YOUTH FINANCIAL LITERACY SHORT SCALE: PROPOSITION AND VALIDATION OF A MEASURE

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ABSTRACT

We propose a short instrument for measuring financial literacy among young adults: Youth Financial Literacy Short Scale. It contains 12 questions with three dimensions: financial knowledge, attitude, and behavior. An instrument was applied with 1,126 young Brazilians and we used exploratory factor analysis, structural equation modeling and hierarchical cluster analysis, with an indicator that defines whether an individual has a high or low level of financial literacy. Financial behavior is what most impacts young people, representing 53.6% of financial literacy, and financial knowledge only 11.1%. We highlight the importance of young people put the financial knowledge they learn into practice.

Keywords: financial literacy; youth; scale; validation.

1. INTRODUCTION

The number of financial products, as well as the accessibility of these products, is constantly growing. Mobile apps and the internet are enabling people to make payments, transfers, and access credit instantly. This possibility represents the advance of digital media. However, the importance of financial literacy for further conscious decision-making has continued to increase.

Financial literacy can be defined as a combination of awareness, knowledge, skill, attitude, and behavior necessary to make sound financial decisions and ultimately achieve individual financial well-being (Organisation for Economic Co-operation and Development - OECD, 2018). Thereby, financial literacy is positively linked to financial outcomes, and as such, it is essential for individuals to thrive in today's society, mainly because a financially strong and healthy workforce provides the foundation for empowered communities and economic growth (Bolognesi, Hasler, & Lusardi, 2020).

In the same sense, Dewi et al. (2020) argue that financial literacy is not only important for depositors or investors or for the welfare of individuals in managing their financial matters, but also for the behavior of financial institutions, the economy, and financial stability. Financially literate citizens tend to make informed and responsible financial decisions, which decreases their likelihood of staying in a low-income cycle and increases their likelihood of succeeding in a financial world that focuses on self-financial responsibility (Zhu and Chou, 2020).

Watanapongvanich et al. (2020), for example, investigated people from Japan and observed that financial literacy had a significantly negative relationship with gambling frequency. Additionally, the empirical results of a study by Niu, Zhou, and Gan (2020) show that financial literacy has a strong and positive impact on various aspects of retirement preparation among Chinese people, including determining financial needs in retirement, making long-term financial plans, and purchasing private pension insurance.

In view of the large number of consequences on the population level of financial literacy, many studies have been conducted to investigate the influence of profile variables on the level of financial literacy, such as gender, marital status, number of dependents, education, etc. However, one of the most studied variables is the individual's age, which gave rise to the so-called inverted "U" shaped curve (Agarwal et al., 2009). This curve that represents the relationship between age and the level of financial literacy reveals that young people and the elderly are those who have lower levels of knowledge, poorer attitudes, and riskier financial behavior, unlike adults who are in the middle age demographic. Jiang et al. (2020) corroborate these findings, stating that advanced literacy is quite low among the younger respondents and is relatively

high among the middle-aged group. This level declines slightly in respondents older than 60, suggesting that financial literacy may have a nonlinear relationship with age.

This relationship suggests that young people and the elderly need more financial literacy. However, as mentioned by Aprea et al. (2016), financial literacy is particularly important among today's adolescents and youth as they are more exposed to financial decision-making than their parents. In addition, Bolognesi, Hasler, and Lusardi (2020) observed that 62% of millennials assess their own financial knowledge as high or very high; however, only 19% of these respondents could answer correctly the three financial literacy questions presented. Therefore, young adults are also an audience that needs attention.

Artavanis and Karra (2020) also provide evidence on the alarmingly low level of financial literacy among undergraduates. More importantly, we show that students with a deficit in financial literacy are more likely to significantly underestimate future loan payments, which can impair their ability to repay student debt due to unexpectedly high payment-to-income upon graduation.

In view of this, we realize that there is a consensus in the literature about the importance of financial literacy. However, when it comes to scientific research, there are many ways and strategies for measuring this construct (Hung, Parker, & Young, 2009). When investigating these measurement instruments, we observe that most are created for the general public, without targeting a specific audience. Zhu and Chou (2020) moved in that direction by creating and validating the Financial Fitness for Life (FFFL) Test. This instrument has 50 questions and measures the financial literacy of Hong Kong Chinese adolescents between 13 and 18 years.

Then, having in mind we do not have a consensus about the best measurement for financial literacy in the literature and more importantly, we could not find a specific instrument for young adults, we aim to propose a short instrument for measuring financial literacy for young adults up to 29 years old. This instrument is called Youth Financial Literacy Short Scale, and it contains 12 questions covering the three components of financial literacy: financial knowledge, attitude, and behavior, following the definition of the OECD (2018).

Sharif and Naghavi (2020) point out that when research refers to young people, the word "youth" and the phrase "young adults" are frequently used and interchangeable with no apparent "one universally accepted definition." To make it clear, in this study that was carried out in Brazil, we are considering as young adults those individuals up to 29 years old. Law No. 12,852, of August 5, 2013, establishes the Youth Statute and considers young people to be aged between 15 (fifteen) and 29 (twenty-nine) years.

This study advances the literature by presenting a specific model for measuring financial literacy among young people. This audience deserves to be studied in isolation because they are individuals who

are vulnerable consumers, who lack sufficient knowledge to make critical financial decisions (Williams & Oumlil, 2015). Besides that, young adults are more susceptible to financial threats because of less experience in the financial domain and are unable to start saving at an early age, which hampers their future savings accumulation (Utkarsh et al., 2020).

In addition, we have advanced the literature by proposing a measurement instrument in line with the OECD concept of financial literacy and which has only 12 items. The studies that proposed a short instrument for financial literacy usually focus on only one dimension, which is financial knowledge. Being a short instrument is important for scientific research to avoid response errors that, according to Malhotra and Birks (2007), can be broken down into “respondent inability” and “respondent unwillingness.”

2. THEORETICAL BACKGROUND

Financial literacy has been highlighted as a key input for sound financial decision-making for both participation in financial assets as well as liabilities. The positive impact of financial literacy and cognitive abilities on the participation in risky asset markets in particular and financial wealth accumulation in general has been documented in several empirical studies (Cupák et al., 2020).

The Financial Literacy and Education Commission (NSFL, 2006) defines financial literacy as “the ability and awareness to use knowledge and skills to manage financial resources to achieve maximum financial well-being.” Xiao et al. (2014) have another definition: “financial literacy can be defined as achieving financial well-being through applying certain levels of financial understanding and performing the needed financial conducts.” It can also be defined as the ability to use knowledge and skills to manage one’s financial resources effectively for a lifetime of financial security (Jump$tart Coalition for Personal Financial Literacy, 2017).

From such various definitions, Dewi et al. (2020) define financial literacy as a process in perceiving financial knowledge, financial awareness, and financial experience to be used in financial decision-making through enhanced skills and positive financial managing capability so as to have positive financial behavior to achieve financial goals and freedom. On the other hand, according to OECD (2016), an international organization with the aim of promoting policies that improve the economic and social well-being of people around the world, financial literacy is considered a complex phenomenon and should be measured based on the combination of financial knowledge, attitudes, and behaviors. Thus, with the Youth Financial Literacy Short Scale, financial literacy assumes the same definition proposed by OECD (2018).

Financial knowledge is related to knowledge of basic mathematics, simple and compound interest, risk, return, savings and diversification, assisting in decision making regarding the choice of suitable financial products and ensuring financial well-being (Lusardi and Mitchell, 2014). Investors with low levels of financial knowledge are more likely to exhibit poor investing behavior: diversifying naively, failing to identify dominated funds, and paying higher fees (Fisch et al., 2019). According to the Central Bank of Brazil (2017), knowledge in basic finance can help consumers compare and choose the financial products and services most appropriate to their needs. And yet, when combined with skills in arithmetic, financial knowledge tends to help people react autonomously to events that reflect on their financial well-being.

Financial attitude can be defined as a personal inclination towards financial matters or the ability to plan ahead and maintain a savings account that matters (Rai, Dua, & Yadav, 2019), because even if an individual has sufficient knowledge and ability to act in a particular way, his attitude is what will influence the decision to act or not (OECD, 2016). For the Central Bank of Brazil (2017), financial attitude also involves motivation and confidence to apply financial knowledge, as well as the feeling (or intention) of an individual in relation to a certain decision in his financial life. And for Haque and Zulfiqar (2016), financial attitude deals with ability to manage finances, interest of the individual in increasing financial knowledge, spending/saving attitudes, and attitudes toward taking risks while making an investment.

Lastly, financial behavior is a behavior related to the application of finance (Susilowati, Kardiyem, & Latifah, 2020) or an individual's behavior related to finance that can affect the well-being of the individual (Dewi et al., 2020). For Akben-Selcuk (2015), the aspects of an individual's financial behavior can be seen from their punctuality in paying bills, personal budgeting, and their savings for the future.

Despite the consensus about the importance of financial literacy, it is still possible to find a lot of divergence in relation to measurement models. One of the best-known works in the literature for measuring the level of financial literacy is the instrument proposed by Lusardi and Mitchell (2008), who developed the Big Three that considers three items that have already been widely replicated.

In the United States, the 2013 Consumer Financial Literacy Survey, sponsored by the National Foundation for Credit Counseling (NFCC) and The Network Branded Prepaid Card Association (NBPCA), collected data from 2,037 Americans in 2013 with an instrument that measures individuals' attitudes and behaviors through twenty-two five questions. The items address aspects of the budget, spending and savings, bill payment, credit and prepaid debit cards, knowledge of personal finances and financial problems, in addition to socioeconomic aspects (Harris Interactive Inc., 2013).

Van Rooij, Lusardi, and Alessie (2011) also constructed a research instrument that contemplates two sets of questions: 1) five items that measure basic financial skills, which are considered as prerequisites for

daily transactions, such as inflation, interest rate interest and time value of money; 2) seven issues that explore complex financial knowledge, such as stocks, bonds, and mutual funds. However, the instrument elaborated by the authors does not pay attention to all the conceptual aspects of financial literacy, focusing only on questions of financial knowledge.

Based on the OECD documents, the OECD / INFE Toolkit (2018) was developed to measure financial literacy and financial inclusion. The financial literacy component of the questionnaire reflects the definition of financial literacy of the OECD mentioned earlier. The questions cover financial planning and management, the choice and use of financial products, financial knowledge, and a variety of attitudes and behaviors that affect financial literacy and financial well-being. Also included are questions about digital financial services and cryptographic assets, as well as questions to identify whether respondents had experienced being victims of a financial scam or had issues related to integrity and trust.

Lusardi, Oggero, and Yakoboski (2017) developed the Personal Finance Index (P-Fin Index). The instrument measures the knowledge and understanding that enable good financial decision-making and effective management of personal finances. The P-Fin Index is based on answers to 28 questions, with three or four questions dedicated to each of the following functional areas: Earnings; Consume; Economy; Investing; Loan/debt management; Insurance; Understanding the risk; and Sources of access information.

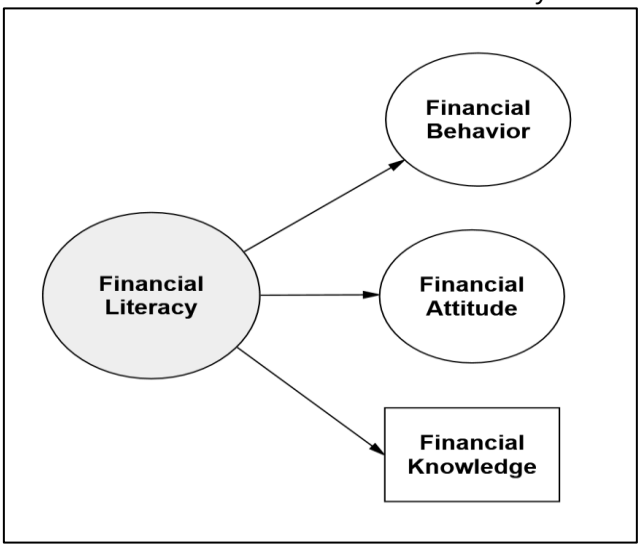
The measurement instruments mentioned so far are widely used in the literature. They were created for the general public, without paying attention to the particularities of each group. However, as indicated in the first chapter of this paper, there is a relationship between financial literacy and the likelihood of making financial mistakes: the young and the elderly are more likely to make less-than-optimal financial decisions (Agarwal et al., 2009).

When looking for studies that have focused on the younger audience, several were identified. Aprea and Wuttke (2016), for example, described the development of a first version of a competence-oriented assessment instrument involving 198 secondary students in Germany. The instrument mainly consists of 23 test items intended to mirror different phases of financial decisions. Moreover, self-reports on motivational and attitudinal aspects, as well as questions on students' sociodemographic backgrounds, were included. Also in 2016, the Test of Financial Literacy (TFL) was created by Walstad and Rebeck (2016) and published for the Council for Economic Education (CEE, 2016). The TFL is a standardized test with 45 items for measuring the achievement of high school students in units or courses that emphasize content and instruction in personal finance. However, as mentioned previously, both the measurement instrument validated by Aprea and Wuttke (2016) and that by Walstad and Rebeck (2016) consider only high school students and covered a significant number of questions.

Keyser and Duvenhage (2019) also aimed to validate the factorial structure and psychometric properties of a financial literacy instrument in a South African student sample. The authors had a total of 265 students in the sample with a mean age of 21.35 years. But the maximum age was 44.

In view of this, the Youth Financial Literacy Short Scale model assumes the OECD definition of financial literacy, considering the constructs of financial knowledge, attitude, and behavior. In addition, it is designed to be a short measurement instrument aimed at young adults. Figure 1 presents the model.

Figure 1. Models of the dimensions that form the Youth Financial Literacy Short Scale



Source: Prepared by the authors (2020).

As shown in Figure 1, the Youth Financial Literacy Short Scale is a scale composed of three dimensions, which are conceptualized in Table 1.

Table 1. Dimensions of the Youth Financial Literacy Short Scale

	Dimensions	Definition
Youth Financial Literacy Short Scale	Financial Knowledge	Knowledge of basic mathematics, simple and compound interest, risk, return, savings and diversification, assisting in decision making regarding the choice of suitable financial products.
	Financial Attitude	An individual's intention in relation to a certain decision in their financial life.
	Financial Behavior	Individual's behavior related to financial aspects.

Source: Prepared by the authors (2020).

3. METHOD

The process of developing the Youth Financial Literacy Short Scale started with a review of the literature, which provided theoretical support for the definition of the scale and its constructs, followed by the

construction of the initial set of items. The literature review was followed by a qualitative approach to validate and refine definitions and items. Then, the quantitative step was taken, which involved two more analyses. The first, exploratory in nature, aimed to validate the set of items and the proposed dimensions. The second is to validate the theoretical model of the scale. For the quantitative stage, the instrument was applied in public places in eleven Brazilian cities. The final sample was 1.126 young Brazilians. In this study, we considered young individuals aged between 15 and 29 years (BRASIL, 2013).

In the first step of the quantitative stage, exploratory factor analysis was performed with the Factor program version 10.10.01 (Ferrando & Lorenzo-Seva, 2017). A polychoric correlation matrix was used for attitude and behavior dimensions and tetrachoric correlation for knowledge dimension with the principal component method for the extraction of factors. The factorability of the data was verified using Bartlett's test. The unidimensionality of each scale was tested using parallel analysis (Horn, 1965). To increase the accuracy of the method, the 95% confidence interval for random eigenvalues was considered (Crawford *et al.*, 2010). Reliability was evaluated by calculating the composite reliability index (Fornell & Larcker, 1981) with values equal to or greater than 0.70 considered acceptable (Hair *et al.*, 2014).

The quality of the items was also assessed using the item response theory models. Specifically, the difficulty and discrimination of the items were investigated, and the discrimination values were considered to be adequate when it was close to or greater than 1.00. The analysis of attitude and behavior dimensions was performed using the Graded Response Model (GRM) model for polytomous items (Samejima, 1969), and for financial knowledge, the unidimensional two-parameter logistic model (2PL) (Birnbaum, 1968), using the Bayesian Expected a Posteriori (EAP) method.

In the second stage, structural equation modeling was used to validate the Financial Literacy Scale. The models are estimated with the variance-covariance matrix estimated by maximum likelihood via direct procedure. The convergent validity was analyzed by observing the magnitude and statistical significance of the standardized coefficients using the absolute adjustment indices: chi-square statistic (χ^2), Root Mean Square Residual (RMR), Root Mean Square Error of Approximation (RMSEA), Goodness-of-Fit Index (GFI) and comparative fit indices: Comparative Fit Index (CFI), Normed Fit Index (NFI), Tucker–Lewis Index (TLI). There is no consensus in the literature on acceptable values for these indices. However, for the chi-square/degrees-of-freedom ratio, recommendations are less than 5, for CFI, GFI, NFI, and TLI values greater than 0.950 are suggested, and RMR and RMSEA should be below 0.080 and 0.060, respectively (Hair et al., 2014; Hooper et al., 2008; Kline, 2015). On the other hand, unidimensionality is evaluated from the standardized residues related to the indicators of each latent variable. They are considered constructs that presented, for a 5% significance level, standardized residues below 2.58 (Hair et al., 2014).

Thus, the variables that represent financial attitude, financial behavior, and financial knowledge were obtained with the weight of their standardized factor loads, which were subjected to cluster analysis in order to classify young people to their level of financial literacy. The hierarchical analysis techniques were then applied, using Ward's method. Ward's method was selected because it is one of the most consistent for interval scales. The quadratic Euclidean distance, in turn, is recommended for the methods of centroid and Ward clustering and was used because it has the advantage of not extracting the square root of the data (Hair *et al.*, 2014).

After knowing the cluster to which each individual belongs, the descriptive statistics of the dimensions within each cluster were calculated, to know the levels of financial attitude, financial behavior and financial knowledge of the different groups. In addition, in order to verify whether there is a significant difference between the groups, the mean difference test was applied. Finally, a methodology was developed to standardize the application of the Youth Financial Literacy Short Scale from the calculation of the individual's Euclidean quadratic distance in relation to the center of each cluster, in order to identify individual financial literacy. From these distances, it is possible to determine which cluster the young is closest to, and thus it is possible to classify them as an individual with a low or high level of financial literacy.

4. CONSTRUCTION OF THE ITEMS

In order to construct the items on the scale, a literature review was initially carried out. The level of financial knowledge was built on multiple-choice questions adapted from Van Rooij et al. (2011), Klapper et al. (2013), National Financial Capability Study (NFCS, 2013), OECD (2018), Yakoboski, Lusardi and Hasler (2018) and the three questions used worldwide in this study were first developed by Lusardi and Mitchell (2011a) for the American Health and Retirement Study (HRS) in 2004. The construct consists of twelve items that aim to explore the respondent's level of knowledge regarding inflation, interest rates, time value of money, risk, return, diversification, stock markets, credit, discounts, control of expenses, and basic mathematical operations. Financial attitude is measure by three items adapted from OECD (2018), and the financial behavioral dimension consists of seven items adapted from Shockey (2002), O'Neill and Xiao (2012), and OECD (2018).

Table 2 presents the description of the items of the financial knowledge dimension using a nominal scale (right or wrong questions), and Table 3 complements the dimensions and respective items for financial attitude and financial behavior using a five-point Likert scale.

Table 2. Description of the items of financial knowledge dimension

Item Code	Item	Alternatives
Item 1	Suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? You do not make any other deposits or withdraw any money from this account.	More than €102.* ; Exactly €102. ; Less than €102. ; Do not know.
Item 2	Imagine that you have received a donation and that you will keep the money in your safe at home. Considering that inflation is 5% per year, after one year you will be able to buy:	More than today. ; Exactly the same as today. ; Less than today.* ; Do not know.
Item 3	Typically, which asset has the biggest fluctuations over time?	Savings. ; Stocks.* ; Bonds. ; Do not know.
Item 4	Do you think that the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund.	True.* ; False. ; Do not know.
Item 5	Suppose you took out a loan of $10,000.00 to be paid after 1 year and the total cost of interest is $600.00. The interest rate you will pay on this loan is:	0.3%; 0.6%; 3%; 6%*; Do not know.
Item 6	Suppose you saw the same TV in two different stores for the starting price of $1,000.00. Store A offers a discount of $150.00, while store B offers a discount of 10%. What is the best alternative?	Buy at store A ($150.00 discount).* ; Buy at store B (10% discount). ; Do not know.
Item 7	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?	More than today. ; Exactly the same as today. ; Less than today.* ; Do not know.
Item 8	Suppose you borrowed $100.00 from a friend and after a week paid $100.00. How much interest are you paying?	0%* ; 1% ; 2% ; Do not know.
Item 9	An investment with a high rate of return will have a high rate of risk. This statement is:	True.* ; False. ; Do not know.
Item 10	When inflation increases, the cost of living goes up. This statement is:	True.* ; False. ; Do not know.
Item 11	John acquires a loan of $1,000.00 that has an interest rate of 20% per year compounded annually. If he does not make payments on the loan and at that interest rate, how many years would it take for the amount due to double?	Less than 5 years.* ; From 5 to 10 years. ; Over 10 years. ; Do not know.
Item 12	It is possible to reduce the risk of investing in the stock market by buying a wide range of shares. This statement is:	True.* ; False. ; Do not know.

Note: * Denotes the correct answer.
Source: Prepared by the authors (2020).

Table 3. Description of the items of financial attitude and financial behavior dimensions

Dimension	Item Code	Description	Scale
Financial Behavior	Item 13	I reserve the money I receive monthly for future needs.	1 = Never, 2 = Almost never, 3 = Sometimes, 4 = Almost always, 5 = Always.
	Item 14	I keep part of my income every month.	
	Item 15	I save money regularly to achieve long-term financial goals, such as educating my children, purchasing a home, retiring.	
	Item 16	I save more when I receive a salary increase.	
	Item 17	In the past 12 months, I have been able to save money.	
	Item 18	I personally oversee my financial affairs.	
	Item 19	I set long-term financial goals and strive to achieve them.	
Financial Attitude	Item 20	I find it more rewarding to spend money than to save for the future.	1 = Strongly agree, 2 = Agree, 3 = Indifferent, 4 = Disagree, 5 = Strongly disagree.
	Item 21	Money is made to spend.	
	Item 22	I tend to live today and let tomorrow happen.	

Source: Prepared by the authors (2020).

5. VALIDATION OF THE YOUTH FINANCIAL LITERACY SHORT SCALE

From the theoretical foundation (Section 2) and the construction of the items (Section 3), the qualitative assessment step of the scale began. Four specialists were invited to participate, three of them having experience in behavioral studies and one in the financial markets. Each specialist received the instrument and an instruction document, in which evaluations were requested regarding the dimension represented, the degree of relevance of the item, the adequacy of the formulation of each item, and the adequacy of the scale. At this stage, all experts agreed with the items and constructs established and indicated minor adjustments to improve some items. Subsequently, a pre-test was carried out, with of the instrument being administered to ten young people with different profiles, who did not indicate the need for semantic change in the items.

To start the quantitative stage, the final instrument was built on paper and distributed to 1.126 young Brazilians. In this study, we considered young individuals aged between 15 and 29 years (BRASIL, 2013). The interviewees live in different regions of Brazil, with the majority (53.4%) being male, single (91.6%), without dependents (89.9%), graduate or undergraduate students (65.8%), and 22 years on average. The results of the exploratory factor analysis are shown in Table 4.

Table 4. Factor loads, real eigenvalues and parallel analysis, Bartlett's test and Composite reliability index of the dimensions

Dimensions	Item Code	Factor load	Eigenvalues (dimensions)		Bartlett test	Composite reliability index
			Real data	Parallel analysis (95th percentile)		
Financial Knowledge	**Item 1**	**0.706**	5.680	1.212	6375.7*	0.914
	Item 2	0.680	1.069	1.157		
	Item 3	0.648	0.917	1.116		
	Item 4	**0.700**	0.761	1.086		
	Item 5	0.671	0.677	1.056		
	Item 6	**0.791**	0.636	1.029		
	Item 7	**0.755**	0.560	1.005		
	Item 8	**0.800**	0.491	0.980		
	Item 9	0.585	0.425	0.954		
	Item 10	0.629	0.352	0.930		
	Item 11	0.589	0.261	0.901		
	Item 12	0.660	0.173	0.868		
Financial Behavior	**Item 13**	**0.905**	4.353	1.159	5232.7*	0.918
	Item 14	**0.903**	0.961	1.098		
	Item 15	**0.838**	0.507	1.057		
	Item 16	**0.760**	0.490	1.018		
	Item 17	**0.840**	0.331	0.987		
	Item 18	0.551	0.277	0.961		
	Item 19	0.655	0.082	0.923		
Financial Attitude	**Item 20**	**0.828**	1.494	1.086	280.3*	0.823
	Item 21	**0.845**	0.969	1.019		
	Item 22	0.309	0.536	0.981		

Note: * Denotes significance at 1%.
Source: Research results (2020).

Bartlett's test rejected the null hypothesis that the data matrix is an identity matrix for all dimensions, indicating the factorability of the data. Horn's parallel analysis confirms that all dimensions are one dimensional since the values of the parallel analysis are lower than the values obtained for the real data. Most items have a factor load greater than 0.7, indicating a large contribution of variables in the formation of the items. Composite reliability indices are all greater than 0.80, indicating the reliability of dimensions. Therefore, the exploratory factor analysis validates the dimensions provided in the theoretical model and its respective items. Item Response Theory (IRT) was applied for an extra assessment of the role of the items in the scale. Table 5 shows the estimated parameters.

Table 5. Discrimination (α) and difficulty (β) parameters of items

Dimension	Item code	2PL Model		GRM Models				
		α	**B**	α	**β1**	**β2**	**β3**	**β4**
Financial Knowledge	**Item 1**	**0.998**	-1.424					
	Item 2	0.928	-0.785					
	Item 3	0.851	-1.623					
	Item 4	**0.979**	-0.994					
	Item 5	0.906	-0.921					
	Item 6	**1.293**	-1.943					
	Item 7	**1.153**	-1.098					
	Item 8	**1.334**	-2.038					
	Item 9	0.721	-1.325					
	Item 10	0.810	-1.971					
	Item 11	0.729	0.121					
	Item 12	0.880	-0.040					
Financial Behavior	**Item 13**			**2.126**	-1.585	-0.750	-0.010	0.644
	Item 14			**2.106**	-1.397	-0.591	0.054	0.627
	Item 15			**1.533**	-0.625	0.000	0.516	1.010
	Item 16			**1.169**	-1.408	-0.785	0.095	0.924
	Item 17			**1.547**	-1.274	-0.527	0.194	0.868
	Item 18			0.661	-3.556	-2.207	-1.367	1.122
	Item 19			0.867	-2.498	-1.118	-0.263	1.327
Financial Attitude	**Item 20**			**1.476**	-2.134	-1.062	-0.467	0.850
	Item 21			**1.578**	-1.934	-0.443	0.124	1.259
	Item 22			0.325	-4.202	-1.362	0.230	3.171

Note: 2PL= two-parameter logistic model, GRM = Graded Response Model.
Source: Research results (2020).

The 2PL model was estimated for financial knowledge, and it was found that, of the twelve items, only five have values close to or greater than one, and it is indicated to remain on the scale. For the other two dimensions, we estimate GRM models. Financial behavior and financial attitude have five and two items with appropriate levels of discrimination, respectively. The difficulty indices (β), in general, are ordered with smaller categories requiring a lower theta to endorse the content of the items.

With this, the exploratory phase had a reduction of nine items due to low discrimination, all also with factor loads less than 0.70. Therefore, the Youth Financial Literacy Short Scale could be validated with twelve items: five for financial knowledge, five for financial behavior, and two for financial attitude.

Thus, after we know the variables that measure each of the dimensions, the final model was built, which unites the measurement models and the structural model, for Youth Financial Literacy Short Scale. The evaluation of the integrated model was performed based on the adjustment indices and the statistical significance of the estimated regression coefficients (Table 6).

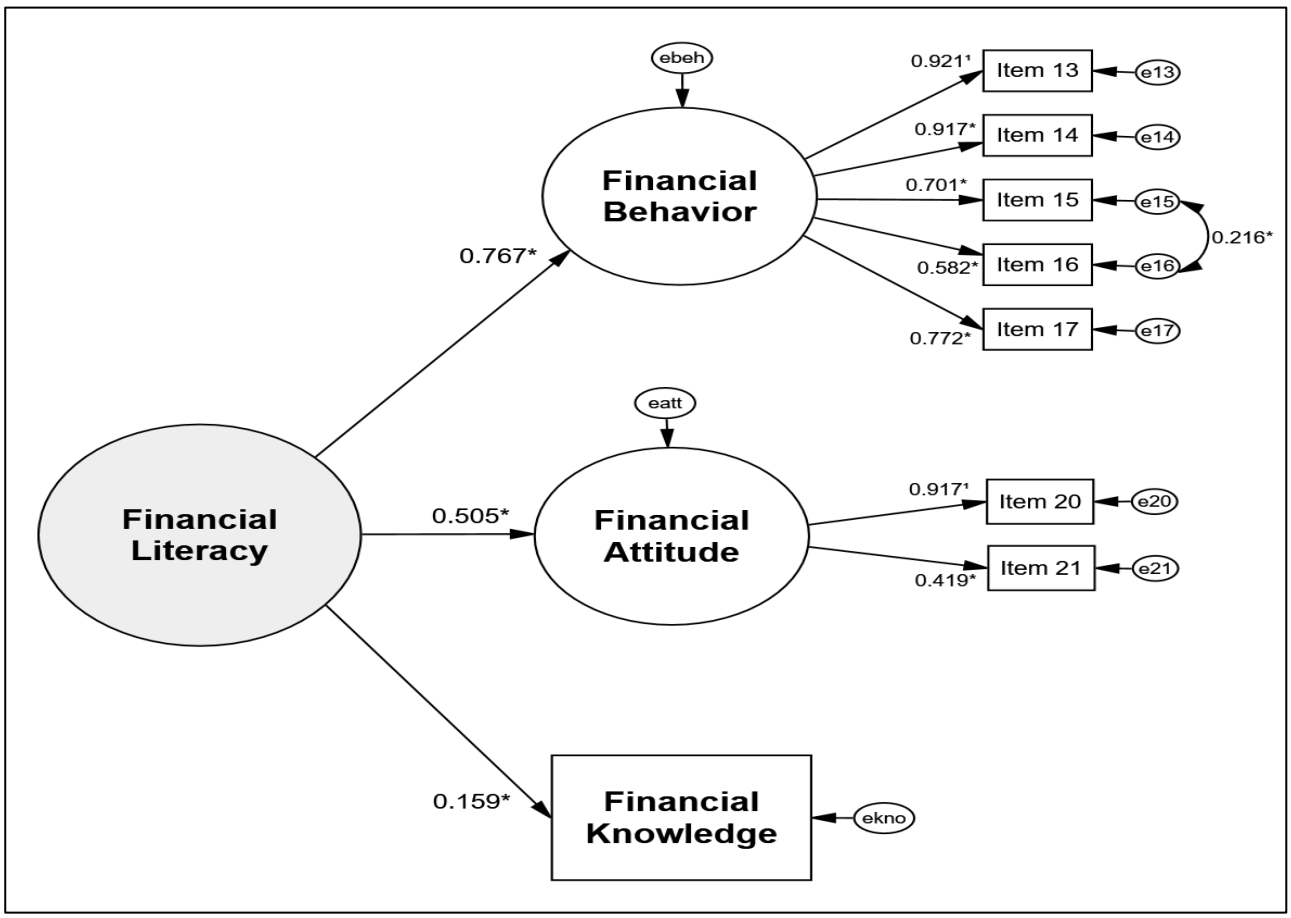
Table 6. Adjustment indices of the Youth Financial Literacy Short Scale

Adjustment indices	Values appropriate to indices[1]	**Youth Financial Literacy Short Scale**	
		Proposed	Final
χ^2 statistic	-	128.744	80.662
(p-value)	> 0.050	p- 0.000	p- 0.000
Degrees of freedom (d.o.f.)	-	18	17
χ^2 / d.o.f.	< 5.000	7.152	4.745
GFI	> 0.950	0.969	0.982
CFI	> 0.950	0.971	0.984
NFI	> 0.950	0.967	0.979
TLI	> 0.950	0.955	0.973
RMR	< 0.080	0.060	0.051
RMSEA	< 0.060	0.074	0.058

Source: Research results (2020).

We found that the model initially proposed did not show adequate adjustment indices because the chi-square / degrees of freedom ratios were higher than five and the RMSEA index showed value greater than 0.060. Thus, in the search for suitable measurement model, the strategy of inserting correlations between the errors of the variables was adopted, which were suggested by the software and made theoretical sense. It is necessary to include only a correlation between the errors in items 15 and 16. After this change, the model presented adequate adjustment indices and Figure 2 presents the final model for Youth Financial Literacy Short Scale, with standardized coefficients and significance of the relationships.

Figure 2. Final Model for Youth Financial Literacy Short Scale



Note: * p < 0.01; z-value not calculated, where the parameter was set to 1, due to the requirements of the model.
Source: Research results (2020).

When analyzing the variables that measure each of the dimensions of the Youth Financial Literacy Short Scale, it is noted that of the five items that form financial behavior, item 13 is the one with the greatest impact (0.921), followed by item 14 (0.917). We conclude that for young people, having a greater frequency in the behavior of making a reserve of the money they receive monthly for a future need and saving part of their income every month, are the items that most impact their positive financial behavior. Item 16 (0.582), which tries to save more when they receive a salary increase, is the behavior that has the least impact. When analyzing the financial attitude, we reinforce this result, in which disagreeing with the fact that it is more satisfactory to spend money than to save for the future (item 20) has the greatest impact on the financial attitude (0.917).

These results are justified by the moment of life that young people are in, in which the main focus is on acquiring experiences and from these to be able to save money for their future, than to wait for a salary increase in this phase. In addition, the effect it will have on their future is even greater, given the power of compound interest in this amount over the years. Song (2019) mentions the importance of long-term investments to increase the effect of compound interest on retirement savings.

Finally, when analyzing the impacts of each of the three dimensions that make up the Youth Financial Literacy Short Scale, we find that financial behavior (0.767) is what most impacts young people, followed by financial attitude (0.505), and finally, financial knowledge (0.159). Specifically, when comparing the impact coefficients, it can be seen that behavior alone represents 53.6% of financial literacy, while financial knowledge represents only 11.1%. We concluded that for young people to be considered financially literate, they need to put financial concepts into practice.

This result is even more important when we analyze the target audience of this study, as young adults are more susceptible to financial mistakes (Agarwal et al., 2009). In addition, financial behavior of young adults is also important because any mistake at this stage of their life postpone their financial planning for the future (Lusardi, Mitchell & Curto, 2009), as well as that influence their financial attitude and behavior in their adult life (Shim et al. 2010).

After discovering the items and impacts of the dimensions of the Youth Financial Literacy Short Scale, we created a step-by-step guide for young people to be able to find their level of financial literacy, in a reduced model, with only twelve items. Initially, it is necessary to answer the Youth Financial Literacy Short Scale questionnaire (Appendix 1) and code your answers according to Chart 1.

Chart 1. Codification of the answers marked in the Youth Financial Literacy Short Scale questionnaire

Financial knowledge: Item1, Item4, Item6, Item7 and Item8 (right or wrong questions) For the correct answer = value 1; For incorrect answers = value 0 **Financial behavior:** Item13, Item14, Item15, Item16 and Item17 (Likert scale) Never = value 1; Almost never = value 2; Sometimes = value 3; Almost always = value 4; Always = value 5 **Financial attitude:** Item20 and Item21 (Likert scale) Strongly agree = value 1; Agree = value 2; Indifferent = value 3; Disagree = value 4; Strongly disagree = value 5

Source: Research results (2020).

Subsequently, for each dimension, using the weight of the factor loads of the SEM stage, we calculate the weighted average by the weights of the factor loads, with the three dimensions allowing values up to 5 points. The standardization method for each construct is shown in Chart 2.

Chart 2. Construction of standardized measures for each dimension

Financial knowledge: KNOW = [Item1 + Item4 + Item6 + Item7 + Item8] **Financial behavior:** BEH = [0.237*Item13 + 0.236*Item14 + 0.180*Item15 + 0.149*Item16 + 0.198*Item17] **Financial attitude:** ATTI = [0.686*Item20 + 0.314*Item21]

Source: Research results (2020).

With the three standardized dimensions, cluster analysis was applied in order to classify young people into low and high levels of financial literacy. The hierarchical cluster analysis was performed using Ward's method, finding two clusters. The first (Cluster 0) represents individuals who have a low level of financial literacy (67.5% of young people), while the second (Cluster 1) represents those with a high level (32.5%). Table 7 presents the descriptive statistics of the standardized dimensions according to the distribution of the clusters.

Table 7. Descriptive statistics of dimensions according to the distribution of clusters

Dimensions	**Cluster 0** (67.5%) Low level of financial literacy			**Cluster 1** (32.5%) High level of financial literacy			**t-test**	**Mann-Whitney test**
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	Sig.	Sig.
Financial Behavior	2.628	2.629	0.851	4.480	4.566	0.470	**0.000**	**0.000**
Financial Attitude	3.267	3.372	0.966	4.038	4.000	0.722	**0.000**	**0.000**
Financial Knowledge	4.108	5.000	1.174	4.695	5.000	0.535	**0.000**	**0.000**

Source: Research results (2020).

When analyzing the different tests, it is clear that the three dimensions showed significant differences between individuals with high and low levels of financial literacy. This confirms the hypothesis that the dimensions of financial behavior, financial attitude, and financial knowledge are decisive for the classification of young people's financial literacy levels. This result corroborates the OECD report (2016), which defines that financial literacy is a complex phenomenon.

We found that individuals with a high level of financial literacy (cluster 1) had an adequate level of financial behavior. On the original scale (1 to 5 points), the average responses were between the option almost always and always (points 4 and 5 of the scale). Those with a low level (cluster 0) have a median result, showing a frequency of behaviors between the options almost never (point 2) and sometimes (point 3) of the scale. We confirmed a significant difference between groups, with a high frequency of good financial behavior in individuals with high literacy and a low to median frequency in those classified with low financial literacy. With this, we conclude that young people with high financial literacy are those who present a high frequency of money-saving behaviors in the current phase of life that they are in, thinking about their financial future.

The financial attitude, whose scale ranges from 1 to 5 points, points out that the more the respondent partially and totally disagrees (points 4 or 5) with the statements made, the better their financial attitudes, there was a smaller difference (although statistically significant) between the two groups. The average

responses of the group with a high level of financial literacy are equivalent to point 4 of the scale (disagree), and those named with a low level (cluster 0) have an average result equivalent to option 3 of the scale (indifferent). Based on the differences found, it could be concluded that young people classified as having high financial literacy are more concerned with the formation of future savings when compared to those classified as having low financial literacy.

Finally, when analyzing financial knowledge, the disparity between groups is less evident, since those with a high level of financial literacy got, on average, 93.90% of the five questions and those classified with low level obtained an average index of hits of 82.15%. This result is satisfactory when thinking about how much young people know about finance, demonstrating that this generation is concerned with learning about the subject and, therefore, corroborates with the findings of the modeling of structural equations, that the dimension of financial knowledge is the which has the least impact on young people's financial literacy.

Then, in order to develop an indicator that defines whether an individual has a high or low level of financial literacy, we used the quadratic Euclidean distance from the center of the cluster (average), with the three dimensions that represent the proxies for its measurement. Thus, using the equations below, the way of estimating the quadratic distance of the responses obtained by individuals with the center of cluster 0 (Equation 1) and with the center of cluster 1 (Equation 2) is presented. From them, it is possible to determine whether the respondent is closer to the center of cluster 0 ($D_0 < D_1$) or to the center of cluster 1 ($D_1 < D_0$).

$$D_0 = (4.108 - KNOW)^2 + (2.628 - BEH)^2 + (3.267 - ATTI)^2 \quad (1)$$

$$D_1 = (4.695 - KNOW)^2 + (4.480 - BEH)^2 + (4.038 - ATTI)^2 \quad (2)$$

Thus, Chart 3 presents the criteria for analysis and decision to know whether an individual has a high or low level of financial literacy.

Chart 3. Analysis and decision criteria

If $D_0 > D_1$, the individual is considered to have a **HIGH level of financial literacy**.
If $D_0 < D_1$, the individual is considered to have a **LOW level of financial literacy**.

Source: Research results (2020).

Finally, in order to demonstrate the results in a more applied way, a methodology was developed to standardize the application of the Youth Financial Literacy Short Scale, which is available in Appendix 2. We also highlight that the proposed model for measuring young financial literacy is ratified by several authors

when they find that it cannot be determined from simple and isolated measures, but, rather, a more complex analysis of the dimensions in question should be included (Atkinson and Messy, 2012). In addition, according to Agarwalla et al. (2012), insights into these dimensions separately can provide more valuable information than that provided by a single construct that determines only financial literacy.

6. CONCLUSIONS

In recent years, much progress has been made in the discussion of financial literacy, including the creation of recommendations, rules, and instructions by international organizations and central banks in different countries. This work advances the field by proposing a Youth Financial Literacy Short Scale.

After the qualitative and quantitative analysis steps, it can be concluded that the three dimensions proposed are valid: Financial Attitude, Financial Behavior, and Financial Knowledge. Together, it measures financial literacy. However, when analyzing the impacts of each of the three dimensions, we found that financial behavior is what most impacts young people, followed by financial attitude, and finally, financial knowledge, with an impact close to 10%. We concluded financial behavior alone represents more than half of young people's financial literacy level.

We highlight the importance of young people in being encouraged to put the financial knowledge they learn into practice. In other words, it does not help governments, universities, institutions, or regulatory bodies in countries to dedicate themselves only to teaching concepts to young people, such as the difference between a simple and compound interest rate, the effect of inflation on their lives, or even the principle diversification. What will make a difference in promoting a financially literate society is the effort to put these lessons into practice and, in fact, change the behavior of young people. This is because it is in their youth that people acquire the habits they will carry throughout their lives, and it is these habits that will make a difference in the future of any country's economy.

In addition to the validation of dimensions, the study developed a standardization, which allows any researcher, public agent, banking system manager, or other interested party to identify the level of youth financial literacy. The scale is a short measure allowing a quick assessment of the level of youth financial literacy. For academics, it can be very useful when the research intends to evaluate other dimensions besides financial literacy.

The application of the scale must follow the procedures suggested by the literature for the application of instruments such as the existence of an adequate environment and the response time. The scale was developed in the context of application on paper and self-administered, changes in these parameters may

require adaptations of language and format. It is a scale for young people, aged between 15 and 29 years, the application for other age groups may also require adaptations. Despite construction efforts, the Youth Financial Literacy Short Scale still needs cross-cultural validation. Future research can either follow this path or be dedicated to assessing financial literacy scale in different demographic and socioeconomic profiles.

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Appendix 1. Questions of Youth Financial Literacy Short Scale

Dimension	Item Code	Item	Alternatives / Scale
Financial knowledge	Item 1	Suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? You do not make any other deposits or withdraw any money from this account.	More than €102.* Exactly €102. Less than €102. Do not know.
	Item 4	Do you think that the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund.	True.* False. Do not know.
	Item 6	Suppose you saw the same TV in two different stores for the starting price of $1,000.00. Store A offers a discount of $150.00, while store B offers a discount of 10%. What is the best alternative?	Buy at store A ($150.00 discount).* Buy at store B (10% discount). Do not know.
	Item 7	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?	More than today. Exactly the same as today. Less than today.* Do not know.
	Item 8	Suppose you borrowed $100.00 from a friend and after a week paid $100.00. How much interest are you paying?	0%* 1% 2% Do not know.
Financial Behavior	Item 13	I reserve the money I receive monthly for future needs.	1 = Never, 2 = Almost never, 3 = Sometimes, 4 = Almost always, 5 = Always.
	Item 14	I keep part of my income every month.	
	Item 15	I save money regularly to achieve long-term financial goals, such as educating my children, purchasing a home, retiring.	
	Item 16	I save more when I receive a salary increase.	
	Item 17	In the past 12 months, I have been able to save money.	
Financial Attitude	Item 20	I find it more rewarding to spend money than to save for the future.	1 = Strongly agree, 2 = Agree, 3 = Indifferent, 4 = Disagree, 5 = Strongly disagree.
	Item 21	Money is made to spend.	

Note: * Denotes the correct answer.
Source: Prepared by the authors (2020).

Appendix 2. Standardization of application of the Youth Financial Literacy Short Scale

Step 1 - Having the respondents' answers, according to the items of the data collection instrument, code the variables as:

Financial knowledge: Item1, Item4, Item6, Item7 and Item8 (right or wrong questions)
For the correct answer = value 1; For incorrect answers = value 0

Financial behavior: Item13, Item14, Item15, Item16 and Item17 (Likert scale)
Never = value 1; Almost never = value 2; Sometimes = value 3; Almost always = value 4; Always = value 5

Financial attitude: Item20 and Item21 (Likert scale)
Strongly agree = value 1; Agree = value 2; Indifferent = value 3; Disagree = value 4; Strongly disagree = value 5

Step 2 – Construction of standardized measures for each dimension:

Financial knowledge: KNOW = [Item1 + Item4 + Item6 + Item7 + Item8]

Financial behavior: BEH = [0.237*Item13 + 0.236*Item14 + 0.180*Item15 + 0.149*Item16 + 0.198*Item17]

Financial attitude: ATTI = [0.686*Item20 + 0.314*Item21]

Step 3 – Insert the results in the following equations:

$$D_0 = (4.108 - KNOW)^2 + (2.628 - BEH)^2 + (3.267 - ATTI)^2$$
$$D_1 = (4.695 - KNOW)^2 + (4.480 - BEH)^2 + (4.038 - ATTI)^2$$

Step 4 – Determine the level of financial literacy by analysis and decision criteria:

If $D_0 > D_1$, the individual is considered to have a **HIGH level of financial literacy**.

If $D_0 < D_1$, the individual is considered to have a **LOW level of financial literacy**.

Source: Research results (2020).