Advances in the assessment of self-determination: internal structure of a scale for people with intellectual disabilities aged 11 to 40

Abstract

Background. Advances in theoretical frameworks of self-determination require the development of new assessment instruments. This study examines the dimensional structure of a self-determination scale and analyses the factorial invariance of its measurement across age and gender.

Method. The AUTODDIS Scale was used to assess the self-determination of 541 people with intellectual disabilities aged from 11 to 40.

Results. Different models (correlational and hierarchical structures) of the scale were tested. The correlational model obtained from the exploratory structural equation model (ESEM) approach provided the best fit for the data. The results also supported measurement invariance across youths (aged 11 to 21 years) and adults (aged 21 to 40 years) and across genders.

Conclusions. This study contributes to international research on self-determination and the development of assessment tools in this field, offering a better understanding of this multifaceted and complex construct. The results provide construct validity evidence regarding a new measurement tool tested across people aged 11 to 40, using information from third parties. However, further research is needed to explore the best ways to understand and assess the different factors related to self-determination.

Keywords: self-determination, intellectual disability, assessment, dimensionality, invariance, youths, adults

Researchers, professionals, and families recognise the importance of promoting self-determination in the life of any person and especially in the lives of people with disabilities (Álvarez et al. 2019; Carter et al. 2008; Mason et al. 2004; Thoma et al. 2002; Vicente et al. 2020). The teaching of skills related to self-determination has been linked to the achievement of desired outcomes in the school setting (Mumbardó-Adam et al. 2017; Palmer et al. 2012; Shogren et al. 2012; Wehmeyer et al. 2011) as well as in the immediate post-school years and adult life (Martorell et al. 2008; Shogren et al. 2015).

Attempts to understand and operationalise the construct of self-determination at an international level date back many years, beginning with the classical functional model (Wehmeyer 1999), which understood self-determination as 'acting as the primary causal agent in one's life and making choices and decisions regarding one's quality of life free from undue external influence or interference' (Wehmeyer 1996, p. 24), to the current re-conceptualisation of this model, Causal Agency Theory (Shogren, Wehmeyer, Palmer, Forber-Pratt et al. 2015), which is the recently proposed theoretical framework for understanding the development of self-determination. This reconceptualisation is related to the functional model of self-determination. In fact, autonomy, self-regulation, psychological empowerment, and self-realisation (essential characteristics derived from previous models), as shown below, are part of Causal Agency Theory (Shogren, Wehmeyer, Palmer, Forber-Pratt et al. 2015).

Causal Agency Theory (Shogren, Wehmeyer, Palmer, Forber-Pratt et al. 2015) describes the three essential characteristics of self-determined actions (volitional action, agentic action, and action-control beliefs) and eight associated component constructs. Volitional action is defined by self-initiation and autonomy – the components involved in intentional and conscious decision-making based on personal preferences. Agentic action – defined by self-direction, self-regulation, and pathways thinking – involves adjusting one's

own actions by directing them toward the achievement of goals and overcoming obstacles as they occur. Finally, action-control beliefs are about recognising one's own abilities and beliefs needed to reach goals, involving control expectancies and acting with self-realisation and empowerment. In short, this theory holds that the promotion of these component constructs, through supports and appropriate instructional practices, contributes to the development of the three essential characteristics over the different life stages, particularly during adolescence (Shogren et al. 2018a).

This re-conceptualisation of the way that self-determination is understood implies a requirement for further research and for the development of novel assessment tools that are aligned with the new theoretical framework. This would then allow us to strengthen our understanding of the construct and increase the range of tools available to implement evidence-based practices. Assessment tools allow us to measure outcomes that are essential to make informed decisions when designing interventions for individuals and to check their efficacy; assessed aggregated outcomes can be also used at the organisational level for quality improvement and at the macro-system level to guide the development and implementation of policies (Schalock 2018).

Self-determination scales are available in a number of countries. There are many assessment tools in English language (*The Minnesota Scales*, Abery et al. 1995a; 1995b; *The self-Determination Assessment Battery*, Hoffman et al. 2015; *The American Institute for Research Self-Determination Scale -AIR-*, Wolman et al. 1994), such as The Arc's Self-Determination Scale (Wehmeyer and Kelchner 1995) as a self-report tool based on the functional model. However, the available instruments in the Spanish language are a translation of The Arc's Self-Determination Scale (Wehmeyer et al 2006); an adaptation based on this instrument, the ARC-INICO Self-Determination Scale (ARC-INICO Scale; Verdugo, Vicente, Fernández-Pulido et al. 2015; Verdugo, Vicente, Gómez et al. 2015); and

a translation and validation of the student version of the AIR ((Mumbardó-Adam, Guardia-Olmos and Giné, 2018).

There are currently initiatives under way to develop new tools aligned with Causal Agency Theory. Shogren and colleagues (2018b) report on the Self-Determination Inventory System [SDIS], which includes a version in self-report format [SDI:SR] and another to be completed by parents and teachers [SDI:PTR]. Results suggested that the same set of items can be used to measure self-determination using the SDI across students and teachers, but there are low correlations between self and proxy scores (Shogren et al., 2020). The factor structure and fit have been confirmed for the self-report version only (Shogren, Little et al. 2018) and for its translation and adaptation into Spanish (Mumbardó-Adam et al. 2018). This inventory is designed for adolescents, but it expands the assessment to young people with and without intellectual disability (ID). Little research has focused on showing evidence that the existing measures are tapping into the same underlying construct. In Spain, Mumbardó-Adam and colleagues (2018) found significant correlation between the SDI:SR and the ARC-INICO Scale, and both shared 21.4% to 29.3% of the explained variance, confirming the relationship between the functional theory of self-determination and the Causal Agency Theory.

Yet, there is still a need to develop new assessment instruments, given that there is a large population for whom no validated assessment tool exists (i.e. young adults or adults with ID, or people for whom self-report measures are not suitable). Although there is no doubt about the importance of promoting self-determination skills during childhood and adolescence, it remains being important and relevant in adulthood (Palmer 2010; Wehmeyer and Shogren 2016), specially during early adulthood, as a critical stage that involves an essential transition process (educational, employment, and/or lifestyle). Studies conducted with young adults and adults with disabilities after their exit from high school (Shogren, Wehmeyer, Palmer, Rifenbark et al. 2015; Wehmeyer and Schwartz 1997; and also in Spain:

Martorell et al. 2008) show successful outcomes in the transition to adulthood; however, there are no self-determination assessment tools available for that stage and beyond.

Equally, although self-report measures are relevant, third-party assessment scales are also needed because this type of standardised tool provides additional data when combined with the self-reports and is essential (as well as behavioural observation or interviews with third parties) to assess individuals with high support needs that might not be assessed otherwise. According to Field and colleagues (1998), an appropriate assessment should use a variety of methods to verify assessment information, the person with disability should be central in the process, and their relatives and support services staff can also play an important role in providing information.

To address this gap and create a suitable assessment tool for young people and adults with ID, to be completed by third parties (and therefore contribute to the development of a wide variety of methods which would also be applicable to the population for whom self-report measures are inappropriate), a research project was conducted to develop the AUTODDIS Scale. The development of this tool began with a Delphi study (Vicente, Guillén, Gómez et al. 2019), with the aim of operationalising the construct of self-determination to obtain a pool of observable items that were relevant to the target population and that suitably represented the domains and component constructs of the current theoretical model.

Following on from the initial development stage (Vicente, Guillén, Gómez et al. 2019) and the subsequent pilot study that was conducted (Vicente, Guillén, Fernández et al. 2019), the first aim of the present study is to examine the dimensional structure of the scale. To that end, the study seeks to analyse the functioning of the items, reducing the scale to an appropriate number of reliable and representative items per subdomain, and provide evidences of construct validity based on the internal structure of the scale through different

factorial approaches. In addition, given the target population for the scale (individuals with ID aged between 11 and 40), this study also includes a second goal focused on examining the factorial invariance of the scale across age and gender.

Method

Participants

Study participants were recruited through the involvement of 33 organisations for people with ID from different regions of Spain (11 of the 17 Spanish autonomous communities). We collected data on 541 people with ID, aged between 11 and 40 ($M = 26.28$; $Me = 26$; $Mo = 24$; $SD = 8.28$). Most were men ($n = 334$; 61.7%). All assessments for these people with ID were completed by 181 professionals as external informants who had known them for at least 4 months (range between 4 to 312 months; $M = 64$ months; $SD = 57.15$) and with whom they had frequent contact (74.8% saw them daily or several times a week; 14.3% saw once a week or less; and 10.9% did not provide this information). The range of scales completed per informant was between 1 and 38. Most informants completed the scale for only one person with ID (49.2%); 38.6% of informants assessed among two and five participants; and 11.2% assessed more than five. Most informants were women (75.1%). Their professional profiles were diverse and included teachers (21%), carers (20.4%), psychologists (9.9%), occupational therapists (3.9%), directors of centres or services (2.8%), speech therapists (2.8%), social workers (2.8%), and educators (2.8%).

The informants were asked to indicate the level of ID of the participants by giving an estimation of their intellectual functioning and adaptive behaviour (i.e. mild, moderate, severe, and profound) using available reports in their organisations with information about intellectual quotients (IQ) and adaptive behaviour scales or other clinical judgments. For the first criterion (i.e. intellectual functioning), most participants were identified as having a mild (38.8%) or moderate (39.7%) ID; the proportion of participants with a severe or profound

level was smaller (14.2% and 5.2%, respectively). Values were missing for only 2.1% of participants. Percentages for the second criterion (i.e. adaptive behaviour) were similar: most participants had a mild or moderate level (33.3% and 37.9%, respectively), and a smaller proportion had a severe (14.2%) or profound level (3.9%). Note, however, that the percentage of missing values for this measurement reached 10.7%.

Measures

The AUTODDIS Scale is a multidimensional instrument composed of different subscales to be completed by an external observer who knows the person with ID well (e.g. professionals or family members). The field-test version of the scale consists of 88 items – written in the third person – that assess the domains and subdomains of self-determination according to the theoretical model proposed by Shogren, Wehmeyer, Palmer, Forber-Pratt and colleagues (2015). Although this theory defines three essential characteristics and eight associated component constructs, in the scale development process (Vicente, Guillén, Gómez et al. 2019), one of these essential characteristics was composed of two (not three) component constructs. The self-direction and self-regulation subdomains included items related with identifying different pathways to navigate barriers or problems. Table 1 shows the structure of the scale and a sample item for each subdomain. The first domain, *volitional characteristics (autonomous and volitional actions)*, is made up of 28 items distributed across two subdomains: *autonomy* (8 items) and *self-initiation* (20 items). The second domain, *agentic characteristics (self-managed actions)*, consists of 31 items distributed across the subdomains of *self-direction* (16 items) and s*elf-regulation* (15 items). Finally, the *action-control beliefs* domain is made up of 29 items, structured around three subdomains: *self-realisation* (6 items), *control expectancies* (4 items), and *empowerment* (19 items). The

response format for all items was a four-point Likert scale based on level of agreement (i.e. strongly disagree, disagree, agree, and strongly agree).

- Table 1 -

This pilot version of the scale was developed using the results of a Delphi study, in which a consensus was reached on a comprehensive pool of items (Vicente, Guillén, Gómez et al. 2019). Subsequently, Vicente, Guillén, Fernández and colleagues (2019) conducted a pilot study with 165 people with ID. In this study, a detailed description of the preliminary characteristics of a pilot-version scale was provided, together with evidence of internal consistency (Cronbach's alphas above .95), evidence of validity based on the significant correlations between the domains, and an external assessment of each domain subjectively estimated by respondents (ranging from .66 to .73).

Procedure

Data gathering was carried out by contacting organisations and centres that work with people with ID in the different autonomous communities of Spain. An email containing the objectives of the study, as well as an invitation to participate, was sent to a large number of potential organisations. In addition, information on the study was disseminated on the website of the University of Salamanca's Institute of Community Integration (INICO), which prompted a number of organisations to express their interest in participating. A contact person was identified within each organisation who had expressed an interest in participating, and the research team was responsible for providing the necessary information for the duration of the process.

Each organisation was responsible for identifying people who could be assessed as well as the informants who would complete the assessments on their behalf. The criteria for selecting participants were: (a) having an intellectual disability; and (b) being between 11 and

40 years old. The requirements for joining as a professional informant were: (a) being a professional who supports a participant; (b) knowing an evaluated participant for at least 4 months; and (c) having frequent contact for at least once a month. Each informant could assess more than one participant, provided that the requirements were satisfied. Likewise, the organisations were responsible for collecting and looking after the informed consent declarations before forwarding them to the research team. The preferred method for administering the scale was online ($n = 476$), although the traditional paper-based option ($n = 65$) was also offered.

The study received ethical approval from the Research Ethics Committee of the Community of Aragón (CEICA) and complied with the principles for the development of research as set out in the Declaration of Helsinki. Participating organisations and the research team ensured that informed consent was collected for all participants. Personal data, such as names and surnames, were not gathered, but anonymous identification codes were used to ensure confidentiality and anonymity.

Data Analysis

The analyses described in the following passages were performed using Jamovi 1.2.5, FACTOR 10.10.01 (Lorenzo-Seva and Ferrando 2006), and MPlus 7.4.

Measurement Models

To summarise the data, different factorial approaches were followed in this study, and five different models were tested. First, three confirmatory factor analyses (CFA) were performed with the objective of evaluating the extent to which the data collected strictly adhered to the theoretical model presented in this study (i.e. the correlational and hierarchical relations between the three essential characteristics and their associated component constructs). An initial CFA model (M1) tested a structure with the seven correlated factors

(see Table 1). A second confirmatory model (M2) calculated a two-level model (a higher one corresponding to the three domains, and a first level corresponding to the seven subdomains). And a third confirmatory model (M3) proposed a three-level model (i.e. where a higher level with a general factor was added to M2). A fourth model (M4) was also created with the objective of evaluating the bi-factor nature of the construct. In that structure, a general orthogonal factor was specified on all items in addition to the seven specific factors (also orthogonal).

Finally, an exploratory structural equation model (ESEM; M5) with an oblique target rotation approach was followed (Asparouhov and Muthén 2009). This type of factorial modelling approach has a number of advantages over the more widespread CFA: (a) it is less restricted (allowing the estimation of more parameters, not only of the main loadings, but also of the possible cross-loadings); (b) it is more flexible (providing local measures of parameter fit); (c) it is more robust (accurately recovering complex factor structures); and (d) it is more versatile (used as an exploratory or a confirmatory tool; Marsh et al. 2014; Morin et al. 2016; Garrido et al. 2018; González-Arias et al. 2018; Martínez-Molina and González-Arias 2018).

The weighted least squares and adjusted mean and variance estimator (WLSMV) was chosen in all of these analyses (because of the ordinal data nature; Beauducel and Herzberg 2006). Goodness of fit was evaluated using the most widespread related indices along with their assessment criteria, that is, χ^2, χ^2/df, *CFI*, *TLI* and *RMSEA* (Schreiber 2017).

Invariance Analysis

Taking as a reference the measurement model with the best fit indices, a set of nested factorial structures was executed in order to analyse the possible invariance (or equivalence) between different parameter levels (configural, strong, and strict; Meredith 1993; Millsap and Yun-Tein 2004). These differences were tested between: (a) two age groups (< 21, ≥ 21,

using the maximum age to remain in the education system as a cut-off point); and (b) sex (female, male). Six nested models for each pair of groups were compared and assessed in the following order: configural, strong, and strict (Chen 2007; Cheung and Rensvold 2002; Marsh et al. 2010; Martinez-Molina and Arias 2018).

Results

Item and descriptive analysis for subdomains

Before modelling the AUTODDIS data with more stringent factorial approximations (e.g. structural equation modelling or confirmatory factor analysis), basic exploratory and reliability analyses were performed on each of the subscales (EFA based on polychoric correlations, the unweighted least squares estimator, parallel analysis as a retention factor criteria, oblique rotation if necessary, corrected homogeneity indices, and Cronbach's alpha).

The pilot version of the scale had a wide number of items, because – as is recommended – the initial number of items should be at least double that which is ultimately considered to be part of the final version of the measurement instrument, because many of them – for different reasons (e.g. metric, compressibility, difficulty, etc.) – will end up being discarded (Muñiz & Fonseca-Pedrero, 2019). Because the aim was to reduce the scale to a manageable number of items per subdomain and to select not just the most reliable items, but also those which best represent each content per domain, avoiding redundancy, the following criteria were considered (Appendix A): (a) exceeding the loading cut-off criteria (i.e. the 40–30–20 rule; Howard 2016); (b) decreasing the reliability of the scale (i.e. corrected homogeneity indices); and (c) the research team identifying parallel items with redundant content in other items.

An exploratory factor analysis (parallel analysis; Horn 1965) was carried out by subdomain, checking their uni-dimensionality and factor loading magnitudes. Items that did not fulfil the 40–30–20 rule (Howard 2016) were reviewed. The estimated values in our study

ranged from 0.496 (i21) to 0.943 (i37). Corrected homogeneity indices (CHI) were also calculated for the items (ranging between 0.482 and 0.871). To keep an item in the scale, a limit of CHI < 0.300 was established (Costello and Osborne 2005); thus, none were eliminated. Finally, 24 parallel items with redundant content were identified and eliminated (e.g. i075 *'she/he expresses her/his wishes assertively'* was eliminated, while i087 *'she/he expresses her/his opinions assertively'* was kept).

In this way, the subscales were reduced to a total of 58 items. Table 2 shows the univariate descriptive statistics, Pearson correlations, and a reliability indicator (Cronbach's alpha). At the basic descriptive level, the aggregate values of the scales have a distribution close to zero asymmetry and kurtosis. This reduced version was used to estimate the fit of the models tested to the data and to test the invariance across age and gender.

- Table 2 -

Estimated Models

The CFA (correlated factors at the same level or at different hierarchical levels; M1, M2 and M3) and the bifactor structure (M4) described worse fit than the ESEM (M5; the model that also estimated the factor cross-loadings between the dimensions). The fit indices for models M1 to M5 are shown in Table 3. M5, which was based on ESEM analysis, offered a good fit – the best among the proposed models (*RMSEA* = 0.051, *CFI* = 0.980, *TLI* = 0.974). For example, M5 compared to M1 describes a ΔRMSEA = –0.020, ΔCFI = 0.027, ΔTLI = 0.023. Therefore, the rest of the analysis in this report is based on M5 (Figure 1).

- Table 3 –

- Figure 1 -

ESEM M5 (see Table 4). The resulting exploratory structural model supported the main theoretical dimensions proposed, although not all. The self-regulation and control-expectancies factors showed low reliability indices (composite reliability for ordinal

structures) and few items with substantive loadings (≥ 0.30). Although the main loadings of the other proposed dimensions (autonomy, self-initiation, self-direction, self-realisation, and empowerment) remained in the corresponding factors, we also found between 2 to 6 cross-loadings per factor.

- Table 4 -

Age and Sex Invariance Analysis

Tests of configural, strong, and strict invariance were executed between two age groups (< 21, ≥ 21) and genders (female, male). In both analyses (see Table 3), all mentioned fit indices met the criteria for strict invariance (gender: *RMSEA* = .0.039; *CFI* = 0.987; *TLI* = 0.985, *ΔRMSEA* = 0.000, *ΔCFI* = 0.001, *ΔTLI* = 0.000; age: *RMSEA* = .0.048; *CFI* = 0.978; *TLI* = 0.976, *ΔRMSEA* = 0.005, ΔCFI = -0.005, ΔTLI = -0.005). This means that – considering M5 with regard to the collected data – factor structure, factor loading magnitudes, and item residual variances were equivalent between groups.

Discussion

The first goal of this study was to analyse the dimensional structure of the AUTODDIS Scale to contribute to a better understanding of the nature of the construct of self-determination. To this end, after eliminating redundant and/or non-reliable items (appendix A), we examined different models (correlational and hierarchical structures) of the cleaned version of the scale. Our results indicate that the correlational model obtained from the ESEM approach (M5) provided the best fit for the data. The model is quite well aligned with the proposed theoretical model (Shogren, Wehmeyer, Palmer, Forber-Pratt et al. 2015): the final items of the scale reproduced six out of the seven components of the construct (i.e. autonomy, self-initiation, self-direction, self-regulation, self-realisation, and empowerment subdomains), although one of them (self-regulation) was underrepresented (i.e. only two

items consistency loaded on a clear factor). Although this component is under-represented, its number of items is similar to that of the SDI:SR subscales, which are composed of three items (Shogren, Little et al. 2018). Our model did not identify the control expectancy as a subdomain of self-determination. This could be explained by the difficulty in measuring personal beliefs about the link between the self and one's own goals through data obtained from third parties. Therefore, more research is needed to delve into the differences to assess the essential components through self-reports and reports of others. Shogren and colleagues (2020) found a limited relationship in responses of adolescents and their teachers when looking at the latent parameters, although they suggested that the same set of items can be used to measure self-determination. Other studies about the validation of self-determination instruments also found difficulties in strictly reproducing the theoretical model, and the authors had to eliminate many items considered redundant because of their pronounced correlated residuals (Shogren, Little et al. 2018). With the self-regulation subscale being removed from the analysis, the model fits were found to be more satisfactory (Mumbardó-Adam et al. 2018; Shogren, Little et al. 2018).

The second aim of our study was to examine measurement invariance by gender and age. We were able to establish measurement invariance across youths (aged 11 to 21 years) and adults (aged 21 to 40 years) and across gender. This is consistent with previous research on tools developed to assess self-determination of adolescents (Shogren et al. 2014; Shogren, Little et al. 2018; also in Spain, Mumbardó-Adam et al. 2017; Vicente et al. 2017), thereby contributing to expanding research regarding age range. Our research confirms that both the factorial structure and the item residual variances of the scale are equivalent for youths and adults. Gender is one variable that is usually examined with mixed findings; Wehmeyer and Garner (2003) found no differences in self-determination according to gender with a US-based sample of adults, whereas Nota and colleagues (2007) and Shogren and colleagues

(2007) found significant differences by gender, although with adolescents and not adults. This could mean that after adolescence, self-determination status levels off and becomes more stable over time, and that the cultural context could play an important role in age- and gender-based findings (Vicente et al. 2017).

This study makes a significant contribution to international research on self-determination, because previous measures have never been tested across youths and adults, nor have they used information from third parties. Having self-determination assessment tools specifically designed by people with ID aged 11 to 40 will allow future studies conducted with adults in Spain to use specific tools, instead of other scales (e.g. quality of life scales: Pascual-García et al. 2014). Likewise, having standardised scales with third-party information (such as the AUTODDIS Scale) is necessary, because this type of tool provides additional data from diverse perspectives (Field et al. 1998), which can be combined with the self-reports and which is essential to assess individuals with high support needs whom self-reports are not suitable.

In conclusion, these findings provide evidence of both construct validity and equivalence across age and gender for the AUTODDIS Scale. The findings confirm the validity of the scale to assess the six identified self-determination components with people with intellectual disabilities aged from 11 to 40. However, more research is needed given the partial fit of our data to the proposed theoretical model (Shogren, Wehmeyer, Palmer, Forber-Pratt et al. 2015). It is also important to take into account that the theoretical model has been recently developed, and although some evidence about its validity has already been published (Shogren, Little et al. 2018; Shogren et al., 2020; Shogren, Wehmeyer, Little et al., 2015), there is the need for ongoing research to provide more and better evidence in different countries (e.g. what are the mechanisms that interweave the components and essential characteristics of the model; are all the components at the same level; is self-determination

defined differently among stakeholders; and are there components in which the cultures differ?)

We must take certain limitations into consideration. Despite the sample having an adequate size and coming from diverse regions across Spain, it was limited to a convenience sample; therefore, the results of the study cannot be directly generalised to other populations. Further analyses are needed to develop the final version of the scale; specifically, in order to provide new reliability and external validity evidence and guarantee that different informants give consistent estimates of the same phenomenon, inter-rater reliability must be analysed by using those cases where it was possible to collected data from a relative as a second informant (19.41%). The relationship with other conceptually related constructs must also be examined. Likewise, future research is needed to check the factorial model (after excluding the control expectancy subscale), as well as to potentially improve the instrument by including new items to evaluate the control expectancy and self-regulation subscales and again explore factorial models and hierarchical structures.

The greatest challenge for practitioners is to continue to evolve and make changes in practices that enhance peoples' lives by creating environments that facilitate growth and development (Schalock 2018). Assessment tools provide necessary ongoing feedback in order to adapt and implement individual supports and practices, determine their effectiveness, and identify issues to be improved. Therefore, there is a need for further research which explores the best ways to understand and assess the complex and multifaceted construct of self-determination. New assessment tools, designed to assess the diverse personal and environmental factors related to self-determination across the life span (i.e. for children, adolescents, young adults, adults, and the elderly) and focus on general and specific populations (i.e. people with and without intellectual disability, people with autism spectrum disorder, and people with extensive support needs) are still required.

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Table 1. Structure of the scale according to Causal Agency Theory (Shogren et al. 2015)

Domains	Subdomains	Sample item (Spanish; *English*)
Volitional Action	Autonomy	Cuida su imagen personal; *She/he takes care of her/his appearance.*
	Self-Initiation	Escoge con quién pasa su tiempo libre; *She/he chooses who to spend her/his free time with.*
Agentic Action	Self-Direction	Se plantea metas y objetivos en la vida; *She/he sets goals and objectives in life.*
	Self-Regulation	Ajusta sus acciones a los cambios de planes; *She/he adjusts her/his actions when plans change.*
Action-Control Beliefs	Self-Realisation	Sabe cuáles son las cosas que hace mejor; *She/he knows what things she/he does best.*
	Control Expectancies	Persiste en sus objetivos a pesar de los fracasos; *She/he perseveres with her/his objectives despite setbacks.*
	Empowerment	Pide tener más oportunidades para hacer cosas nuevas; *She/he asks for more opportunities to do new things.*

Note. Some items are shown in their original Spanish version; the English translations are shown in italics.

Table 2. Descriptive reliability, correlation and internal consistency

	AUT	SIN	SDI	SRE	REA	CEX	EMP
SIN	.840						
SDI	.773	.871					
SRE	.782	.830	.867				
REA	.734	.792	.771	.808			
CEX	.709	.763	.778	.836	.796		
EMP	.769	.865	.842	.862	.798	.807	
i	8	11	9	9	6	4	11
n	541	541	541	541	541	541	541
M	2.62	2.58	2.12	2.37	2.64	2.48	2.47
SD	0.78	0.71	0.70	0.65	0.61	0.66	0.71
Min	1	1	1	1	1	1	1
Max	4	4	4	4	4	4	4
Sk	-0.48	-0.37	0.02	-0.40	-0.62	-0.39	-0.50
Ku	-0.39	-0.24	-0.39	-0.11	0.75	0.03	-0.20
α	.925	.939	.950	.925	.909	.828	.960

Note. AUT = Autonomy; SIN = Self-Initiation; SDI = Self-Direction; SRE = Self-Regulation; REA = Self-Realisation; CEX = Control Expectancies; EMP = Empowerment; i = number of items in the scale; n = number of participants; α = Cronbach's α. All Pearson's correlations were $p < 0.001$.

Table 3. Fit indices of the estimated models

	Model	Structure	Analysis	$\chi 2$	*df*	$\chi 2/df$	CFI	TLI	RMSEA	ΔRMSEA	ΔCFI	ΔTLI	$\Delta\chi 2/df$
Measurement	M1	Correlated factors	CFA	5817	1574	3.70	.953	.951	.071				
	M2	Higher-Order, 2 levels	CFA	5939	1588	3.74	.952	.950	.071				
	M3	Higher-Order, 3 levels	CFA	5870	1585	3.70	.953	.951	.071				
	M4	Independent factors	Bi−factor	5495	1538	3.57	.956	.953	.069				
	M5	**Correlated factors**	**ESEM**	**3042**	**1268**	**2.43**	**.980**	**.974**	**.051**				
Invariance	*Gender*	*Female, male*											
	M5	Configural	ESEM	4055	2536	1.60	.984	.979	.047				
	M5	Strong	ESEM	4263	3002	1.42	.986	.985	.039	.008	.002	.006	−.18
	M5	**Strict**	**ESEM**	**4302**	**3060**	**1.41**	**.987**	**.985**	**.039**	**.000**	**.001**	**.000**	**−.19**
	Age	*<21, ≥ 21*											
	M5	Configural	ESEM	4018	2536	1.58	.983	.978	.047				
	M5	Strong	ESEM	4540	3006	1.51	.983	.981	.043	−.004	.000	.003	−.07
	M5	**Strict**	**ESEM**	**4989**	**3064**	**1.63**	**.978**	**.976**	**.048**	**.005**	**−.005**	**−.005**	**.04**

Note. RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker−Lewis Index; ESEM = Exploratory Structural Equation Model; Bold measurement and invariance models showed the best test results.

Table 4. Factor loadings, correlations and reliability of M5 (ESEM)

	AUT	SIN	SDI	SRE	REA	CEX	EMP
AUT_1	**.724**	-	-	-	-	-	-
AUT_2	**.726**	-	-	-	-	-	-
AUT_3	**.824**	-	-	-	-	-	-
AUT_4	**.932**	-	-	-	-	-	-
AUT_5	**.963**	-	-	-	-	-	-
AUT_6	**.461**	.405	-	-	-	-	-
AUT_7	**.490**	.358	-	-	-	-	-
AUT_8	**.332**	.375	-	-	-	-	-
SIN_1	-	**.321**	.345	-	-	-	-
SIN _2	.336	**.519**	-	-	-	-	-
SIN _3	-	-	-	-	-	-	-
SIN _4	-	**.414**	-	-	-	-	-
SIN _5	-	**.378**	-	-	-	-	-
SIN _6	-	-	-	-	-	-	-
SIN _7	-	**.562**	-	-	-	-	-
SIN _8	-	-	.336	-	-	-	-
SIN _9	-	-	-	-	-	-	-
SIN _10	-	**.538**	-	-	-	-	-
SIN _11	-	-	.496	-	-	-	.378
SDI_1	-	-	**.386**	-	-	-	-
SDI_2	-	-	**.597**	-	-	-	-
SDI_3	-	-	**.594**	-	-	-	.346
SDI_4	-	-	**.445**	-	-	-	-
SDI_5	-	-	**.540**	-	-	-	-
SDI_6	-	-	**.566**	-	-	-	-
SDI_7	-	-	**.599**	-	-	-	-
SDI_8	-	-	**.592**	-	-	-	-
SDI_9	-	-	-	-	-	-	-
SRE_1	.362	-	-	-	-	-	-
SRE_2	-	-	-	-	-	-	.422
SRE_3	-	-	.385	-	-	-	-
SRE_4	-	-	.405	-	-	-	-
SRE_5	-	-	.502	.385	-	-	-
SRE_6	-	-	.363	.391	-	-	-
SRE_7	-	-	-	-	-	-	.383
SRE_8	-	-	-	**.626**	-	-	-
SRE_9	-	-	-	**.649**	-	-	-
REA_1	-	-	-	-	**.854**	-	-
REA_2	-	-	-	-	**.679**	-	-
REA_3	-	-	-	-	**.846**	-	-
REA_4	-	-	-	.302	**.637**	-	-
REA_5	-	-	-	-	**.509**	-	-
REA_6	-	-	-	-	**.508**	-	-
CEX_1	-	-	-	-	-	-	-
CEX_2	-	-	-	-	-	-	-
CEX_3	-	-	-	-	-	-	.336
CEX_4	-	-	-	-	.342	-	.316
EMP_1	-	-	-	-	.300	-	**.570**
EMP_2	-	-	-	-	-	-	**.512**
EMP_3	-	-	-	-	.305	-	**.657**
EMP_4	-	-	-	-	-	-	**.790**
EMP_5	-	-	-	-	-	-	**.707**
EMP_6	-	-	-	.441	-	-	**.539**
EMP_7	-	-	-	-	-	-	**.564**
EMP_8	-	-	-	-	-	-	**.462**
EMP_9	-	-	-	-	-	-	**.494**
EMP_10	-	-	-	-	-	-	**.581**
EMP_11	-	-	-	-	-	-	**.823**
CR	.884	.605	.763	.441	.837	.061	.869
SIN	.462						
SDI	.606	.387					
SRE	.426	.214	.452				
REA	.607	.438	.554	.493			
CEX	.218	.116	.126	.206	.274		
EMP	.680	.459	.634	.464	.657	.228	

Note. AUT = Autonomy; SIN = Self-Initiation; SDI = Self-Direction; SRE = Self-Regulation; REA = Self-Realisation; CEX = Control Expectancies; EMP = Empowerment; Loadings ≥ .30 and $p < .01$ are shown; Main loadings are in bold; Factor correlations $p < .01$ are in bold.