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Analysis of the psychometric properties of the Melbourne Decision Making Questionnaire in Colombian adolescents

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Abstract Background/objective: Decision-making is a set of skills useful for daily functioning which allow people to perform their tasks and control objectives and goals, generating responses to the environment's demands from their resources. Research and intervention with adolescents require reliable instruments to assess decision-making. The Melbourne Decision Making Questionnaire (MDMQ) is an instrument that assesses decision-making styles and has been successfully validated in different cultural contexts. This study analysed the psychometric properties, construct validity (factorial, convergent, and discriminant), and predictive validity of the MDMQ in Colombian adolescents. **Method:** A cross-sectional study was conducted in which 822 adolescents aged 14 to 18 years (*M* = 16.09, *SD* = 1.31, 33.7% girls), 410 from the regular school system (*M* = 15.50, *SD* = 1.29, 48.54% girls) and 412 adolescents from the Criminal Responsibility System (*M* = 16.6, *SD* = 1.04, 18.93% girls) participated. Decision-making styles, emotional intelligence, cognitive distortions, prosocial behaviour and antisocial behaviour were assessed. Confirmatory Factor Analysis (CFA), reliability, correlational and predictive analyses were performed. **Results:** The CFA showed satisfactory fit indices for the original model of four factors and 22 items. Sufficient reliability conditions were observed. The results indicated that rational decision-making (vigilance) is positively associated with emotional intelligence and influences prosocial behaviour. Negative decision-making styles are associated with cognitive distortions and influence antisocial behaviour. **Conclusions:** After analysing the psychometric properties, it is concluded that the MDMQ is a valid instrument to assess the decision-making styles of Colombian adolescents.

Análisis de las propiedades psicométricas del Melbourne Decision Making Questionnaire en adolescentes colombianos

PALABRAS CLAVE
Toma de decisiones,
adolescentes,
comportamiento prosocial,
comportamiento antisocial

Resumen Antecedentes/objetivo: La toma de decisiones es un conjunto de habilidades útiles para el funcionamiento diario que permite a las personas realizar sus tareas y controlar objetivos y metas, generando respuestas a las demandas del entorno a partir de sus recursos. La investigación y la intervención con adolescentes requieren instrumentos fiables para evaluar la

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toma de decisiones. El Melbourne Decision Making Questionnaire (MDMQ) es un instrumento que evalúa los estilos de toma de decisiones y ha sido validado con éxito en diferentes contextos culturales. Este artículo analizó las propiedades psicométricas, la validez de constructo (factorial, convergente y discriminante) y la validez predictiva del MDMQ en adolescentes colombianos. **Método:** Se realizó un estudio transversal en el que participaron 822 adolescentes de 14 a 18 años (*M* = 16.09, *DT* = 1.31, 33,7% chicas), 410 del sistema escolar (*M* = 15.50, *DT* = 1.29, 48.54% chicas) y 412 adolescentes del Sistema de Responsabilidad Penal (*M* = 16.6, *DT* = 1.04, 18.93% chicas). Se evaluaron los estilos de toma de decisiones, la inteligencia emocional, las distorsiones cognitivas, la conducta prosocial y la conducta antisocial. Se realizaron análisis factoriales confirmatorios (AFC), análisis de fiabilidad, correlacionales y predictivos. **Resultados:** El AFC mostró índices de ajuste satisfactorios para el modelo original de cuatro factores y 22 ítems. Se observaron condiciones de fiabilidad suficientes. Los resultados indicaron que la toma de decisiones racional (vigilancia) se asocia positivamente con la inteligencia emocional e influye en el comportamiento prosocial. Los estilos negativos de toma de decisiones se asocian con las distorsiones cognitivas e influyen en el comportamiento antisocial. **Conclusiones***:* Después de analizar las propiedades psicométricas, se concluye que el MDMQ es un instrumento válido para evaluar los estilos de toma de decisiones de los adolescentes colombianos.

The Melbourne Decision Making Questionnaire (MDMQ) is an instrument for measuring decision-coping patterns or styles identified in Janis and Mann's (1977) conflict theory of decision making. The MDMQ has been translated into several languages, adapted in several countries, and applied in a wide range of contexts (Filipe et al., 2020).

Decision making is a cognitive process that enables us to design, plan, carry out, and control human behaviour and activities. It is directly associated with motivation levels, goals, and available resources (Ekel et al., 2020).

The study of decision-making analyses antecedent factors such as personal abilities and characteristics and environmental conditions; also processes related to decision-making skills and decision-making styles. Decisions made could depend on styles and abilities and affect behaviour and decision outcomes in life (Bruine de Bruin et al., 2015). Several decision-making styles have been recognized, and the most recommended one is the rational style or vigilance (Altman, 2017; Luna Bernal & Laca Arocena, 2014; Mann et al., 1997).

The study of decision making provides people and organisations with tools for making correct decisions from among various possible alternatives, seeking the maximum degree of profit, success, and benefits (Yoe, 2019). In adolescents, it focuses on understanding the factors associated with the decision-making process, contributing to reducing risky behaviours, guiding healthy life practices, promoting quality of life, and developing problem-solving strategies (Blakemore & Robbins, 2012; Reyna, 2018).

Adolescents have been observed to discriminate less when making decisions than adults in profit/loss frameworks and to take more risks. As we approach adulthood, the ability to infer behavioural outcomes increases, reasoned decision increases, and predictability of consequences improves (Defoe et al., 2015; Jaroslawska et al., 2020; Pomery et al., 2009).

Research on decision-making in adolescents has focused on individual perspectives, evaluating rational processes, risk inclinations, social preferences, cooperation, and competitiveness (Sutter et al., 2019). Decision-making in adolescents is influenced by contextual factors such as social role, occupation, among others, which could be considered when studying the decision process. Harman et al. (2019) have indicated that "recent research trends have focused on the dynamics of decision making, which provides greater fidelity to real-world decision contexts" (p. 6).

Variables related to decision-making in adolescents

Multiple factors have been related to adolescent decision-making styles, including rational, impulsive, prosocial, and adaptive processes (Ekel et al., 2020; Koechlin, 2020). People with rational decision-making styles have been observed to apply planned strategies to direct their lives and reduce risk behaviours (Goudriaan et al., 2011). Rational styles have been linked to increased life satisfaction, self-esteem, and coping strategies focused on problem-solving (Deniz, 2006). The rational decision style in adolescents reduces high risk behaviours in areas such as health, education, and the economy (Altman, 2017). The rational style has been associated with greater behaviour control and less impulsiveness; intuitive and spontaneous styles have been related to seeking sensations, emotions, and adventures, the tendency to get bored and more impulsiveness (Baiocco et al., 2009).

Evidence indicates that adolescents with antisocial behaviours are more likely to make negative cognitive attributions when making decisions. These attributions are related to accepting immoral behaviours and antisocial beliefs (Sorge et al., 2015). In adolescents, cognitive distortions have been linked to antisocial and criminal behaviour (Barriga et al., 2008).

Evidence indicates that the positive social influence of peers and community members fosters prosocial decision-making, including cooperation and teamwork (Declerck & Boone, 2016; Koechlin, 2020; van Hoorn et al., 2016; van Hoorn et al., 2019). Appropriate educational incentives and encouragement can guide decision-making in children and adolescents. The cognitive functions, rational decisions, prosocial behaviour, and adaptive behaviour may be best developed in educational contexts where judgment and problem solving are best (Brocas & Carrillo, 2020).

Emotions can also influence adolescent decision-making because the representations associated with the decisions can include valence, arousal, and discrete emotions. Emotion contributes to determining whether specific presentations are processed, and it is highly probable that sensitive states contribute, although not necessarily, to the formation of preferences in decision-making (Rivers et al., 2008). Research on decision-making and emotional intelligence (EI) suggests that high EI levels are related to adaptive strategic decisions (Hess & Bacigalupo, 2011). In adolescents with low EI and a lack of emotional self-awareness, evasive styles are evident, with the individuals concerned leaving others to decide for them (Di Fabio & Kenny, 2012). Likewise, the avoidance style has been observed as predicting greater stress, depression, and decreased well-being (Bavol'ár & Orosová, 2015). High levels of EI are associated with the ability to handle stressful tasks (Fallon et al., 2014), and with rational decision-making in social situations involving uncertainty or stress (Alkozei et al., 2016; Sample, 2018).

The theory of conflict in decision making

The MDMQ is based on the decision theory of conflict (Janis & Mann, 1977). The conflict model is a social psychological theory that proposes decision-making styles. These styles could be influenced by anxiety traits, habitual coping styles, information processing capacity, and individual differences in stress tolerance. Making a decision involves stress, which is caused by two kinds of concern: the risk of objective, material, economic or social recognition losses, and subjective losses and affective value, which reduce self-esteem and the ability to cope with risk situations (Alzate et al., 2004). The antecedent conditions that determine a particular coping style when making decisions 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" (Mann et al., 1997, p. 2). As previously noted, motivational and emotional factors, information processing style, and personality factors affect decision-making (Chambers & Rew, 2003). In decisional conflict theory, the combination of conditions creates five response patterns: non-conflicting adherence, non-conflicting change, defensive avoidance, hypervigilance, and vigilance (Alzate et al., 2004; Cotrena et al., 2018).

In the pattern of non-conflicting adherence, the person ignores information about the risk of losses, and complacently continues the actions without questioning or changing decisions. In the pattern of non-conflicting change, the person uncritically adopts whichever new course of action is most salient or most strongly recommended. In the pattern of defensive avoidance, the person escapes conflict by procrastinating or shifting responsibility to someone else. In hypervigilance, the person shows high emotional arousal, loses the focus of attention, and could experiment with high stress. In the vigilance, the person canvasses an array of alternatives, searches for relevant information, assimilates information, and evaluates alternatives carefully before choosing. The conflict model proposes that vigilance is the only coping pattern or style that facilitates sensible and rational decision-making (Mann et al., 1997, p. 2). The MDMQ assesses three patterns: vigilance, hypervigilance, and avoidance (buck-passing and procrastination) (Filipe et al. 2020; Mann et al. 1997). The vigilance implies a careful, impartial, exhaustive, and rational evaluation of the alternatives; hypervigilance, which is a hasty and anxious approach; and, avoidance which includes procrastination and buck-passing. Procrastination is characterized by delays in making decisions, and buck-passing is a style that involves leaving decisions to others and avoiding responsibility (Cotrena et al., 2018).

The MDMQ has been translated into several languages and validated in various countries and cultures; for example, Australia, the United States, New Zealand, Japan, China, and Taiwan (Mann et al., 1998), Turkey (Deniz, 2004), Spain (Alzate et al., 2004), Mexico (Luna Bernal & Laca Arocena, 2014) and Brazil (Cotrena et al., 2018), among others (Filipe et al., 2020).

The present study

Although studies on decision-making in adolescents have been carried out in Colombia (González et al., 2017), there is no evidence for the validation or design of instruments similar to the MDMQ that evaluate the decision-making style.

The objective of this study is to analyse the psychometric properties of MDMQ in adolescents. According to previous findings, we expect to establish relationships between decision-making styles with EI (Fallon et al., 2014; Hess & Bacigalupo, 2011) and cognitive distortions (Ciccarelli et al., 2017). We also expected factors in the MDMQ to account for part of the variance in prosocial and antisocial behaviour (Reyna, 2018; Sorge et al., 2015).

We are interested in analysing the psychometric properties of the MDMQ in normative adolescents and adolescents with criminal behaviour because the study of socio-emotional and decision-making variables are increasingly crucial in antisocial adolescents (Poon, 2020). Having instruments that contribute to the evaluation of decision-making could favour interventions and the development of prevention and orientation programs.

Method

Participants

The participants in the research included 822 adolescents (M=16.09, SD = 1.31, 33.7% girls), of two types of origin: The adolescents in sample 1 (n = 410) came from

educational institutions in four Colombian cities and were between 14 and 18 years old (*M* = 15.5, *SD* = 1.29), of which 48.5% (*n* = 199) were girls. Sample 2 (*n* = 412) belonged to the System of Criminal Responsibility for Adolescents (SRPA), also from four Colombian cities, were aged between 14 and 18 (*M* =16.6, *SD* = 1.04), of which 18.9% (*n* = 78) were girls. All of the participating adolescents were in school between the 6th and 11th grades.

Variables and instruments

The Trait Meta-Mood Scale (TMMS-24) (Fernández-Berrocal et al., 2004) was used to evaluate EI. This instrument was designed based on the emotional intelligence skill model (Mayer & Salovey, 1997), which assesses clarity, attention, and emotional repair. It consists of 24 items, with eight statements for each of the three subscales. The response options are presented on a Likert-type scale: *strongly disagree* (score 1), *somewhat disagree* (2), *neither agree nor disagree* (3), *somewhat agree* (4), and *strongly agree* (5). High scores indicate a higher degree of skill in emotional intelligence. Some items include: "I pay close attention to my feelings", "I am usually very clear about my feelings", and "No matter how badly I feel, I try to think about pleasant things". In this study the reliability analysis showed adequate values: Attention (sample 1, α = .84; sample 2, α = .85), Clarity (α = .87, .87) and Emotional Repair (α = .85, .86).

The Prosocial Behaviour Scale (PBS) was applied (Caprara & Pastorelli, 1993). It is made up of 15 items that evaluate *prosocial behaviour* through three response alternatives: *never* (1), *sometimes* (2), and *often* (3). The items refer to helping behaviours, sympathy, and trust. High scores indicate a higher degree of prosocial behaviour. Some items include: "I try to help others" and "I help others with their homework." In this study, the reliability analysis showed adequate values (sample 1, α = .79; sample 2, α = .77).

Antisocial-criminal behaviours were evaluated using the **Antisocial-Criminal Behaviour Questionnaire (A-D)** (Seisdedos, 1995), which consists of 40 items in two subscales, antisocial behaviour (20 items) and criminal behaviour (20 items). It is a dichotomous scale with the answer *yes* (1) and *no* (0). High scores indicate a higher degree of antisocial and criminal behaviour. Some examples of antisocial behaviour evaluated with the AD questionnaire include teasing or fooling strangers and breaking or throwing things that belong to someone else. Among criminal behaviours include carrying weapons or getting money by threatening weaker people. In this study the reliability analysis showed adequate values: Antisocial Behaviour (sample 1, α = .82; sample 2, α = .89), and Criminal Behaviour (α = .75, .91).

The **How I Think Questionnaire (HIT-Q)** (Barriga & Gibbs, 1996; Peña-Fernández et al., 2013) was used to examine cognitive distortions. It is a self-report designed to assess self-serving cognitive distortions. It consists of 54 items and is valued with a six-point scale (1 = *totally disagree* and 6 = *totally agree*). It contains 39 items that express attitudes or beliefs, and evaluate four factors that are self-centred (9 items), blaming others (10 items), minimization (9 items), and assuming the worst (11 items); the scale presents eigth control items (anomalous responses) and seven items that express prosocial thoughts (positive fillers). High scores indicate a higher degree of cognitive distortions. Some ítems are: "People need to be roughed up once in a while", "When I get mad, I don't care who gets hurt", and "People are always trying to hassle me." In this study, the reliability values evaluated for the subscales have Cronbach's Alphas of between .70 and .82.

Finally, the **Melbourne Decision Making Questionnaire (MDMQ)** (Mann et al., 1997) was used to evaluate decision making. This questionnaire is made up of 22 items, with three response options: "*Very true for me*" (score 2), "*Somewhat true for me*" (score 1), and "*Not at all true for me*" (score 0). In this study, for the full sample, the reliability analysis showed adequate values: Vigilance (6 items, α = .72), Hypervigilance (5 items, α = .68), Buck-passing (6 items, α = .77), and Procrastination (5 items, α = .68).

Procedure

A cross-sectional study was used to assess the psychometric properties of the MDMQ, and the International Test Commission Guidelines for Translating and Adapting Tests were followed (Muñiz et al., 2013). The Spanish translated version was used (Alzate et al., 2004), and five experts were invited to review the proposed adaptation, evaluating the linguistic, psychological and cultural differences between the original and the population of interest. A pilot study was conducted with 100 adolescents from SRPA institutions, collecting participant observations, which helped to determine the inclusion criteria, including having a level of education of at least sixth grade or higher and not being diagnosed with a psychiatric disorder. These criteria were taken into account because some boys and girls from the SRPA with low education showed problems understanding the items, and some who had psychiatric disorders, showed difficulties in responding to the questions. The adolescents were informed about the research and participated voluntarily, anonymously, and free of charge. The legal guardians and the participants signed the consents. The researchers applied the questionnaires on paper during the tutoring hours, taking advantage of the schools and SRPA centres' schedules. The application took an average time of 30 minutes.

Compliance with ethical standards

The procedures were carried out following the guidelines of the Declaration of Helsinki (World Medical Association, 2013). The study was approved by the Ethics Committee of the University of Valencia (N0 1102812-07/11/2019) and endorsed by the Office of Planning and Management Control, Sub-directorate of Public Evaluation Monitoring of the Colombian Institute of Family Welfare - ICBF/SRPA (SIM 17615328-37).

Data analysis

A confirmatory factorial analysis (CFA) was carried out with the MPlus program (version 6.12) (Muthén & Muthén,

2017; Wang & Wang, 2020). For the CFA, the entire sample was analysed (*n* = 822), and then the two subsamples, because we wanted to establish if the MDMQ is appropriate for adolescents' offenders and non-offenders.

The performance of the models was evaluated with the TLI (Tucker-Lewis Index), and CFI (Comparative Fit Index). Values above .90 are considered good indices of fit (Hu & Bentler, 1999). The level of error was verified with the RMSEA indicator (Root Mean-Square Error of Approximation), with scores of below .05 indicating a good fit (Hox et al., 2018).

Further, construct validity analyses were performed using Pearson correlations between the questionnaire and other reference measures with a full sample, and a hierarchical multiple regression analysis with each of the subsamples was carried out to assess criterion validity (Hair et al., 2014). Reliability analyses were performed with the SPSS software package (version 22.0).

Results

Factor structure

The four-factor structure of the MDMQ has been extensively tested in various studies with a better fit than two- and three-factor models (Bailly & Ilharragorry-Devaux, 2011; Filipe et al., 2020; Mann et al., 1997). Considering that according to the theory, the most parsimonious models are of three and four factors, these two models were evaluated (Bailly & Ilharragorry-Devaux, 2001; Mann et al., 1997). The 3-factor model is based on three different ways of making decisions: vigilance, hypervigilance, and avoidance, composed of buck-passing and procrastination. The 4-factor model shares the premise of 3-factor model, but differentiates procrastination and buck-passing as two forms of avoidance (Filipe et al., 2020).

Confirmatory factor analysis (CFA) was performed for the entire sample. In the three-factor model, the results showed satisfactory indices (χ^2 (gl) = 3844.163 (231); RMSEA (CI) = .04 (.037-.047); CFI = .91; TLI = .91). In the four-factor model, the results showed better fit indices (χ^2 (gl) = 4046.49 (231); RMSEA (CI) = .03 (.024-.035); CFI = .96; TLI = .96). Due to the interest of inquiring about the goodness of fit indices in the two subsamples, we evaluated the four-factor model in them. The analysis of samples 1 and 2 also showed adequate indices (Sample 1: χ^2 (*df*) = 2337.44 (231); RMSEA (CI) = .04 (.034-.049); CFI = .93; TLI = .92; Sample 2: χ^2 (*df*) = 1892.758 (231); RMSEA (CI) = .04 (.026-.043); CFI = .94; TLI = .93). Items and standardized parameter estimates from this solution are presented in Table 1.

Reliability analysis

The internal validity was examined by calculating the composite reliability coefficient (CRC) and the average variance extracted (AVE), can be seen in Table 2. For all factors, CRC was above the recommended .70 and the AVE exceeded .50 (Bagozzi & Yi, 1988). Cronbach's Alpha presents adequate indices (total sample, α = .81; sample 1, α = .79; sample 2, α = .80).

Table 1 Items and standardized factor loadings for the Confirmatory Factor Analysis -MDMQ (*n* = 822)

		CFA
Item	**F1: Vigilance**	
2	Me gusta considerar todas las alternativas al tomar una decisión.	.54
4	Intento encontrar las desventajas de todas las alternativas.	.45
6	Tomo en consideración cuál sería la mejor manera de llevar adelante una decisión.	.60
8	Cuando tomo decisiones, me gusta reunir una buena cantidad de información.	.53
12	Intento ser claro(a) en mis objetivos antes de elegir.	.55
16	Tomo muchas precauciones antes de elegir.	.61
	F2: Hypervigilance	
1	Siento como si estuviera bajo una tremenda presión de tiempo cuando tomo decisiones.	.53
13	La posibilidad de que algo salga mal hace que cambie bruscamente mis preferencias.	.57
15	Cada vez que me enfrento a una decisión difícil me siento pesimista para encontrar una buena solución.	.55
20	Después de tomar una decisión, dedico mucho tiempo a convencerme de que fue la correcta.	.52
22	No puedo pensar con claridad si tengo que tomar decisiones apresuradas.	.58
	F3: Buck-passing	
3	Prefiero dejar las decisiones a otros.	.66
9	Evito tomar decisiones.	.72
11	No me gusta asumir la responsabilidad de tomar decisiones.	.66
14	Si una decisión puede ser tomada por mí o por otra persona, dejo que la otra persona la tome.	.58
17	No tomo decisiones a menos que realmente tenga que hacerlo.	.48
19	Prefiero que las personas que están mejor informadas decidan por mí.	.48
	F4: Procrastination	
5	Pierdo mucho tiempo en asuntos poco importantes antes de tomar la decisión final.	.50
7	Incluso después de haber tomado una decisión, retraso ponerla en práctica.	.45
10	Cuando tengo que tomar una decisión, espero mucho tiempo antes de empezar a pensar en ella.	.53
18	Me demoro en tomar decisiones hasta que es demasiado tarde.	.56
21	Aplazo tomar decisiones.	.63

Note. The exclusion criterion for the items was set at .30 (Hair et al., 2014). No items were excluded from the CFA analysis.

Table 2 Means, standard deviations and reliability of the items and scales (*n* = 822)

	$\bar{X}$	*SD*	r_{jx}	α-x
1. Vigilance (α = .72; AVE = .55; CRC = .72)				
2	1.45	.67	.17	.82
4	1.19	.68	.28	.81
6	1.42	.64	.10	.82
8	1.30	.71	.10	.82
12	1.51	.61	.09	.82
16	1.26	.71	.24	.81
2. Hypervigilance (α = .68; AVE = .55; CRC = .73)				
1	0.95	.65	.44	.80
13	0.98	.68	.46	.80
15	0.93	.73	.44	.80
20	1.02	.71	.42	.80
22	1.03	.73	.47	.80
3. Buck-passing (α = .77; AVE = .60; CRC = .85)				
3	0.46	.67	.50	.80
9	0.60	.69	.49	.80
11	0.72	.74	.46	.80
14	0.77	.73	.46	.80
17	1.08	.74	.43	.80
19	0.79	.75	.46	.80
4. Procrastination (α = .68; AVE = .61; CRC = .71)				
5	0.87	.70	.38	.81
7	1.05	.67	.37	.81
10	0.76	.69	.41	.80
18	0.69	.68	.36	.81
21	0.72	.69	.47	.80

Notes. $\bar{X}$ = Means; *SD* = standard deviation; r_{jx} = scale-item correlation; α-x = reliability if the item is deleted; AVE = Average Variance Extracted; CRC = Compound Reliability Coefficient.

Validity analysis

In order to study the convergent and divergent validity, Pearson correlations were made between the MDMQ scales and other psychological variables (Table 3). The vigilance factor showed a positive and significant correlation with attention, clarity, emotional repair, and prosocial behaviour, and a negative correlation with antisocial behaviour. The cognitive distortion subscales showed positive correlations with hypervigilance, buck-passing and procrastination, and negative correlations with vigilance.

To analyse the predictive validity, a hierarchical multiple regression analysis was performed for each of the samples (Table 4), taking antisocial behaviour as the dependent variable. The sociodemographic variables of gender and age were introduced in the first step, and the dimensions of the MDMQ in the second step. The model is significant in both samples, but it explains a reduced percentage of variance (Sample 1: R^2 = .04; Sample 2: R^2=.07). In Sample 1, the variables of gender and age do not provide a significant percentage of variance to the model (Gender: β = -.08, *t* = -1.53, *p* = .13; Age: β = .22, *t* = 3.28, *p* = .001), which is significant when adding the dimensions of the MDMQ. However, only procrastination is significant (β = -. 56, *t* = -11.83, *p* = .001). In Sample 2, the sociodemographic variables provide a significant percentage of variance (R^2 =. 03, *F* = 5.70, *p* = .004), and this percentage increases in step 2 (R^2 = .07, *F* = 4.70, *p* < .001), in which two dimensions provide a significant percentage of the explained variance (Vigilance: β = -.13, *t* = -2.64, *p* = .001; Hypervigilance: β = .13, *t* = 2.17, *p* = .03).

A hierarchical multiple regression analysis was also performed, taking prosocial behaviour as the dependent variable. The model is significant in both samples, but it explains a reduced percentage of variance (Sample 1: R^2 = .05; Sample 2: R^2 = .13). In Sample 1, the variables of gender and age do not provide a significant percentage of variance (Gender: β = -. 04, *t* = 1.54, *p* = .12; Age: β = -.08, *t* = -.657, *p* = .51), which is significant when adding the dimensions of

Table 3 Rank, mean of the variables, standard deviations, and correlations between the dimensions of the MDMQ and other variables (*n* = 822)

Variables	Rank	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. VI	0-12	8.13	(2.59)													
2. HIP	0-10	4.91	(2.33)	.14**												
3. BP	0-12	4.72	(2.76)	0.02	.52**											
4. PC	0-10	4.08	(2.25)	-.09**	.54**	.59**										
5. AT	5-40	25.59	(7.12)	.28**	.22**	.12**	.13**	-								
6. CL	5-40	25.43	(7.14)	.25**	-0.06	-.12**	-.09**	.53**	-							
7. RP	5-40	27.62	(7.25)	.34**	-.07*	-.087*	-.12**	.41**	.58**	-						
8. AB	0-20	9.70	(4.92)	-.145**	0.05	0.04	.14**	0.02	0.06	-0.05	-					
9.SC	1-6	2.85	(1.01)	-.18**	.16**	.18**	.22**	-.09**	-0.06	-.14**	.34**	-				
10. BO	1-6	2.55	(1.01)	-.18**	.08*	.15**	.18**	-.08*	-0.07	-.09**	.26**	.82**	-			
11. MIN	1-6	2.45	(1.04)	-.23**	0.03	.15**	.18**	-.10**	-.076*	-.12**	.31**	.82**	.85**	-		
12. AW	1-6	2.85	(0.97)	-.16**	.12**	.17**	.20**	-0.07	-0.07	-.14**	.32**	.81**	.84**	.84**	-	
13.PB	1-30	24.25	(3.68)	.31**	.13**	0.02	-0.02	.27**	.25**	.28**	-0.03	-.32**	-.33**	-.36**	-.32**	-

Notes. VI = Vigilance; HIP = Hypervigilance; BP = Buck-passing; AP = Procrastination; AT = Attention; CL = Clarity; RP = Repair; AB = Antisocial Behaviour; SC = Self-centred; BO = Blaming Others; MIN = Minimization; AW = Assuming the Worst; PB = Prosocial Behaviour.
* *p* < .05. ** *p* < .01. *** *p* <. 001.

Table 4 Hierarchical multiple regression for antisocial and prosocial behaviour

Antisocial Behaviour								
Predictor	**Sample 1**				**Sample 2**			
	ΔR^2	ΔF	β	*t*	ΔR^2	ΔF	β	*t*
Step 1	.01	1.96			.03	5.70 **		
Gender			-.08	-1.53			-.09	-1.94
Age			.08	1.70			.12	2.60 *
Step 2	.04	3.63 **			.04	4.12 **		
VI			-.01	-.28			.-.13	-2.64**
HIP			-.03	-.40			.13	2.17*
BP			-.04	-.67			-.06	-1.01
PC			.22	3.28**			.08	1.21
Total	.04	3.09 **			.07	4.70 ***		
Prosocial Behaviour								
Predictor	**Sample 1**				**Sample 2**			
	ΔR^2	ΔF	β	*t*	ΔR^2	ΔF	β	*t*
Step 1	.00	.08			.02	4.32 *		
Gender			.02	0.34			.11	2.41*
Age			-.01	-0.23.			.08	1.75
Step 2	.07	7.06 ***			.12	11.5 ***		
VI			.14	2.86**			.17	3.52***
HIP			-.15	-2.32*			.24	3.99***
BP			-.09	-.1.46			.06	1.10
PC			-.03	-.04			-.07	1.20
Total	.07	4.73 ***			.13	9.25 ***		

Note. VI=Vigilance; HIP = Hypervigilance; BP = Buck-passing; PC = Procrastination;
* p <. 05. ** p <. 01. *** p < .001.

the MDMQ. Two variables are significant: vigilance (β = 1.21, t = 2.86, p = .004) and hypervigilance (β = -. 097, t = -2.32, p = .021). In Sample 2, the sociodemographic variables provide a reduced but significant percentage of variance (R^2 = .02, F = 4.31, p = .014), and this percentage increases in step 2 (R^2 = .12, F = 9.25, p <.001).

Discussion

Due to the importance of decision-making in adolescents and the need for instruments to facilitate their evaluation (Altman, 2017; Defoe et al., 2015), this study aimed to analyse the psychometric properties of the Melbourne Decision Making Questionnaire (MDMQ) in Colombian adolescents.

The results indicate that the MDMQ meets reliability criteria, has an adequate factor structure, and predictive and construct validity. The instrument showed adequate internal consistency and reliability (α=.81). The CFA evidenced a four-factor model, as in the original study (Mann et al., 1997) and subsequent validations (Alzate et al., 2004). The adjustment indices of the CFA indicate a superiority of the four-factor model compared to the three-factor model; these results are similar to those observed in other studies (Bailly & Ilharragorry-Devaux, 2011; Mann et al., 1997).

According to the decision conflict theory of Janis and Mann (1977), there are different ways of managing the stress caused by decision-making. Vigilance is considered the most appropriate decision style (Altman, 2017). The skills to make decisions are formed throughout life. In the case of adolescents, we consider it appropriate to intervene in decision making in order to contribute to the achievement of goals and the reduction of risks (Blakemore & Robbins, 2012; Reyna, 2018). In adolescents with criminal behaviour, this intervention should be oriented towards prosocial decisions (Brocas & Carrillo, 2020; Poon, 2020).

As expected, the vigilance factor positively correlated with prosocial behaviour, attention, clarity, and emotional repair (Fallon et al., 2014; Hess & Bacigalupo, 2011) and negatively with cognitive distortions and antisocial behaviour (Ciccarelli et al., 2017). The factors of hypervigilance, procrastination, and buck-passing factors also correlated positively with cognitive distortions.

The MDMQ predicted antisocial behaviour, and previous research suggests that the decision-making process contributes to the explanation of antisocial behaviour in penitentiary and community samples of adolescents (Sorge et al., 2015). The MDMQ also predicted prosocial behaviour, which is related to vigilance in decision-making. These results are consistent with descriptive theories of cognitive decisions,

which suggest that rational decision-making favours prosocial decisions (Reyna, 2018). Adolescents with criminal behaviour could present more difficulties making rational decisions and show more distortion (Barriga et al., 2008; Sorge et al., 2015). We consider that cognitive distortions could affect decision-making and prosocial behaviour. Therefore, it is important to continue investigating the relationships between these variables.

Our results suggest the relationship between EI and decision-making styles, observed through the positive association of attention, clarity, emotional repair with vigilance, and negative association with the other decision-making styles. The relationship between decision-making and emotional intelligence is a topic currently of interest in research on adolescents with criminal behaviour because it contributes to the explanation of adaptive and prosocial decisions (Ekel et al., 2020). This relationship has been found in studies with adults, but until now "these constructs have not been paid attention to as correlates" in adolescents (Sample, 2018, p. 155).

This study has a series of limitations, including self-report instruments that can be affected by biases such as social desirability. Similarly, due to the conditions of data collection and the sampling for convenience used, the sample's randomisation could not be guaranteed. In sample 2, boys with criminal behaviour are overrepresented, so the analyses concerning gender are limited. Also, this study's limitations include the lack of evidence for concurrent, convergent, and discriminant validity, because other scales that evaluated decision-making were not applied. It also lacks other measures that could have contributed to predictive validity, such as stress and well-being, which are variables that have been related to decision-making (Bavol'ár & Orosová, 2015; Fallon et al., 2014). Future research should consider including these variables, conducting alternative models to the CFA tested, realize invariance analysis by gender and age, validating the MDMQ in other populations, and carry out longitudinal studies.

In conclusion, the validation of the MDMQ provides a useful and valid instrument for evaluating decision-making styles in the Colombian adolescent population. Its application to adolescents in school and antisocial problems suggests that the instrument is appropriate for adolescents in different social and cultural conditions.

Conflict of interests

All authors declare that they have no conflict of interest.

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