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The latent structure of decision styles

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ABSTRACT

Responding to calls for theoretical development in research on decision styles, this article focuses on their structural relationships. A two-component model of decision styles is proposed. One component, pertaining to dual process theories of thinking, is concerned with the processes people use to make decisions, and the other is concerned with processes used to regulate decisions (e.g. whether they should be made immediately or delayed). The results of a first study ($N = 629$) using items from a comprehensive decision style measure (the Decision Styles Questionnaire), support the two-component model. The results of a second study ($N = 305$), based on an alternative set of style measures, provide support for an extended version of the model. Implications of the theory and research findings for future work on decision styles are discussed.

1. Introduction

Decision-making style has been defined as "a habitual pattern individuals use in decision-making" (Driver, 1979, p. 48), and "the learned, habitual response pattern exhibited by an individual when confronted by a decision situation" (Scott & Bruce, 1995, p. 820). Decision-making styles are associated with multiple outcomes in many aspects of everyday life (Bruine de Bruin, Parker, & Fischhoff, 2007) and impact multiple life domains (Bakewell & Mitchell, 2003; Creed, Patton, & Bartrum, 2004; Gottfredson, 1996; Kaplan, Greenfield, Gandek, Rogers, & Ware, 1996; Mau, 1995; Niles, Erford, Hunt, & Watts, 1997; Sprotles & Kendall, 1986; Venkatesh & Morris, 2000).

Although significant gains in our understanding of decision-making style have been made in the last 30 years, this area continues to lack an established theoretical framework (Appelt, Milch, Handgraaf, & Weber, 2011; Mohammed & Schwall, 2009). As a consequence research on decision styles tends to be fragmented, instruments designed to measure decisions styles focus on overlapping dimensions and omit dimensions measured by alternative tests (Epstein & Meier, 1989; Epstein, Pacini, DenesRaj, & Heier, 1996; Leykin & DeRubeis, 2010; Mann, Burnett, Radford, & Ford, 1997; Scott & Bruce, 1995), and researchers find it necessary to use multiple instruments in order to measure decision styles comprehensively (Bruine de Bruin et al., 2007; Kozhevnikov, 2007; Leykin & DeRubeis, 2010).

We address these issues by proposing a comprehensive model of decision styles, including the specification of relationships between style dimensions. We distinguish between stylistic differences in the core *cognitive processes* people use to make decisions (e.g. intuition, rationality), and *regulatory decision-process* styles concerned with choice regulation (e.g. avoidance, maximization). Based on theoretical principles derived from appraisal tendency theory (Lerner, Gonzalez, Small, & Fischhoff, 2003; Lerner, Han, & Keltner, 2007; Lerner & Keltner, 2000, 2001), we propose that decision anxiety has a direct influence on regulatory decision-process styles, but no influence on core decision process styles. A model derived from this proposition, presented in Fig. 1, is tested empirically.

1.1. The structure of decision-making styles

Until recently, the relationships between the various scales measuring decision-making styles have been poorly understood. Although research has examined the relationships between specific style measures (e.g. the GDMS and MDMQ (Loo, 2000; Mann et al., 1997; Scott & Bruce, 1995; Thunholm, 2004), it has not been directly concerned with establishing the underlying structure of decision-making style. This issue was addressed by Leykin and DeRubeis (2010). They reviewed published decision-style questionnaires and identified a broad range of scales from these: perfectionist, regretful, indecisive, risk-seeking, vigilant, intuitive, dependant, avoidant, spontaneous, and anxious. After carrying out several exploratory factor analyses on data obtained with questionnaires measuring these scales, Leykin and DeRubeis concluded that seven dimensions are necessary to represent the fundamental

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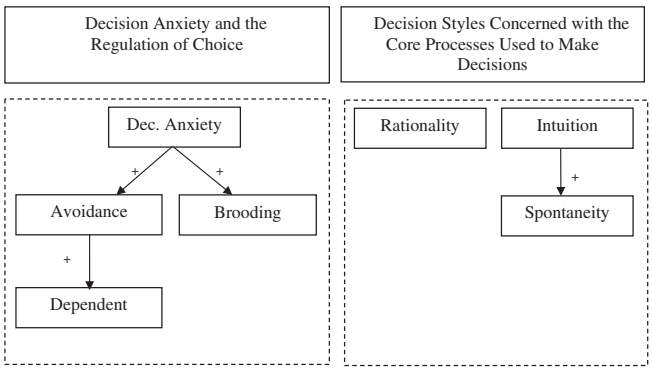

Fig. 1. A two-component model of decision-making styles.

structure of decision-making style: spontaneous, dependent, vigilant, avoidant, brooding (often referred to by others as regret), intuitive, and anxious. This taxonomy of seven styles is the most comprehensive currently available.

2. A two-component model of decision-making styles

How might the seven styles identified by Leykin and DeRubeis be organized, and the relations between them better understood? Three styles, intuition, vigilance, and spontaneity, are conceptually similar to theoretical concepts prominent in mainstream research on judgment and decision-making. This research suggests that two systems of information processing are involved in reasoning and problem solving. The first, (System 1) is intuitive, automatic, associative, fast, heuristic, and involves parallel processing, whereas the second (System 2), is analytic, explicit, rule-based, relatively slow, and involves sequential processing (Evans, 2007; Hodgkinson, Langan-Fox, & Sadler-Smith, 2008; Johnson-Laird, 1983; Pacini & Epstein, 1999; Stanovich & West, 2000). Leykin and DeRubeis' intuitive scale (e.g. "when I make decisions I tend to rely on my intuition") and spontaneous scale (e.g. "my decisions are spontaneous") are conceptually similar to fast and intuitive System 1 thinking, whereas their vigilance scale (e.g. "I weigh the pros and cons of each option before I make a decision") is clearly closely related to conscious and analytic System 2 thinking. We therefore suggest that vigilance, intuition and spontaneity form a group of decision-making process styles. In this group, intuition and vigilance pertain to System 1 and System 2 thinking processes respectively, and the (fast and heuristic) spontaneous style is more likely in people who tend to rely on (fast and heuristic) intuition when making choices.

The remaining decision-making styles identified by Leykin and DeRubeis (2010), dependent, avoidant, brooding, and anxious, are conceptually distinct from the core decision styles described by System 1 and System 2 thought processes. Three of these styles can be construed as decision processes concerned with the regulation of choice: the extent to which decisions tend to be delayed or avoided (avoidant), involve regretful post-decision reflection (brooding), and are referred on to others (dependent). The fourth is concerned with the tendency to experience negative affect during decision-making (anxious). Unlike the core decision-making styles of intuition, vigilance and spontaneity, the decision making styles of avoidant, brooding, dependant and anxious are concerned with the regulation of choice rather than how choice is made.

If the decision process styles of intuitive, vigilance, and spontaneity, are conceptually distinct from both the regulatory decision styles of dependent, avoidant, and brooding, and the tendency to experience decision-related anxiety, two fundamental questions are raised: (1) to what extent are the decision-making process styles (vigilance, intuition and spontaneity) *empirically* independent of the regulatory-decision styles and decision-related anxiety, and (2) what is the latent structure of the core decision-process styles, the decision–regulation styles, and decision-related anxiety? To answer these questions we develop and test empirically a theoretical model of the structural relationships between decision styles. In the following section we explain the rationale for this model, beginning with an examination of the role of emotion, and particularly anxiety, in everyday choice.

3. The latent structure of decision style regulation

Following the introduction of the somatic marker hypothesis (Damasio, Tranel, & Damasio, 1991) and the 'affect as information' approach (Schwartz & Clore, 1988), theorists have argued that affect plays a central role in the decision-making process (Russell, 2003). Affective reactions develop unconsciously and automatically as a result of past actions, and these reactions precede and influence conscious and rational decision-making processes (Hinson, Whitney, Holben, & Wirick, 2006). Anxiety is a state of helplessness which occurs as result of "a perceived inability to predict, control, or obtain desired outcomes in certain upcoming personally salient situations or contexts" Barlow (2000, p. 1249). Because decisions are concerned with the evaluation of desired (and non-desired) outcomes in an uncertain future (Rick & Loewenstein, 2008), anxiety has a close relationship with decision-making and has been the focus of much research here (Mohammed & Schwall, 2009).

4. The role of anxiety in regulatory decision-making styles

How might the tendency for some people to feel anxious when making decisions influence their other decision-making styles? According to appraisal-tendency theory (Lerner et al., 2003, 2007; Lerner & Keltner, 2000, 2001), specific emotions are defined by a set of central dimensions which include perceived certainty, pleasantness, control, responsibility and attentional activity. For example, fear is associated with low certainty, low pleasantness, medium attentional activity, high anticipated effort, low control, and medium responsibility (Lerner & Keltner, 2000). Appraisal-tendency theory proposes that specific emotions trigger a cognitive predisposition (or *appraisal tendency*) to construe future events "in line with the central-appraisal dimensions that triggered the emotion" (Lerner & Keltner, 2000, p. 477). Therefore, if someone is fearful, appraisal-tendency theory would predict them to make choices with low certainty, an unpleasant feeling, a medium level of attentional activity, the anticipated need to make considerable effort in the choice process, with little perceived control over the outcome, and with a medium level of perceived responsibility.

Because anxiety is very similar to fear (Barlow, 2000; Öhman, 2008) the action tendencies of anxiety are likely to closely resemble those of fear. If fear-related action tendencies are applied to decision-related anxiety, a mechanism by which it might regulate and control other decision-styles is apparent. First, individuals might be expected to resist and avoid experiencing the unpleasant feeling state, low sense of control, and lack of certainty associated with decision-related anxiety, and this would explain a tendency to avoid decisions (the avoidant style). Second, if decisions are avoided, but as is often the case have to be taken, we might expect people to refer decisions to others (the dependent style). Third, negative mood state associated with low pleasantness, the low perceived control and certainty, together with the greater perceived risk of negative events (Butler & Mathews, 1987), would be consistent with a tendency to reflect on negative rather than

positive decision outcomes (brooding). These relationships are shown diagrammatically in Fig. 1.

5. The latent structure of core decision process styles

The appraisal tendencies associated with fear/anxiety (i.e. making choices with low certainty, an unpleasant feeling, a medium level of attentional activity, the anticipated need to make considerable effort in the choice process, little perceived control over the outcome, and a medium level of perceived responsibility), have no readily apparent implications for whether people use intuitive System 1 or conscious System 2 thought processes to make decisions. There is therefore no reason to extend the proposed relationships between anxiety and decision regulatory styles to include the core decision process styles of vigilance and intuition. However, a tendency to use the spontaneous style (choices are made instantaneously) is clearly related more closely to fast, intuitive, System 1 thinking than relatively slow and conscious System 2 thought. It is therefore proposed that the three decision process styles are independent of the regulatory styles, with spontaneity depending in part on the tendency to be intuitive (see Fig. 1). We test this two-component model of decision styles with two studies. In the first study evidence for the model of decision-style shown in Fig. 1 is examined. In the second study an extended version of this model which includes the decision style of maximization (Schwartz et al., 2002) is examined.

6. Study 1

6.1. Method

6.1.1. Participants

Participants were obtained from an organization offering people e-vouchers in exchange for the online completion of surveys. Six hundred and twenty-nine individuals took part, aged from 21 to 82 years (*median* = 48.5), 48.4% were males. Most of the participants were part of the working population (70.3%), 8.8% were unemployed and 20.9% retired, 83% were White British, 9.2% White/Other, and the remainder from ethnic minority backgrounds.

6.1.2. Materials and procedure

Participants completed the Decision Styles Questionnaire (Leykin & DeRubeis, 2010). The items in this questionnaire are set out in Supplementary Material: Appendix 1. The Decision Styles Questionnaire measures the following decision styles: anxiety, avoidance, brooding, dependent, vigilance, intuition, and spontaneity. Leykin and DeRubeis' items measuring being respected as a decision-maker, and being confident as a decision-maker, were excluded as these authors view them as being concerned with 'perceptions of self' rather than with decision-making style. All 34 questionnaire items were presented online in a different random order for each participant, and responses were on a five-point Likert scale (strongly agree to strongly disagree).

6.2. Results and discussion

The means and standard deviations for all items, and the intercorrelations between them, are shown in Supplementary Material: Appendix 2. Correlations between the seven decision style scales, and the Cronbach alpha reliability coefficient for each scale, are shown in Table 1. An initial confirmatory factor analysis was carried out using Mplus software (Muthén & Muthén, 1998–2011) to examine the fit of the items measuring the seven decision styles. Model fit was acceptable: $\chi^2(574) = 1953.32$, $p < .001$, RMSEA = .06 (95% CI = .059–.065), SRMR = .09. Examination of modification indices indicated three items with relatively poor fit (*'I make decisions quickly' (spontaneous), 'I try to be clear about my objective before choosing' (vigilance), 'I do not seek advice from others when I make decisions' (dependent)*). Confirmatory factor analysis was repeated with these items omitted, and the model showed good fit $\chi^2(474) = 1193.32$, $p < .001$, RMSEA = .05 (95% CI = .046–.053), SRMR = .06.

Table 1
Study 1: intercorrelations between decision style scales and the reliability of each subscale (Cronbach alphas in the diagonal).

	Scale	1	2	3	4	5	6	7
1	Vigilant	.82						
2	Intuitive	.13*	.82					
3	Spontaneous	−.24**	.44**	.72				
4	Anxious	.10*	.06	.14**	.83			
5	Avoidant	−.01	.03	.20**	.70**	.86		
6	Dependent	.19*	.04	.07	.52**	.40**	.85	
7	Brooding	.15*	.04	.18*	.81**	.62**	.44**	.78

* $p < .05$.
** $p < .01$.

We then tested two structural equation models with all remaining 32 items: one where the factors were independent, and one based on our hypotheses. The first structural equation model specifying all seven factors as independent, had poor fit $\chi^2(495) = 2973.31$, $p < .001$, RMSEA = .09 (95% CI = .086–.092), SRMR = .21. However, the second model specifying the relationships set out in Fig. 1 had good fit $\chi^2(474) = 1390.84$, $p < .001$, RMSEA = .05 (95% CI = .051–.058), SRMR = .08. The fit of the second model was significantly better than the first $\chi^2(21) = 1582.47$, $p < .001$. Statistically significant standardized paths are shown in Fig. 2. It should be noted that the statistical significance of the χ^2 values in both models is probably due to the number of manifest variables (Moshagen, 2012).

The results of Study 1 support the two component structure of decision making styles, as hypothesized and set out in Fig. 1. There are no significant paths or covariances between the core decision-making process styles on the one hand and the decision-regulatory styles on the other. The relationship between decision anxiety and dependence is fully mediated by decision avoidance.

The following study aims to re-test the two component model using, where possible, alternative scale items to those used in Study 1. Whereas Study 1 is based on the items developed by Leykin and DeRubeis, the items in Study 2 are drawn primarily from the established General Decision-Making Style questionnaire (Scott and Bruce, 1995).

The Decision Styles Questionnaire (Leykin & DeRubeis, 2010) from which the items in Study 1 were drawn does not include maximization, a style on which there has been considerable research (e.g. Bin Rim, Turner, Betz, & Nygren, 2011; Dar-Nimrod, Rawn, Lehman, & Schwartz, 2009; Diab, Gillespie, & Highhouse,

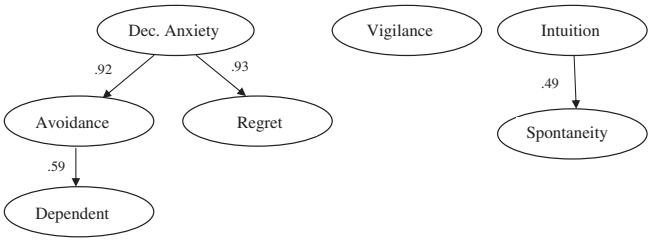

Fig. 2. Structural equation model of the relations between decision styles. Paths to items are omitted. All between-factor paths attaining significance at $p < .05$ are shown.

2008; Lai, 2010; Purvis, Howell, & Iyer, 2011; Schwartz et al., 2002; Spunt, Rassin, & Epstein, 2009). Given that fear leads to a high level of anticipated effort (Lerner & Keltner, 2000), and that fear is a similar emotion to anxiety, it is plausible that people experiencing decision-related anxiety tend to make an extra effort to make the best possible decisions: to maximize. This hypothesis is supported by research suggesting that anxiety and maximization are associated (Purvis et al., 2011). In the light of these considerations, the model tested in Study 2 is a slightly elaborated version of that tested in Study 1: a path from anxiety to maximization has been added.

7. Study 2

7.1. Method

7.1.1. Participants

Participants were obtained from the same source as in Study 1. Three hundred and five individuals took part, aged from 21 to 82 years (*median* = 49), 60.2% were males. Most of the participants were part of the working population (74.2%), 6% were unemployed and 19.8% retired. 87.1% of the participants were White British, 6.6% White/Other, and the remaining from ethnic backgrounds.

7.1.2. Materials and procedure

Decision-related anxiety was measured with the items developed by Leykin and DeRubeis (2010) supplemented by three new items designed to increase scale reliability. The decision styles of avoidant, dependent, spontaneous, intuitive and rational (referred to as 'vigilance' by Leykin and DeRubeis) were measured with the General Decision-Making Style questionnaire (Scott & Bruce, 1995), omitting the same three items as those in Study 1, and supplementing the remaining items with three or four new ones to increase scale reliability.

To ensure that the relation between decision anxiety and brooding found in Study 1 could be replicated with items specifically designed to measure the more commonly used concept of decision-related regret, a regret scale was developed for Study 2. All items measuring this construct developed by Schwartz et al. (2002) and Nygren (2000) were administered to 605 adults. An exploratory factor analysis showed that the following four items loaded on a single factor at over .4: 'I tend to be someone who worries a lot over decisions I've made', 'After making a decision, I find that I often go back and re-evaluate the situation', I have trouble putting the results of disappointing decisions I've made behind me', and 'After making a decision I sometimes worry about the regret I'll feel if the outcome turns out to be a bad one'. The reliability of these items was good (alpha = .81), and they were used to measure regret in Study 2.

In addition, a maximization scale was designed using some of the items developed by Schwartz et al. (2002). Only the 10 items concerned with achievement striving and decision difficulty were included as research suggests that the other component, 'high standards', may not pertain to the maximization construct (Bin Rim et al., 2011). An exploratory factor analysis indicated that the following four items loaded on a single factor at over .4 'When I watch TV, I channel surf, often scanning through the available options even while attempting to watch one programme', 'When I am in the car listening to the radio, I often check other stations to see if something better is playing, even if I am relatively satisfied with what I'm listening to', 'I treat relationships like clothing: I expect to try a lot on before finding the perfect fit', and 'Renting videos or DVDs is really difficult I'm always struggling to pick the best one'. The reliability of these items was acceptable (alpha = .57) and they were selected to measure maximization. The complete set of 46 items used in Study 2 are set out in Supplementary Material: Appendix 3.

7.2. Results and discussion

The means and standard deviations for all items, and the intercorrelations between the items, are shown in Supplementary Material: Appendix 4. Correlations between the eight decision style scales, and the Cronbach alpha reliability coefficient for each scale, are shown in Table 2. A confirmatory factor analysis was carried out using Mplus software to examine the fit of the items measuring all eight decision styles. Model fit was acceptable: $\chi^2(1,532) = 1137.12.7$ $p < .001$, RMSEA = .06, (95% CI = .056–.066), SRMR = .08.

A structural equation model, based on the 46 items shown in Supplementary Material: Appendix 3, and specifying all eight factors as independent, showed poor fit $\chi^2(989) = 2829.42$, $p < .001$, RMSEA = .08 (95% CI = .075–.081), SRMR = .23. However, a second structural equation model specifying the relationships set out in Fig. 1, plus a path from avoidance to maximization, showed acceptable to good fit $\chi^2(978) = 1928.31$ $p < .001$, RMSEA = .06 (95% CI = .053–.060), SRMR = .09. The fit of the second model was significantly better than the first $\chi^2(11) = 901.11$, $p < .001$. All statistically significant standardized paths are shown in Fig. 3.

8. General discussion

The development of instruments to measure decision styles (e.g. Epstein et al., 1996; Leykin & DeRubeis, 2010; Mann et al., 1997; Scott & Bruce, 1995) has made a very important contribution to research on the differences in the way people make decisions and on the consequences of such differences (Bruine de Bruin et al., 2007). Responding to calls for a more systematic and theory-driven approach to research on decision-making styles (Appelt et al., 2011; Mohammed & Schwall, 2009), the primary contribution of this article is to build on existing research by offering a theoretical account of the relationships between them. First, we made a conceptual distinction between stylistic differences in the ways that people make choices (e.g. the tendency to rely on intuition), stylistic differences in the processes regulating choices (e.g. the tendency to avoid decision-making). Second, by combining these distinctions with appraisal-tendency theory (Lerner & Keltner, 2000, 2001) we proposed a two-component (core decision-process versus decision-regulatory process) model of the relationships between decision styles in which anxiety influences maximization, brooding and avoidance, and avoidance influences dependence, and tested this in two studies. The results of both two studies support this two-component model of decision-making styles and the set of style relationships hypothesized. They also show that this two component model has better fit than a model in which the styles are considered independent. The two-component model has a number of important implications for research on decisions-styles. It suggests that decision styles should not be construed as a set of unconnected trait-like factors. Instead, styles should be viewed as dealing with different aspects of the decision-making process, some with the way information is processed (e.g. rationality and intuition) akin to System 1 and System 2 information processing, and some with the regulation of decision-making including, when and if choices are made (avoidance), the willingness to invest considerable resources in choice (maximization), and the amount of post-choice reflection (brooding/regret). Furthermore, the model provides at least a partial explanation for the etiology of some decision-making styles: the tendency to maximize, brood, and avoid choices occurs as a consequence of

Table 2
Study 2: intercorrelations between decision style scales and reliability coefficients (Cronbach alphas in the diagonal).

	Scale	1	2	3	4	5	6	7	8
1	Rational	.91							
2	Intuitive	.19**	.82						
3	Spontaneous	−.19**	.41**	.83					
4	Anxious	−.06	−.16**	.08	.81				
5	Avoidant	−.06	−.11*	.13*	.77**	.90			
6	Dependent	.13*	−.13*	−.03	.60**	.56**	.89		
7	Regret	.10	−.14*	.07	.85**	.68**	.58**	.81	
8	Maximization	−.03	.01	.10	.51**	.51**	.35**	.53**	.57

Note: 'Rational' is referred to as 'vigilant' in Study 1 and regret is referred to as 'brooding' in Study 1. The nomenclature used in each study reflects that used by the authors from whom the respective items were taken. In Study 1, the items for 'vigilant' were taken from Leykin and DeRubeis (2010) and in Study 2 the items for 'rational' were taken from Scott and Bruce (1995). In Study 1, the items for 'brooding' were taken from Leykin and DeRubeis (2010), and in Study 2 the items for 'regret' were taken Schwartz et al. (2002) and Nygren (2000).
* $p < .05$.
** $p < .01$.

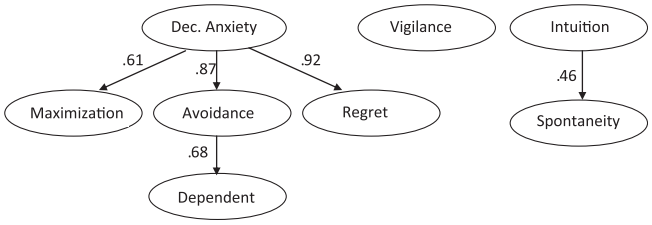

Fig. 3. Structural equation model of the relations between decision styles, including maximization. Paths to items are omitted. All between-factor paths attaining significance at $p < .05$ are shown.

decision-related anxiety, and the dependence on others for choice is at least partly due to the tendency to avoid choice.

Although the results of the two studies provide strong support for our proposed model, both were cross-sectional and relied on self-report questionnaires. Further evidence for the causal relationships between stylistic differences in decision-making proposed here might be derived from longitudinal and experimental research.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.paid.2012.11.002.

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