ^2/df
Null Model:	0.32	0.27	0.26	47.6
Model 1: (2 factors)	0.82	0.80	0.07	12.5
Model 2: (3 factors)	0.82	0.80	0.07	12.4
Model 3: (6 factors)	0.87	0.85	NA	9.7
Model 4: (1 + higher-order factor)	0.85	0.82	NA	12.3
Model 5: (2 + higher-order factor)	0.85	0.81	NA	12.8

NA: not admissible.

Model modification

Some of the results computed by CFA can be used for scale refinement if the data do not represent a good fit for the substantive model. In particular, the maximum likelihood-produced squared multiple correlations can be used to describe how well a particular item represents a latent construct, while the modification indices indicate where an item would be better off loading if it were freed to be estimated. Two criteria were used to refine measurement Model 3. First, items were omitted using an iterative process if their squared multiple correlation was less than 0.25. This first criterion was used on the basis that if an item contributed to 25% or more of the variation in the latent variable, then it was a valuable item. Second, when all squared multiples were above 0.25, those items which had an estimated change in lambda λ of greater than 0.4 were deleted. This second criterion was used on the basis of Stevens' (1986) recommendation that a factor loading of 0.4 or more accounts for a noteworthy contribution of the item to the scale. We also followed Comrey's (1988) recommendation that any item should only be allowed to load on one latent construct.

² Small variations in sample size reported in different analyses and exhibits are due to missing responses on several items, missing information about sex of several subjects as well as casewise deletion of missing data to form the variance-covariance matrices for testing the fit of the scales to the data.

Model modification was conducted using a random selection of 50% of the total sample. The model was modified using this sample and then validated on the other half. The following decisions were made at each iterative step:

- *Step 1:* The five hypervigilance items were joined with the five rationalization items because the initial solution was not admissible due to the high degree of relationship between the two sets of items ($r > 1$).
- *Step 2:* Seven items were deleted (items 2, 4, 6, 8, 13, 16, 25) because their squared multiple correlations were below 0.25.
- *Step 3:* One rationalization item (item 20) was deleted because its squared multiple correlation dropped below 0.25.
- *Step 4:* As a high correlation was noted between buck-passing and defensive avoidance (0.91), the eight items from these two scales were combined.
- *Step 5:* One defensive avoidance item (Item 23) loaded highly with hypervigilance items (lambda $\lambda = 0.67$) and was added to that scale because it was substantively meaningful to do so.
- *Step 6:* One defensive avoidance item (item 10) was deleted because its lambda λ (0.46) was above 0.4 and it did not belong substantively with the hypervigilance items.

Following deletion of nine items on the basis of the refinement criteria (see Steps 2, 3, and 6), 22 items remained, which loaded on four substantive latent constructs: vigilance, hypervigilance, buck-passing, and procrastination. Exhibit 2 presents the goodness-of-fit indices for each of the randomly selected samples (1011 and 1007), the total sample which completed all 22 items (2018) and for each country sample separately. The fit for the total sample was GFI 0.92, AGFI 0.90, RMSR 0.05 and the χ^2/df ratio 9.01. We also ran a multigroup analysis to test for invariance of the scales across the six national samples with factor loadings free in each sample. The fit statistics reveal that the psychometric properties of the four scales are similar across countries (GFI 0.85, RMSR 0.08, and χ^2/df 4.12). While the revealed structure is broadly similar across each country sample, it is apparent from Exhibit 2 that the four-factor solution has best fit for US (GFI 0.89, AGFI 0.86; RMSR 0.05, χ^2/df 3.63) and least fit for New Zealand (GFI 0.78, AGFI 0.72; RMSR 0.09, and χ^2/df 5.51). The fact that the Asian and Western samples have, overall, similar fit indicates that the revised four-factor model is applicable across cultures.

Exhibit 2. Goodness-of-fit indices for the revised (4 factor) model — (22 items)

Sample	GFI	AGFI	RMSR	χ^2/df
Modifying sample ($n = 1011$)	0.92	0.89	0.05	5.31
Validation sample ($n = 1007$)	0.89	0.87	0.06	6.49
Total sample ($n = 2108$)	0.92	0.90	0.05	9.01
Australia	0.78	0.73	0.08	4.65
United States	0.89	0.86	0.05	3.63
New Zealand	0.78	0.72	0.09	5.51
Japan	0.81	0.76	0.10	4.93
Hong Kong	0.84	0.80	0.07	3.56
Taiwan	0.86	0.83	0.08	3.79

These results show that the modified data set is a good indicator of four of the six hypothesized decision-coping patterns, namely, vigilance, hypervigilance, buck-passing, and procrastination. The buck-passing items together with several defensive avoidance items became one scale. Empirical support for the existence of rationalization was not obtained. The four scales, the 22 items, their

Exhibit 3. Melbourne Decision Making Questionnaire

The items, standardized factor loadings, and squared multiple correlations ($n = 2018$)

Scale/items	Loading	R^2
<i>Vigilance (mean = 9.41, sd = 2.22) alpha 0.80</i>		
I like to consider all of the alternatives.	0.62	0.39
I try to find out the disadvantages of all alternatives.	0.64	0.42
I consider how best to carry out a decision.	0.61	0.37
When making decisions I like to collect a lot of information.	0.53	0.28
I try to be clear about my objectives before choosing.	0.70	0.49
I take a lot of care before choosing.	0.72	0.52
<i>Buck-passing (mean = 4.85, sd = 2.93) alpha 0.87</i>		
I avoid making decisions.	0.79	0.63
I do not make decisions unless I really have to.	0.68	0.46
I prefer to leave decisions to others.	0.80	0.63
I do not like to take responsibility for making decisions.	0.72	0.52
If a decision can be made by me or another person I let the other person make it.	0.74	0.55
I prefer that people who are better informed decide for me.	0.61	0.37
<i>Procrastination (mean = 3.88, sd = 2.39) alpha 0.81</i>		
I waste a lot of time on trivial matters before getting to the final decision.	0.59	0.35
Even after I have made a decision I delay acting upon it.	0.59	0.35
When I have to make a decision I wait a long time before starting to think about it.	0.61	0.37
I delay making decisions until it is too late.	0.76	0.58
I put off making decisions.	0.82	0.66
<i>Hypervigilance (mean = 4.61, sd = 2.26) alpha 0.74</i>		
Whenever I face a difficult decision I feel pessimistic about finding a good solution.	0.63	0.39
I feel as if I am under tremendous time pressure when making decisions.	0.60	0.35
The possibility that some small thing might go wrong causes me to swing abruptly in my preference.	0.55	0.31
I cannot think straight if I have to make a decision in a hurry.	0.56	0.31
After a decision is made I spend a lot of time convincing myself it was correct.	0.58	0.36

standardized factor loadings and their squared multiple correlations are presented in Exhibit 3. Exhibit 3 also presents information about the means, standard deviations, and alpha reliabilities of the four scales.

The intercorrelations of the four decision-making scales are presented in Exhibit 4. An average correlation of 0.74 was found between buckpassing, procrastination, and hypervigilance, which is consistent with the conflict model, which posits a tendency to use non-vigilant coping patterns in combination or sequentially, according to the stress-arousing features of the decision problem. Despite

Exhibit 4. Correlation matrix for the four Melbourne DMQ scales ($n = 2018$)

	Buck-passing	Procrastination	Hypervigilance
Vigilance	-0.30	-0.32	-0.17
Buck-passing		0.72	0.73
Procrastination			0.78

the high intercorrelations, the CFA procedures used in this study ensure that the buckpassing, procrastination, and hypervigilance scales are discrete at the first-order level. However, because of the high intercorrelations between the three scales, we decided to test another model, a variant of model 4, in which vigilance is designated as a first-order factor and non-vigilance as a second-order factor with three constituents — buckpassing, procrastination, and hypervigilance — loading on it. The CFA results for this variant model were GFI 0.92, AGFI 0.90, RMSR 0.05, χ^2/df 9.34, which are almost identical to the four-factor solution, except for a slightly higher χ^2/df ratio in the variant model (9.34 versus 9.01). We still favour Model 4 — the four-factor model — over the variant, higher-order model, because of the substantive derivation of the four-factor model and because there is little between the two models in goodness-of-fit. It is clear, however, that both models are acceptable and that both lend support to the theory underlying the conflict model.

Exhibit 4 also shows that vigilance is negatively correlated with buck-passing ($r = -0.30$), procrastination ($r = -0.32$), and hypervigilance ($r = -0.17$), consistent with the distinction made in the conflict model. Finally, Exhibit 5 presents the means and standard deviations of scores on the four scales for the male and female respondents from the six countries, reduced to $n = 2002$ because 16 of the sample of 2018 failed to provide data on the sex variable.

Exhibit 5 reveals interesting cross-country and gender differences, as well as similarities, in scores on the four scales. The cross-cultural aspects of our research on self-reported decision-making processes are examined in another paper (Mann *et al.*, 1995).

DISCUSSION

The results of the study revealed shortcomings in the Flinders DMQ as a measure of self-reported decision-making patterns. The data failed to support any of the five substantive models and revealed weaknesses in several scales, especially rationalization. However, a revised model, based on items from two of the original scales (vigilance and procrastination) and two reconstituted scales (hypervigilance and buck-passing), produced a good and parsimonious fit with the data for the total sample and an adequate fit for each of the six different country samples. The rationalization scale of the original DMQ had little psychometric validity and disappeared.

Results of the study provide support for a four-factor measure of decision coping, which we propose to call the Melbourne DMQ. Retention of two scales in their original intact form, i.e. vigilance and procrastination, is useful, as this provides a point of continuity between the Flinders DMQ and the new, shortened Melbourne DMQ. Importantly, this also means that future research on vigilance and procrastination will be cumulative with previous research using the vigilance scale (e.g. Burnett *et al.*, 1989; Fletcher and Wearing, 1992; White *et al.*, 1994) and the procrastination scale (e.g. Beswick *et al.*, 1988; Beswick and Mann, 1994; Ferrari, 1991). The retention and continued use of the procrastination scale as a measure of tendencies toward indecisiveness in research on general and everyday procrastination (cf. Ferrari *et al.*, 1995) is warranted. The integrity of the vigilance scale is worth noting, as the scale is constructed of six items, each corresponding to a characteristic/feature of vigilant information processing as described by Janis and Mann (1977, p. 89). The good reliability of the vigilance scale ($\alpha = 0.80$) provides justification for its continued use in decision-making research. The procrastination scale too, with good reliability ($\alpha = 0.81$), has also demonstrated its value as a dependable scale. The revised hypervigilance scale, a combination of items describing time pressure (item 1), abrupt swings in preference (item 21), difficulties in concentration (item 31), pessimism (item 23), and post-decisional bolstering (item 29), conveys a hurried, anxious style of decision making. The scale captures aspects of impulsivity and its consequences, and is a moderately good scale ($\alpha = 0.74$). The revised and original hypervigilance scales correlate $r = 0.81$. Buck-passing

Exhibit 5. Means and standard deviations of six country samples on Melbourne Decision Making Questionnaire ($N = 2002$)

	USA		Australia		New Zealand		Japan		Hong Kong		Taiwan	
	m	f	m	f	m	f	m	f	m	f	m	f
Scale (items)	$n = 180$	$n = 295$	$n = 93$	$n = 158$	$n = 89$	$n = 165$	$n = 140$	$n = 218$	$n = 96$	$n = 177$	$n = 141$	$n = 250$
Vigilance (6 items)	9.23 (2.28)	9.49 (2.23)	9.37 (2.47)	9.40 (2.23)	9.54 (2.20)	9.52 (2.15)	9.16 (2.58)	9.11 (2.22)	9.45 (1.96)	9.01 (2.15)	10.15 (1.75)	9.57 (2.15)
Hypervigilance (5 items)	4.48 (2.10)	4.95 (2.26)	3.64 (2.29)	4.25 (2.09)	3.66 (2.31)	3.68 (2.56)	5.06 (2.02)	5.49 (2.41)	4.80 (1.56)	4.99 (1.82)	4.67 (2.11)	4.57 (2.25)
Buck-passing (6 items)	4.22 (2.89)	4.93 (3.12)	3.93 (2.92)	4.00 (2.85)	3.99 (2.50)	4.08 (3.43)	5.13 (2.43)	5.42 (2.94)	4.81 (2.39)	5.36 (2.76)	5.72 (2.54)	5.53 (2.80)
Procrastination (5 items)	3.52 (2.09)	3.63 (2.35)	2.73 (2.06)	3.04 (2.25)	3.06 (2.00)	2.83 (2.28)	5.41 (2.21)	5.17 (2.15)	3.47 (2.11)	3.81 (2.46)	4.51 (2.13)	4.32 (2.39)

emerged as a strong scale with an alpha reliability of 0.87. The revised buck-passing scale consists of items that describe leaving decisions to others and not taking responsibility (5, 18, 22, 28) and reluctance to make decisions (15, 26). The revised and original buck-passing scales correlate $r = 0.92$. The retention of the vigilance and procrastination scales in their original forms as well as the high correlations between new and old hypervigilance and buck-passing scales show that the theoretical meaning of the Flinders DMQ continues in the Melbourne DMQ, but we have improved on the original instrument by removing faulty and redundant items.

Incorporation of defensive avoidance under the rubric of buck-passing is not surprising. Janis and Mann (1977) conceptualised defensive avoidance as an umbrella term for a diverse group of behavioural strategies for actually avoiding decisions (through procrastination and passing off decisions to others) or for evading mentally the unpleasant realities of difficult decisions (through distortion, denial, projection, and other forms of rationalization). The non-appearance of a separate or higher-order defensive avoidance factor shows that the specific, overt forms of evasion — procrastination and buck-passing — are sufficient to capture the essential features of the construct. Finally, the failure of rationalization to emerge as a separate viable factor suggests that mental evasion is not a distinct coping pattern, but may occur as an adjunct to or justification for procrastination and buck-passing. Another possibility is that rationalization, as conceived in the conflict model, is not a uniform response tendency but constitutes a set of varied mental responses (denial, distortion, projection, bolstering of alternatives, etc.) that are triggered by the specific features of particular dilemmas in a particular situation. Yet another possibility, of course, is that the items devised to measure the concept were not equal to the task or did not travel or translate well across cultures. It might be worth while, before dismissing rationalization as a separate construct, to try again to create a better set of items to represent rationalization in the conflict model.

In conclusion, our research does not support the continued use of the Flinders DMQ, but provides support for an improved measure, to be called the Melbourne DMQ, consisting of four scales with good psychometric properties. Importantly, the improved measure can be recommended for empirical research on decision making across a range of Asian and Western countries. Also importantly, the improved measure provides an operationalization of decision coping patterns that remains close to the theoretical model (Janis and Mann's conflict theory, 1977) from which the original questionnaire was derived. In essence, the key coping patterns identified by conflict theory, vigilance, hypervigilance, and defensive avoidance (as expressed in the form of procrastination and buck-passing), have been validated by our findings.

In the introduction to this paper we pointed to three substantive approaches to the analysis of individual differences in decision making, i.e. motivational processes, cognitive styles, and personality dimensions. The conflict model deals with motivational factors in decision making, in particular conditions that motivate vigilant decision making versus maladaptive coping patterns. Our findings reveal that the conceptual distinction between vigilant decision making and three of the other coping patterns identified in the original Janis and Mann (1977) model, i.e. procrastination, buck-passing, and hypervigilance, is warranted, providing a firm psychometric foundation for future research on the motivational, cognitive, and personality components of these different patterns.

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APPENDIX: FLINDERS DECISION MAKING QUESTIONNAIRE

Instructions: People differ in the way they go about making decisions. Please indicate how you make decisions by ticking for each question the response which best fits your usual style.

When making decisions —

- | | |
|---|---|
| 1. I feel as if I'm under tremendous time pressure when making decisions. | H |
| 2. I feel better about choosing if I can convince myself that the decision is not all that important. | R |
| 3. I like to consider all of the alternatives. | V |
| 4. When I have a decision to make I try not to think about it. | D |
| 5. I prefer to leave decisions to others. | B |
| 6. Whenever I get upset by having to make decisions I choose on the spur of the moment. | H |
| 7. I try to find out the disadvantages of all alternatives. | V |
| 8. I am inclined to blame others when decisions turn out badly. | B |
| 9. I waste a lot of time on trivial matters before getting to the final decision. | P |
| 10. I feel uncomfortable about making decisions. | D |
| 11. I consider how best to carry out the decision. | V |
| 12. Even after I have made a decision I delay acting upon it. | P |
| 13. After making a decision I am inclined to undervalue the worth of the alternatives I did not choose. | R |
| 14. When making decisions I like to collect lots of information. | V |
| 15. I avoid making decisions. | D |
| 16. I only want to hear information about my preferred alternative. | R |
| 17. When I have to make a decision I wait for a long time before starting to think about it. | P |
| 18. I don't like to take responsibility for making decisions. | B |
| 19. I try to be clear about my objectives before choosing. | V |
| 20. I forget or overlook important information about choice alternatives. | R |
| 21. The possibility that some small thing might go wrong causes me to swing abruptly in my preferences. | H |
| 22. If a decision can be made by me or another person I let the other person make it. | B |
| 23. Whenever I face a difficult decision I feel pessimistic about finding a good solution. | D |
| 24. I take a lot of care before choosing. | V |
| 25. I choose on the basis of some small thing. | H |
| 26. I don't make decisions unless I really have to. | D |
| 27. I delay making decisions until it is too late. | P |
| 28. I prefer that people who are better informed decide for me. | B |
| 29. After a decision is made I spend a lot of time convincing myself it was correct. | R |
| 30. I put off making decisions. | P |
| 31. I can't think straight if I have to make decisions in a hurry. | H |

Code:

V = VIGILANCE (MAX. = 12)

H = HYPERVIGILANCE (MAX. = 10)

D = DEFENSIVE AVOIDANCE (MAX. = 10)

B = BUCK-PASSING (MAX. = 10)

P = PROCRASTINATION (MAX. = 10)

R = RATIONALIZATION (MAX. = 10)

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