

Validation and invariance across age and gender for the Melbourne Decision-Making Questionnaire in a sample of Portuguese adults

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Abstract

The personal pattern of coping with the stress associated with making decisions characterizes the way an individual makes choices and judgments. The Melbourne Decision Making Questionnaire (MDMQ) analyses these personal patterns and has been used across various cultures in order to assess four main strategies: vigilance, buck-passing, procrastination, and hypervigilance. We sought to adapt and validate a Portuguese version of the MDMQ. Our study was conducted with a sample of 523 Portuguese people aged 18 or older. The questionnaire retained the original four scales, which represent four different decisional patterns, showing good reliability and validity – concurrent as well as predictive – and invariance for gender and age. The coping pattern with the highest mean was vigilance, while procrastination had the lowest mean. In contrast to other studies of the MDMQ, our sample had a more diversified distribution of age. Young adults were less capable than older adults of managing stress when making decisions, due to their higher levels of buck-passing, hypervigilance, and procrastination. Vigilance showed stronger correlations to positive affect, satisfaction with life, and better decisional self-esteem, while the remaining scales were related to negative affect, reduced decisional self-esteem, and lower satisfaction with life. These decision-making styles are chosen depending on time constraints, pressure, or other contextual characteristics. These results suggest that individuals resort to more convenient patterns according to their situation, and that these patterns of decision-making can be trained, developed, and improved.

Keywords: Decision-making, conflict theory, gender and age invariance, satisfaction with life, decisional self-esteem

1 Introduction

Improving decision-making skills leads to better personal and social choices and more satisfaction in life. By definition, deciding implies choosing a course of action, a possibility derived from a judgment made about a problem or a condition that demands a choice, and is characterized by personal beliefs about which resources may allow someone to reach their own goals (Baron, 2008). Decisions are made at the intersection of emotions and reason, which intertwine in a relationship of mutual dependency (Baumeister, Vohs, DeWall & Zhan, 2007). The ability to decide is viewed as a competence that can be improved over the course of one's life (Burnett, 1991; Mann, 1989). In order to improve decision-making, it is important to grasp the steps needed to select an adequate alternative, to understand the context of decision-making, and to know how to articulate personal reason and emotion (Appelt, Milch, Handgraaf & Weber, 2011).

The difficulty in articulating the decision itself, the situation, and personal characteristics results in conflict and stress from the need to choose. It is even more stressful when one has a true understanding of the potential consequences of one's decisions, as well as the difficulties inherent in a going-back strategy (Janis & Mann, 1977). Conflicts emerge when opposite internal tendencies happen simultaneously – such as accepting vs. not accepting a course of action – and these produce stress from the unfulfillment of expectations or needs (Mann, Burnett, Radford & Ford, 1997). According to Mann (1989), the way we cope with stress and conflict is an important clue about how we decide or toward how we can improve our decision-making competence. Janis and Mann (1977) defined a competent pattern for decision-making, vigilance, as following several steps that enable someone to deal adequately with the stress arising from conflict, whereas non-vigilant patterns arise from the misuse of, or failure to resort to, these more competent steps.

1.1 Assessment of decision-making styles

Knowing how people make decisions through their individual decisional patterns or styles sets the stage for the development of strategies that may improve the quality of decisions. There is a need, then, for questionnaires and scales that

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adequately and quickly assess these styles with a view to understanding which characteristics could be improved. The two main questionnaires for assessing styles and patterns of decision-making are the General Decision Making Style (GDMS) (Scott & Bruce, 1995) and the Melbourne Decision Making Questionnaire (MDMQ) (Mann et al., 1997).

The GDMS is based on more behavioral styles – habit-based reactions in specific decision contexts – and is less dependent on personality; it also includes more scales that address adaptive styles, such as the rational and intuitive styles (Scott & Bruce, 1995). By contrast, the MDMQ, contextualized by the conflict theory and stress coping patterns, takes personality and personal characteristics into account, along with the influence of emotion on decision-making (Mann et al., 1997). Being a person-centered instrument, sensitive to emotional aspects, the MDMQ provides an adequate tool that assesses personal decisional patterns as well as the relative weight of emotions in individual decisions, making it possible to set references for personal and interpersonal comparisons of possible changes in the decisional process. We consequently set out to develop the Portuguese adaptation of the Melbourne Decision Making Questionnaire and evaluate its validity and reliability.

1.2 Conflict theory and decisional patterns

The MDMQ was developed according to a general descriptive theory of decision-making under stress (Janis & Mann, 1977), which identifies several patterns of coping behavior. It goes further than other questionnaires, involving emotions rather than relying solely on reasoning. Five main patterns of coping with stress while making decisions were identified: vigilance, defensive avoidance, unconflicted adherence, unconflicted change, and hypervigilance (Mann et al., 1997). Each pattern is characterized by a set of strategies, thoughts, and realistic or flexible actions intended to help reach a decision (Isaksson, Hajdarević, Jutterström & Hörnsten, 2014; Janis & Mann, 1977).

1.2.1 Decisional patterns

Vigilant deciders, competent and satisfied in making their own choices, are able to apply useful strategies. Examples of such strategies are the identification of a large suite of alternatives, the assessment of goals and values in each choice, and the weighing of costs and risks, as well as searching for new and relevant information and reexamining positive and negative consequences, among others (Burnett, 1991; Janis & Mann, 1977). The vigilant coping pattern has proven to be the most effective and self-rewarding decisional style (Bailey & Ilharragorry-Devaux, 2011).

Considering that it is almost impossible to comprehensively follow these strategies, the ineffective patterns cannot be seen as simply the inability to effectively deploy any of

them, but more as a tendency to use defective strategies that ultimately intensify the problems faced and the feelings of resentment that follow (Burnett, 1991). Together with unconflicted adherence and unconflicted change, both hypervigilance and defensive avoidance are ineffective and inadequate responses to the decisional conflict (Janis & Mann, 1977). Defensive avoidance is an attempt to find a fast escape route, making use of strategies such as procrastination, buck-passing or going for the most consensual and pleasant choice (Mann et al., 1997). In unconflicted adherence, the decider ignores information related to the potential losses and decides to maintain the present behavior, opting for the most obvious and most unconflicted path, while in unconflicted change the decider adopts whichever new course of action is most obvious or most strongly recommended (Mann et al., 1997). Hypervigilance is an anxious and unorganized strategy, seeking quick relief, with limited consideration of alternatives, rapid evaluation of available data, and limited review of alternatives (Johnston, Driskell & Salas, 1997).

1.3 The Melbourne Decision Making Questionnaire

The MDMQ (Mann et al., 1997) is an improvement of the Flinders Decision Making Questionnaire (FDMQ) developed by Janis and Mann (1977), which intended to identify the decisional styles according to six scales: vigilance, hypervigilance, defensive avoidance, buck-passing, procrastination, and rationalization. The FMDQ was useful in identifying defective decisional patterns in populations with psychiatric symptomatology (Radford, Mann & Kalucy, 1986) and in finding that decisional self-esteem was a significant aspect in interpreting decision-making ability (Burnett, 1991).

In developing the MDMQ, Mann et al. (1997) considered it advisable to assess unconflicted adherence via buck-passing and procrastination, and unconflicted change through rationalization. Different models were analyzed: a model of adaptive strategy (vigilance) versus maladaptive strategies (the other scales), a model of decision-making versus decision-avoidance strategies resulting in three factors (vigilance, hypervigilance, and the other scales), and a model where each distinctive and alternative strategy for dealing with conflict was considered as a factor. The latter showed the best fit and resulted in the final version. Mann et al. also considered it advisable to assess unconflicted adherence via buck-passing and procrastination, and unconflicted change through rationalization. Different models were analyzed: a model of adaptive strategy (vigilance) versus maladaptive strategies (the other scales), a model of decision-making versus decision-avoidance strategies resulting in three factors (vigilance, hypervigilance, and the other scales), and a model where each distinctive and alternative strategy for dealing with conflict was considered as a factor. The latter

showed the best fit and resulted in the final version of the MDMQ.

1.3.1 Translations and uses

The MDMQ has been translated into several languages: English, Japanese, Mandarin (Mann et al., 1998); Spanish (De Heredia, Arocena & Gárate, 2004); French (Bailly & Ilharragorry-Devau, 2011); Turkish (Colakkadioglu & Deniz, 2015); Flemish (Bouckennooghe, Vanderheyden, Mestdagh & Van Laethem, 2007); Slovak (Sarmany, 1999); Italian (Nota & Soresi, 2000); Russian (Kornilova, 2013); German (Tipandjan, 2010); and Bengali (Rahaman, 2014). Two of the translations did not keep the same structure, involving some modifications such as reducing it to 18 items and/or deleting one scale: Brazilian Portuguese (Cotrena, Branco & Fonseca, 2017) and Swedish (Isaksson et al., 2014). The Brazilian Portuguese version of the MDMQ has been published recently (Cotrena et al., 2017), but differences in several items may compromise how they are understood in European Portuguese, and its factor analysis and internal consistency measurements led to the exclusion of a total of four items from the scales.

The MDMQ has been applied in a wide range of contexts, including high school and higher education (e.g., Arocena, Carlos Mejía & Mayoral, 2011); cancer research (e.g., Brown, Farrell & Weisbenner, 2016); mental health (e.g., Alexander, Oliver, Burdine, Tang & Dunlop, 2017); career guidance (e.g., Gati, Landman, Davidovitch, Asulin-Peretz & Gadassi, 2010); military aircrews (Gautam & Mathur, 2018); and sexuality (Chambers & Rew, 2003).

1.4 Correlates of the MDMQ

Several of the translations and applications of the MDMQ have been analyzed in terms of how the decision-making patterns relate to self-esteem (e.g., Mann et al., 1998), age (e.g., Bouckennooghe et al., 2007), gender (e.g., Mann et al., 1997), affect (e.g., Kamhalová, Halama & Gurňáková, 2013), and satisfaction with life (e.g., Deniz, 2006).

1.4.1 Self-esteem and decision-making

Threats to one's reputation and to one's dexterity in resorting to adequate decisional strategies can become sources of psychological stress and consequently reduce decision-making self-esteem (Mann et al., 1997). Trusting in one's decision pattern has a positive effect on decision-making and personal autonomy, leading to higher satisfaction with life and an increase in well-being (Deniz, 2006; Parker, Bruin & Fischhoff, 2007). Decisional self-esteem correlates positively with vigilance and negatively with procrastination, hypervigilance, and defensive avoidance (Mann et al., 1998; Phillips & Reddie, 2007). A positive decision-making self-image was associated with a positive decision-making style

and a negative one was associated with an inability to follow a productive procedure. Those who have low decisional self-esteem tend to resort to an ineffective decision-making pattern (Phillips & Ogeil, 2017).

1.4.2 Age and decision making

Considering the relationship between age and decision making, older people seem to rely more on emotion and experience and less on reason than younger people, becoming more able to deal with emotional aspects of a problem than youngsters, and performing better on cognitive tasks that depend on affect when compared to more deliberative modes of processing (Löckenhoff, 2011). Moreover, older adults are more likely than youngsters to present a more independent and self-controlled decision style (Delaney, Strough, Parker & Bruine de Bruin, 2015).

In another study, adolescents showed lesser levels of competence in decision-making than their real potential and capability, mainly because of their lower ability to resort to personal control and assumption of responsibility (Mann, Harmoni & Power, 1989). Declines in risk taking, risky decisions, and the effects of peer-pressure were observed between adolescence and adulthood (Gardner & Steinberg, 2005). It can be asserted that in order to become a good decision-maker, experience is of utmost relevance (Brown & Mann, 1991). With age people display more adequate decisional control or the ability to resort to more adequate informational processing strategies, adults show greater decision-making competence and problem-solving skills when compared with young adults (Blanchard-Fields, Stein & Watson, 2004), whereas youngsters have comparatively higher values in hypervigilance, buck-passing, and procrastination (Bouckennooghe et al., 2007; Kornilova, Chumakova & Krasavtseva, 2018).

1.4.3 Gender and decision making

Gender also seems to affect decision-making. Women are more influenced by the environment and more involved in the decision process, they worry, have doubts and uncertainties, and tend to be more concerned with emotion and the consequences that come from the decision, in contrast, men look for more information when making a decision, try to define the decision goals more accurately, feel more pressured, and are more motivated to reach a decision (Lizárraga, Baquedano & Cardelle-Elawar, 2007). Other studies point to men as being more likely to present a more affective decisional style, mostly based on a tendency towards impulsiveness (Delaney et al., 2015).

Some slight differences can be expected in the coping patterns in the MDMQ, with women resorting more to vigilance (Bouckennooghe et al., 2007), buck-passing, and hypervigi-

lance (e.g., Yan, Zhang, Lan, Li & Li, 2018), and less to procrastination (Bouckennooghe et al., 2007).

1.4.4 Satisfaction with life and decision making

Satisfaction with life depends on the judgment made by the individual concerning the achievement of personal goals (Diener, Emmons, Larsen & Griffin, 1985) and was found as a correlate of decision-making. Indeed, ineffective decision patterns predict negative affect and lower satisfaction with life (Bubić & Erceg, 2016). In cross-sectional studies life satisfaction has been shown to relate positively with decision self-esteem and vigilance, and negatively with buck-passing, procrastination, and hypervigilance (e.g., Deniz, 2006). Negative emotions such as anxiety or sadness increase the probability of negative outcomes (Hartley & Phelps, 2012) and contribute to indecisiveness and difficulty in critical thinking (Lerner, Small & Loewenstein, 2004). Self-centered individuals tend to have less-adequate decision-making patterns, which bring increased difficulty in staying focused or in being able to relate with others (Arocena et al., 2011), as well as higher levels of neuroticism (Pitel & Mentel, 2017) and lower academic results (Filippello, Sorrenti & Rizzo, 2011). Vigilance is correlated with active affective regulation, leading to a higher sense of well-being and therefore satisfaction with life (Kamhalová et al., 2013).

The purpose of this study was to adapt and validate the MDMQ to European Portuguese, making this questionnaire, to our knowledge, the first Portuguese tool able to assess decision-making coping strategies and patterns. Considering their relevant roles, the study also aimed to investigate the invariance across gender and age.

2 Method

2.1 Participants

The sample comprised 523 adults, 18 years or older, 306 female (58.5%). It is characterized in Table 1, including marital status, level of education and work status.

2.2 Measures

The Satisfaction with Life Scale (SWLS) assesses global life satisfaction, the judgment one makes when comparing one’s life circumstances with one’s own self-imposed standards, and it has seen consistent worldwide use (Diener et al., 1985; Pavot & Diener, 1993). It is composed of five items (e.g., “I am satisfied with my life”), answered on a 7-item Likert scale that spans from (1) “strongly disagree” to (7) “strongly agree” (range 5–35). Higher scores indicate that people love their lives and feel everything is going well, despite any possible issue they are faced with. In Portugal, initial validation

TABLE 1: Study sample frequencies and percentages for gender, age, marital status, level of education, and work status.

		Frequency (%)
Gender	Female	306 (58.5)
	Male	217 (41.5)
Age	18-25	181 (34.6)
	26-35	97 (18.5)
	36-45	129 (24.7)
	46-55	75 (14.3)
	56-65	26 (5.0)
	65 or above	15 (2.9)
Marital status	Single	282 (53.9)
	Married	148 (28.3)
	Civil Union	50 (9.6)
	Divorced	38 (7.3)
	Widow/er	5 (1.0)
Level of Education	Lower secondary education	14 (2.7)
	High School Diploma	109 (20.8)
	Post-secondary non-tertiary education	31 (5.9)
	Short-cycle tertiary education	36 (6.9)
	University Degree	199 (38.0)
	Master’s Degree	90 (17.2)
	Doctoral or equivalent	44 (8.4)
Work Status	Unemployed	11 (2.1)
	Student	177 (33.8)
	Salaried workers	264 (50.5)
	Independent worker/Self-employed	48 (9.2)
	Retired	23 (4.4)
Total	61.17 (58.81)	41.97 (66.51)

studies with teachers and university students obtained an internal consistency of .77 (Simões, 1992). In a later study with an adolescent sample (Neto, 1993), the scale obtained total mean score of 24.1 (SD = 5.9) and $\alpha = .78$, similar to

the sample of American undergraduates in the original study. Recent work with a more heterogeneous sample has shown that this scale is gender invariant and is effective in assessing life satisfaction, with a total mean value of 17.98 (Figueiras et al., 2010).

The Positive and Negative Affect Schedule, Brief Version (PANAS) was developed to be a brief, reliable, and valid instrument for assessing positive and negative affect, two main dimensions of mood (Watson, Clark & Tellegen, 1988). It is composed of two scales with five items (e.g., “Active”, “Alert”) related to positive affect (PANAS-PA) and five items (e.g., “Afraid”, “Nervous”) related to negative affect (PANAS-NA), answered on a 5-point Likert scale with values varying from (1) “Very slightly or not at all” to (5) “Extremely”, with each scale’s total values varying from 5, low positive/negative affect, to 25, high positive/negative affect. An international validation study of an English brief version of the PANAS presented adequate reliability levels: PANAS-AP with $\alpha = .78$ and PANAS-NA with $\alpha = .76$ (Thompson, 2007). The Portuguese version has been shown to be adequate for studies with several variables or time constraints (Galinha, Pereira & Esteves, 2014).

The Decision-Making Self-Esteem questionnaire (DMSE) uses six items to assess decisional confidence (e.g., “I think I am a good decision maker”). Items are answered on a three-point scale: (0) “not true for me”, (1) “sometimes true”, and (2) “true for me”. Total scores range from 0 to 12 with high values representing high self-esteem. The DMSE obtained a $\alpha = .74$ in a cross-cultural study (Mann et al., 1998). The MDMQ consists of 22 items distributed across four scales: vigilance (e.g., “When making decisions I like to collect lots of information”) and buck-passing (e.g., “I do not like to take responsibility for making decisions”), which have six items each, and hypervigilance (e.g., “I feel as if I’m under tremendous time pressure when making decisions”) and procrastination (e.g., “Even after I have made a decision I delay acting upon it”), with five items each (Mann et al., 1997). It takes approximately 10 minutes, with all items being answered in a three-point scale ranging from “not true for me” (0), “sometimes true” (1) and “true for me” (2). The total values for each scale range from zero to 10 (procrastination and hypervigilance) or to 12 (vigilance and buck-passing). It has obtained good Cronbach’s alphas (ranging from .74 to .87) (Mann et al., 1997) (The Portuguese version of the MDMQ is available here).

Sociodemographic information such as age, gender, marital status, education level, and employment status was collected.

2.3 Procedure

The first part of the adaptation process of the MDMQ followed the most relevant steps that have been identified for proper translation procedure (Gudmundsson, 2009). The

translation of the instrument was done by a speaker of Portuguese and English with expertise in psychology. Afterwards, it was presented to three experts in psychology, who proposed small changes in the translation, following which the items were back-translated by a fluent English speaker; this back-translated version didn’t differ from the original.

The MDMQ was firstly applied in a pilot study, using a convenience sample of 17 participants (11 males), aged 36 to 45. This study showed that the tested version was easily understandable.

The four instruments were stored in Google Forms and were made available between March and June of 2018 via an Internet link. The link was shared through social platforms, reshared by the participants, and emailed to students and workers of a higher education institution.

Participants could continue only after agreeing to an informed consent statement; they then answered the SWLS, PANAS, DMSE, and the MDMQ questionnaires, in that order. When answering the PANAS, the participants were asked how they usually feel when making an important decision in their lives. The study was approved by the Ethics Committee of the Faculty of Psychology at the University of Lisbon.

2.4 Data analysis

To check the structure of the MDMQ and evaluate its theoretical operationalization, three models were submitted to confirmatory factorial analysis (CFA): Model A, depicting a one-dimensional structure with all items being included in a general factor; Model B, addressing a first-order structure with four correlated dimensions, which corresponds to the original model; and Model C, exploring a second-order factorial model with four first-order dimensions.

In terms of the estimation of the model parameters, even though normality diagnostics using detrended quantile-quantile (Q-Q) plots revealed most values clustering around a straight line with 0 slope, some minor deviations led to the use of a robust maximum likelihood estimator (MLM), to provide robust standard errors.

Focusing on the model adequacy, and apart from using scaled Satorra-Bentler χ^2 values, the following fit indices were evaluated: the comparative fit (CFI), the Tucker-Lewis index (TLI), the root mean square residual (RMSEA) with 90% confidence interval, the standardized root mean square residual (SRMR), and the Bayesian information criteria (BIC). Requirements for good-fitting measurement models implied CFI and TLI values equal to or higher than .90 (Bentler & Dudgeon, 1996), with RMSEA and SRMR values below .08 (Hu & Bentler, 1999). For BIC, factorial models with smaller values were considered to have better fit when compared to those with higher BIC values (Byrne, 2013).

The most adequate factorial structure was assessed for measurement invariance to evaluate the stability and gener-

alizability of its psychometric properties across gender and age groups, in this case between young adults (18 to 25 years old) and adults. Measurement invariance was evaluated by estimating the following: the configural invariance model, with all parameters freely estimated, to test whether the theoretical operationalization of the construct was adequate across groups; the metric invariance model, with factor loadings constrained to be equal across groups, to evaluate whether the meaning of the latent construct was similarly perceived across groups; the scalar invariance model, with both factor loadings and intercepts constrained to be equal, to check whether participants not only perceive the meaning of the construct to be similar, but also have equivalent item averages so that comparisons between latent variable scores are possible; and the strict invariance model, with residual variances additionally constrained, to verify if error variances were the same across groups (Van de Schoot, Lugtig & Hox, 2012). For multigroup CFA testing measurement invariance, we evaluated Satorra-Bentler χ^2 values and fit indices differences for nested models.

Reliability was examined by an internal consistency coefficient (Cronbach's α), with values above .70 illustrating a good level of reliability (Nunnally & Bernstein, 1994). Concurrent validity was assessed by correlating the structure found in the MDMQ with DMSE, with SWLS, and with PANAS-PA and PANAS-NA. Positive correlations were expected between vigilance and DMSE, SWLS, and PANAS-PA, and negative correlations between vigilance and PANAS-NA. Negative correlations were expected between the non-vigilance scales (buck-passing, hypervigilance, and procrastination) and DMSE, SWLS, and PANAS-PA. A positive correlation between the non-vigilance scales and PANAS-NA was also expected.

The predictive validity of the MDMQ was inspected through linear regressions with DMSE, SWLS and PANAS-PA and PANAS-NA as criterion variables, and both gender and age were used as control variables. It was expected that the MDMQ scales would present some significant predictive weight in all measures, especially in DMSE.

Structural equation modeling analyses (CFA and multigroup measurement invariance) were performed using lavaan (Rosseel, 2012) and semTools (semTools Contributors, 2018) packages designed for R environment (R Core Team, 2018). All other statistical analyses were performed using IBM SPSS Statistics for Windows (v. 25, IBM Corp., Armonk, New York, USA).

3 Results

3.1 Item analysis

In Table 2 the items of the MDMQ are presented with their means and standard deviations. The means for each item ranged from .417 for item 18, to 1.820 in item 2.

Significant differences were found concerning age and gender in some of the MDMQ scales. In buck-passing, youngsters ($M = 5.01$, $SD = 3.23$) had a higher mean than adults ($M = 3.13$, $SD = 2.81$), $t(325.76) = 6.592$, $p < .001$). In hypervigilance, youngsters ($M = 5.08$, $SD = 2.50$) had a higher mean than adults ($M = 3.41$, $SD = 2.39$); $t(521) = 7.477$, $p < .001$). There was also a significant difference in the scores of women ($M = 4.25$, $SD = 2.69$) and men ($M = 3.63$, $SD = 2.32$) in hypervigilance, $t(501.06) = 2.791$, $p = .005$). In procrastination, significant differences were found between youngsters ($M = 4.08$, $SD = 2.53$) and adults ($M = 2.74$, $SD = 2.46$), $t(521) = 5.864$; $p < .001$). No gender differences were found except for hypervigilance.

3.2 Confirmatory factor analysis

Results for the three factorial models are presented in Table 3. Model B and Model C, respectively depicting the first and second-order structures, presented similarly adequate fit adjustments, with model comparison revealing non-significant differences. Fit indexes for Model A, a one-dimensional structure, were not satisfactory. Factor loadings for each item are presented in Table 2, with item 16 presenting the highest loading, $\lambda = .76$, and item 21 the lowest value, $\lambda = .33$, although the majority of items presented values above $\lambda = .50$.

Since Models B and C were similar in terms of their factorial adjustment, it was not possible to compare both solutions; although Model B revealed slightly better adjustment with a lower-scaled Satorra-Bentler chi-square statistic, it had a slightly higher BIC value. In order to ensure theoretical congruency and model parsimony (e.g., Kline, 2015), Model B — representing the original theoretical operationalization of the scale with four correlated first-order factors — was retained. The MDMQ scales ranged from $\alpha = .75$ to $\alpha = .86$ (Table 2).

3.3 Measurement invariance across gender and age

Invariance testing results across gender and age are presented in Table 4. For both groups, significant results were found when comparing metric and scalar models. This significance required the need to test for partial invariance by freeing parameters that differed across groups. According to Byrne, Shavelson and Mythén (1989), when testing partial invariance there is the need to have for each construct a minimum of two loadings or intercepts constrained to be equal across groups in order to perform adequate inferences regarding the model latent factor means. After freeing intercept parameters (items 8, 9, 11, 15, and 20 for gender; and items 5, 7, 8, 11, 16, 17, and 19 for age groups) and comparing the partial scalar invariance model with the metric one, non-significant

TABLE 2: Means, standard deviations and factor loadings for each item of the MDMQ and Cronbach's alpha for each scale.

Items	Mean	SD	Factor loadings
Vigilance ($\alpha = .747$)			
2. I like to consider all the alternatives.	1.820	.413	.55
4. I try to find out the disadvantages of all alternatives.	1.652	.526	.55
6. I consider how best to carry out the decision.	1.662	.542	.71
8. When making decisions I like to collect lots of information.	1.509	.604	.60
12. I try to be clear about my objectives before choosing.	1.675	.516	.55
16. I take a lot of care before choosing.	1.533	.600	.49
Buck-passing ($\alpha = .859$)			
3. I prefer to leave decisions to others.	.539	.610	.69
9. I avoid making decisions.	.491	.665	.80
11. I do not like to take responsibility for making decisions.	.597	.724	.75
14. If a decision can be made by me or another person, I let the other person make it.	.673	.660	.73
17. I do not make decisions unless I really must have to.	.497	.665	.75
19. I prefer that people who are better informed decide for me.	.983	.707	.54
Hypervigilance ($\alpha = .782$)			
5. I waste a lot of time on trivial matters before getting to the final decision.	.811	.746	.53
7. Even after I have made a decision, I delay acting upon it.	.857	.709	.53
10. When I have to make a decision, I wait a long time before starting to think about it.	.581	.688	.68
18. I delay making decisions until it is too late.	.417	.648	.73
21. I put off making decisions.	.537	.667	.82
Procrastination ($\alpha = .793$)			
1. I feel as if I'm under tremendous time pressure when making decisions.	1.046	.668	.57
13. The possibility that small things might go wrong causes-me to swing abruptly in my preferences.	.757	.709	.65
15. Whenever I face a difficult decision, I feel pessimistic about finding a good solution.	.780	.727	.67
20. After making a decision, I spend a lot of time convincing myself it was the right decision.	.620	.677	.67
22. I cannot think straight if I have to make decisions in a hurry.	.788	.713	.59

results were achieved, suggesting the ability also to compare latent factor means across groups.

3.4 Validity

3.4.1 Concurrent validity

In Table 5, the means and standard deviations for each instrument and correlations between them are presented. The four scales assessing the constructs used in the validity studies presented adequate reliability $\alpha = .76$ for DMSE; $\alpha = .84$ for SWLS; $\alpha = .87$ for PANAS-PA; $\alpha = .91$ for PANAS-NA).

Decisional Self-Esteem had strong correlations with all the other instruments – positive with SWLS, PANAS-PA and vigilance, but negative with PANAS-NA and the non-

vigilance scales (buck-passing, hypervigilance, procrastination). SWLS had similar results, but smaller correlations. Positive Affect had negative correlations with the non-vigilance scales, while Negative Affect presented strong positive correlations with the same scales. Vigilance presented low negative correlations with buck-passing, hypervigilance, and procrastination. Buck-passing, hypervigilance, and procrastination showed higher positive correlations among them.

3.4.2 Predictive validity

The four MDMQ scales were tested on their predictive ability for the outcome criterion variables: SWLS, DMSE, PANAS-PA, and PANAS-NA. Results are presented in Table 6.

TABLE 3: Goodness of fit indices for the three factorial models (N = 523).

Models	S-B χ^2 (df)	BIC	CFI	TLI	RMSEA [90% CI]	SRMR	df, S-B χ^2_{diff}
Model A	1025.756 (209)	19155.950	.78	.76	.09 [.09, .10]	.09	-
Model B	445.862 (203)	18536.571	.94	.93	.05 [.04, .06]	.06	6, 456.18*
Model C	447.844 (205)	18525.161	.94	.93	.05 [.04, .06]	.06	2, 1.2839

Note: Scaled chi square difference test based on Satorra-Bentler (2001) method. *p < .001.

TABLE 4: Invariance models for the four first order factorial structure ($n_{female} = 306$, $n_{male} = 217$; $n_{18-25} = 181$, $n_{>25} = 342$).

Models	S-B χ^2 (df)	BIC	CFI	TLI	RMSEA [90% CI]	SRMR	df, S-B χ^2_{diff}	Comparison
Gender								
Configural	655.252(406)	19009.115	.94	.93	.05 [.04, .06]	.06	-	-
Metric	678.325(424)	18920.688	.93	.93	.05 [.04, .06]	.07	18, 22.786	Configural
Scalar	723.745(442)	18848.789	.93	.92	.05 [.05, .06]	.07	8, 52.272*	Metric
Scalar_p	698.891(437)	18857.006	.93	.93	.05 [.04, .06]	.07	13, 20.501	Metric
Strict	706.446(459)	18733.165	.94	.94	.05 [.04, .06]	.07	22, 10.919	Scalar_p
Age								
Configural	683.830(406)	18929.669	.92	.91	.05 [.05, .06]	.07	-	-
Metric	698.402(424)	18832.866	.93	.92	.05 [.04, .06]	.07	18, 14.468	Configural
Scalar	767.638(442)	18783.438	.91	.91	.06 [.05, .06]	.07	18, 92.736*	Metric
Scalar_p	715.969(435)	18778.749	.92	.92	.05 [.05, .06]	.07	11, 17.404	Metric
Strict	730.636(457)	18681.355	.92	.92	.05 [.04, .06]	.07	22, 22.573	Scalar_p

Note: Scaled chi square difference test based on Satorra-Bentler (2001) method. *p < .001.

The MDMQ regression analysis presented relevant values for the prediction of the various constructs assessed, with different weights for the scales in the variance. DMSE is predicted by all the MDMQ scales, negatively by the non-vigilance scales and positively by vigilance. Satisfaction with life is positively predicted by vigilance, and negatively by hypervigilance and procrastination. Positive Affect is negatively predicted by buck-passing and hypervigilance, and positively by vigilance. Negative Affect is positively predicted by hypervigilance and buck-passing.

The MDMQ scales predicted all the outcome variables, although the number of scales that contribute to each prediction varied, from four scales in predicting DMSE to two scales in predicting negative affect.

4 Discussion

We set out to adapt and validate the Melbourne Decision Making Questionnaire (Mann et al., 1997) in European Portuguese, and to study its gender and age invariance with adults.

We confirmed the four-factor structure, composed of the original 22 items, maintaining the scales of vigilance, hypervigilance, procrastination, and buck-passing (Mann et al., 1997). All scales showed good reliability with values ranging from 0.86 to 0.75. As for gender and age invariance analysis, our results showed no differences across the groupings used: male and female for gender, young adults and adults for age. These results demonstrate that the instrument is reliable for both genders and age groups.

Differences were not found between genders or age groups in the vigilance scale, but some slight differences were found in other scales. Young adults presented higher values in buck-passing, hypervigilance and procrastination compared to adults in general, values that confirm the results of Kornilova et al. (2018). Women showed higher values in hypervigilance, similarly to the results identified by Lizárraga et al. (2007).

The vigilance scale obtained the highest mean value from all the different scales, while procrastination had the lowest mean. These results are similar to comparable studies from other western countries (e.g., De Heredia et al., 2004;

TABLE 5: Means, Standard Deviations, and correlations among constructs (N=523).

	Mean	SD	1	2	3	4	5	6	7	8
1. Vigilance	9.85	2.14	–							
2. Buck-passing	3.78	3.09	–0.09	–						
3. Hypervigilance	3.99	2.56	–0.12	0.70	–					
4. Procrastination	3.2	2.56	–0.12	0.69	0.72	–				
5. DMSE	8.47	2.51	0.22	–0.68	–0.66	–0.61	–			
6. SWLS	17.51	3.87	0.22	–0.33	–0.36	–0.35	0.44	–		
7. PANAS-PA	17.97	4.12	0.16	–0.41	–0.38	–0.35	0.44	0.27	–	
8. PANAS-NA	11.78	4.25	–0.09	0.51	0.61	0.50	–0.55	–0.31	–0.14	–

Note: All values of correlations are of $p < .05$, except -0.09 that is of $p < .01$, two-tailed.

Mann et al., 1998; Pitel & Mentel, 2017). There are aspects that differ, however: vigilance has one of the highest values among these countries, while buck-passing, procrastination and hypervigilance have lower values, with the exception of France or New Zealand and Australia (Bailly & Ilharragorry-Devaux, 2011; Mann et al., 1998). Some considerations should be kept in mind regarding these values. The various cultural adaptations of the MDMQ that have been done are mainly based on samples of college students, while the sample gathered here had a more heterogeneous age distribution. Considering that adults and older adults tend to be more able to cope with stress, it is natural that they present higher levels of vigilance and lower levels on the non-vigilance scales, a tendency that can be identified here as well as in the French adaptation (Bailly & Ilharragorry-Devaux, 2011).

Validity was supported as significant relationships were found in the expected directions. There was a positive relationship between DMSE and vigilance and a negative relationship with the remaining MDMQ scales, as found in the original studies (Burnett, 1991; Mann et al., 1998). This reinforces the conclusion that higher decisional self-esteem is associated with higher ability in decision-making, and lower self-esteem is associated with worse decisional patterns and negative affect (Phillips & Ogeil, 2017).

Positive or negative decisional self-esteem depends on the quality of one’s past experiences. When an individual has been faced with a high number of stressful or negative decisions, decisional confidence is diminished, negative affect increases, and that person experiences more of a general sense of inability in deciding, which results in more frequent use of inadequate patterns (Starcke & Brand, 2012). Still in line with these previous results, the MDMQ scales in the current study suggested that self-esteem is reinforced positively by vigilance and negatively by the remaining scales. Vigilance, which had low negative correlations with the rest of the MDMQ scales, showed stronger connections to positive affect, satisfaction with life, and better decisional self-esteem, confirming that it is the best pattern of decision-making (e.g.,

Seo & Barrett, 2007).

All the non-vigilance scales showed relevant correlations with each other, as in other similar studies (e.g., Bailly & Ilharragorry-Devaux, 2011; Bouckennooghe et al., 2007; Mann et al., 1997), reinforcing the principle that they can be, and probably are, used in combination or sequentially according to the stress-arousing features of the decision problem (Mann et al., 1997). In other words, depending on time constraints, pressure, or other contextual characteristics, one single person can apply a more hypervigilant or a more avoidant pattern accordingly and can even alternate between these patterns if the situation demands an adaptation to a different coping strategy.

Vigilance emerged on all the scales as the most significant predictor of life satisfaction, as expected (Bahadir & Certel, 2013). Hypervigilance was the most significant contributor in predicting negative affect. The link between negative affect and hypervigilance was more to be expected than one with the other scales because procrastination and buck-passing reduce stress by removing the problematic decision from one’s path, either by postponing the decision or by disavowing responsibility, whereas hypervigilance results in an intensification of anxiety and stress (Janis & Mann, 1977).

In general, relationships between the several constructs are in line with what is theoretically expected and found in similar studies, suggesting that the four factors of the questionnaire are stable among cultures (Mann et al., 1998), as well as showing good reliability and validity, both concurrent and predictive.

5 Conclusion

Decisions are stressful and constrain one’s feeling of personal well-being; particularly when they are difficult and have negative outcomes, decisions may decrease personal self-esteem and confidence. Improvement of the ability to decide promotes personal development, enhancing one’s capability to

TABLE 6: Regression analysis of age, gender, and the MDMQ scales predicting DMSE, SWLS, PANAS-PA, and PANAS-NA.

	DMSE				SWLS			
	β	B	SE B	95% CI	β	B	SE B	95% CI
Model 1								
Gender	.09	.46*	.22	[.03, .89]	.02	.19	.35	[-.50, .87]
Age	.24	.44***	.08	[.30, .60]	.09	.25*	.13	[.01, .50]
R2				.08				.00
F				21.25***				2.50
Model 2								
Gender	.06	.28	.15	[-.02, .58]	-.00	-.02	.32	[-.65, .62]
Age	.05	.09	.06	[-.02, .21]	-.01	-.03	.12	[-.26, .21]
V	.13	.15***	.04	[.09, .22]	.17	.31***	.07	[.17, .46]
B	-.36	-.29***	.03	[-.36, -.22]	-.11	-.13	.08	[-.28, .02]
Hy	-.26	-.26***	.05	[-.35, -.17]	-.16	-.25*	.10	[-.44, -.05]
P	-.15	-.15***	.04	[-.23, -.06]	-.15	-.22*	.09	[-.41, -.04]
R2				.56				.18
PANAS-PA								
Model 1								
Gender	.08	.69	.37	[-.05, 1.42]	-.10	-.90**	.37	[-1.62, .16]
Age	.05	.16	.13	[-.11, .42]	-.24	-.74***	.13	[-1.01, -.48]
R2				.01				.08
F				2.97				22.09***
Model 2								
Gender	.06	.50	.34	[-.17, 1.16]	-.07	-.63*	.30	[-1.22, -.03]
Age	-.07	-.20	.13	[-.45, .05]	-.08	-.25*	.11	[-.47, -.02]
V	.08	.16*	.08	[.01, .31]	-.01	-.02	.07	[-.15, .12]
B	-.28	-.38***	.08	[-.53, -.22]	.13	.18*	.07	[.04, .32]
Hy	-.14	-.23*	.10	[-.43, -.03]	.42	.69***	.09	[.51, .87]
P	-.05	-.09	.10	[-.30, .11]	.10	.16	.09	[-.02, .33]
R2				.20				.40

Note: Vigilance = V; Buck-passing = B; Hypervigilance = Hy; Procrastination = P.

* $p < .05$, ** $p < .01$, *** $p < .001$.

attain personal goals more effectively and increasing one’s life satisfaction.

Decisions depend on the characteristics of the individual, on the type of decision in question, and on the situation or moment in which they are made. The strategies individuals employ when deciding are more stable across cultures and types of decisions, enabling various cultural comparisons and the identification of personal decisional patterns. These patterns can be managed by each individual, which makes them the main decisional factor that can be developed and

improved through intervention; the contextual factors, which cannot be so controlled or manipulated, may explain the differences and variability that can be found, for example, in similar types of decisions or in similar decisions made by the same person.

5.1 Implications for practice

The MDMQ is a useful tool to analyze four personal decisional patterns – vigilance, hypervigilance, procrastination, and buck-passing – thereby enabling comparisons and per-

sonal assessments that can help the development of decision-making skills. The MDMQ showed itself to be applicable to different ages and genders, and can be easily and quickly applied.

The MDMQ is now available in European Portuguese to assess stress-related patterns while making decisions, enabling comparison within and between different subjects, which is not only useful for training purposes but also for other studies of decision-making.

5.2 Limitations and future research

There are some limitations in this study that need to be addressed. First, there is the absence of adequate instruments comparable to the MDMQ; being the first full decision-making tool to assess decisional styles or strategies in European Portuguese implies some validation constraints; these were addressed by turning to instruments already used and directly related to some of the theoretical assumptions of the conflict theory of decision-making, such as affect and satisfaction with life. Concerning the sample, more data would be helpful so that some other group comparisons could be made – work status, for instance, could be compared between salaried workers and independent workers or entrepreneurs. One might hypothesize that entrepreneurs, being more exposed to constant stressful decisions, will develop a more vigilant decisional pattern, with less procrastination and buck-passing, and will attain higher decisional self-esteem.

Concerning the factorial analysis, underlying multidimensionality was identified regarding the similar model adjustment between the first order and second order factors, making both factorial solutions incomparable even though the first order model presented lower χ^2 and BIC values. This led to the final option of retaining a more parsimonious model, one conforming more with the theoretical background. Future studies should take into consideration this factorial resemblance, for instance by testing bifactor models, as an alternative approach to depicting the scale multidimensionality. However, bifactor models by relying on the assumption of orthogonality may lead to model identification problems when non-orthogonal relationships are expected between factors and items, such as the ones expected for the MDMQ (e.g., Chen, West & Sousa, 2006).

The MDMQ is a useful resource, able to assess decision-making patterns and, in this case, applicable in the European Portuguese language. The various analyses made, which included invariance studies for gender and age plus assessments of concurrent and predictive validity, achieved values that attribute considerable levels of confidence and reliability to this instrument.

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