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EVALUATION OF THE PERFORMANCE MODEL OF SOCIAL COGNITIVE THEORY OF CAREER: CONTRIBUTIONS OF DIFFERENTIAL LEARNING EXPERIENCES

Evaluación del modelo de rendimiento de la Teoría Social Cognitiva de la Carrera: aportes de las experiencias diferenciales de aprendizaje

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INTRODUCTION. The aim of this study was to evaluate the structure of the self-efficacy sources scale in Mathematics (Usher & Pajares, 2009) and the academic performance model proposed by the Social Cognitive Career Theory (Lent, Brown & Hackett, 1994), considering the self-efficacy sources, self-efficacy beliefs, outcome expectations, and goals. **METHOD.** We evaluated 574 Argentinean teenagers (between 12 and 16 years of age, M = 13.73). **RESULTS.** Confirmatory factor analysis showed that the model fitted the data well. Regarding internal consistency, the four self-efficacy sources reported adequate values (>.70). Nevertheless, vicarious experience presented low reliability. Structural equation modeling also indicated that Social Cognitive Career Theory performance model fits adequately to the local population in our study. The contribution of self-efficacy sources to self-efficacy beliefs was consistent with other research. In the case of outcome expectations, there was only a significant contribution from vicarious learning and physiological and emotional states. **DISCUSSION.** We discuss these results and analize the limitations in order to propose further studies.

Keywords: *Self-efficacy, Self-efficacy sources, Mathematics, Social Cognitive Theory, Social Cognitive Career Theory, academic performance, Argentinean Teenagers.*

Introduction

The Social Cognitive Career Theory (hereafter SCCT, Lent, Brown & Hackett, 1994) represents an effort to integrate personal, behavioural, and contextual constructs in order to explain vocational interests, career selection, and academic performance. Based on Bandura's (1986) general social cognitive theory, the SCCT focuses on the triadic interaction among person, environment, and behavior and how this interaction shapes career development. Self-efficacy beliefs (i.e., a person's judgment about his or her ability to properly execute a set of actions), outcome expectations (i.e., imagined consequences of performing particular behaviors), and goals (i.e., determination to engage in a particular activity or affect a particular outcome) are central among these variables. The SCCT also recognizes that personal control is equally affected by environmental supports and barriers. The SCCT is also focused on the causal paths by which additional personal and environmental inputs (e.g., race/ethnicity, culture, gender, ability, personality traits, and educational experiences) influence career outcomes.

The SCCT performance model hypothesizes that cognitive ability influences student performance directly (through academic-related skills) and indirectly (through the mediating paths of self-efficacy beliefs and outcome expectations). College academic achievement, therefore, could be related to abilities and knowledge acquired during the educational and social trajectories of a given student. These trajectories involve a sequence of challenges and key events (such as performance accomplishments) occurring in high school and college, in which students are given the opportunity to develop skills (e.g., studying, taking tests), academic self-efficacy beliefs, and outcome expectations that contribute to academic success. Those students who develop outcome expectations will be more likely to approach (and less likely to avoid) challenging academic tasks (Lent et al.,

1994). The SCCT posits that self-efficacy and outcome expectations affect performance through the influence of students' performance goals. Students with stronger self-efficacy beliefs and outcome expectations may set and work toward more challenging academic goals than those with weaker self-efficacy beliefs or less positive outcome expectations.

As highlighted by Lent et al. (1994), antecedents and contextual variables lead subjects to display different learning experiences (also called self-efficacy sources), which will in turn contribute to develop self-efficacy beliefs and outcome expectations. Nevertheless, in general, studies (Tokar, Buchanan, Subich, Hall & Williams, 2012) show a lack of interest in these experiences despite having a fundamental role in learning (Lent & Fouad, 2011). In this regard, some researchers have begun to study mechanisms that contribute to the formation of these beliefs (Lopez & Lent, 1992; Usher & Pajares, 2009; Usher & Pajares, 2006).

Bandura (1997) emphasizes that self-efficacy beliefs develop according to the interpretation that subjects make of the information arising from four self-efficacy sources: mastery experience, vicarious learning, social persuasions, and physiological and emotional states. The mastery is considered the most important source of self-efficacy, which refers to the previous successful experiences achieved by the student in a particular area. A second source is vicarious learning in which students evaluate their abilities by comparing their performance with their peers' and by how peers judge their own academic abilities. Social persuasion is the third source and contributes by messages that come from people who are truthful for the student, reinforcing effort and self-confidence. Lastly, physiological and emotional states such as anxiety, stress, fatigue, and positive moods, among others, may affect subject's performance. Students learn to interpret their physiological activity as an indicator of the personal

competence and as an instrument to evaluate their performance.

Much of the research in the area of self-efficacy sources has shown that mastery experience has a strong predictive power in different academic domains (Joët, Usher & Bressoux, 2011), followed by social persuasion, vicarious learning, and negatively physiological and emotional states (Lopez, Lent, Brown & Gore, 1997; Klassen, 2004). However, several studies have failed to confirm these results, instead, it was observed that only some sources correlated with self-efficacy (Anderson & Betz 2001; Klassen 2004). For example, it has been indicated that personal (e.g. age and gender) and cultural-contextual (e.g. race/ethnicity) factors may mediate the relationship between self-efficacy and academic performance (Joët et al., 2011). With regard to gender, a few studies (Britner & Pajares, 2006; Lent, Lopez & Bieschke, 1991; Pajares, Johnson, & Usher, 2007) have not observed differences between gender in domains such as science, math, and writing when dissimilar age groups were considered, whereas other studies have found no significant difference in sixth graders according to different subjects (Joet et al., 2011; Usher & Pajares, 2006). On the other hand, research on ethnic-racial factors have shown that interpretation of facts in terms of optimistic beliefs (vs. pessimists) is even more important than the results obtained by Indo-Canadian and African American students. According to these results, social persuasion makes a central contribution because students give more attention to supportive messages (Graham, 1994; Klassen, 2004).

Regarding the instruments designed to evaluate self-efficacy sources in Mathematics, one group is a body of studies focused on college students (Matsui, Matsui & Ohnishi, 1990; Lent et al., 1991) and high school students (Lopez & Lent, 1992) using traditional instruments. The other group is a body of research pertaining to consider alternative measures and devices (Bates & Khasawneh, 2007; Johnson 2005). In order to

deal with these difficulties and with the lack of coherence among sources assessment, Usher and Pajares (2009) figured out a new version of the scale of self-efficacy sources in Mathematics. The scale has internal structure studies (i.e., exploratory and confirmatory factorial analysis) and temporal stability. According to the authors, some previous studies had used items assessing the previous performance to study the source of mastery, disregarding a relevant measure: students' interpretation on their own achievements. In regard to vicarious learning, some instruments apply only to the modeling that peers or adults can pose, limiting the contribution made by both together, whereas the attempts to assess the physiological-emotional states have only been based on measures of anxiety, ignoring other emotional states. Furthermore, some research have been undertaken using alternative measures for sources of self-efficacy, and instruments that have been not published in the literature (Bates & Khasawneh, 2007; Johnson, 2005).

In our context, researchers have adapted the scale proposed by Usher & Pajares (2009). Item translation studies, exploratory and confirmatory factorial analyses, reliability studies, and predictive validity of self-efficacy beliefs in mathematics studies have been carried out with a pilot sample (n=163) (Cupani, Zalazar-Jaime & Garrido, 2010; Zalazar-Jaime, Aparicio, Ramirez Flores & Garrido, 2011). Results have shown satisfactory values of reliability for mastery experience, physiological and emotional states and social persuasion subscales, but not for vicarious learning. The four sources structure was confirmed when items grouped by the content, by statistics, and by aleatory form were used as subtest indicators, but not when each item was used as indicator (Cupani, Zalazar-Jaime & Garrido, 2010).

Much of the research has been carried out with american teenagers, attending high school and college courses in the areas of science, engineering, and mathematics (Usher & Pajares, 2008;

López et al., 1997; O'Brien, Dukstein, Jackson, Tomlinson & Kamatuka, 1999; Ferry, Fouad & Smith, 2000; Lent et al., 2001), whereas a few studies have replicated results in other cultures and ethnic groups (Klassen, 2004; Usher & Pajares, 2006; Stevens, Olivarez, & Hamman, 2006; Blanco, 2011). For instance, some studies have highlighted that certain characteristics such as the country, social inequality, and cultural values could be associated with academic performance, directly or indirectly, through family and motivation (Chiu & Xihua, 2007). Indeed, in the framework of the SCCT, the transcultural perspective has gained impulse due to the need of considering how the different constructs and models develop in each particular context (Lent & Sheu, 2010; Lent, Brown, Nota, & Soresi, 2003; Lent, Paixao, Da Silva & Leitao, 2010). Even if there are current studies that have evaluated the model of academic performance proposed by the SCCT in our context (Cupani & Gnavi 2007; Cupani & Lorenzo, 2010; Cupani, Richaud de Minzi et al., 2010; Cupani & Pautassi, 2013), no research has has sought to determine how self-efficacy sources contribute to beliefs development.

Therefore, in the present study, we seek por sought to evaluate the internal structure of the Sources of Self-efficacy in Mathematics Scale (SSMS; Usher & Pajares, 2009) and its reliability. Besides, this study also intends to evaluate the academic performance model within the framework of the SCCT, taking into account self-efficacy sources, self-efficacy beliefs, outcome expectations, and goals. In order to do this, participants from public and privates educative centers in the city of Córdoba (Argentina) were selected. The work is focused, particularly, in Mathematics because of students' poor performance level in the national assessment programme (Operativo Nacional de Evaluación; ONE, 2010) as well as in international programmes (Programme International Student Assessment; PISA, 2009). Besides, both programmes emphasize the importance of this field of knowledge that is necessary for subjects adapting to modern societies (Allexsaht-Snider & Hart, 2001; Middleton & Spanias, 1999). In fact, knowledge about the construction of ideas, application of procedures, and abilities to solve problems are critical for learning (Jaafar & Ayub, 2010).

Methodology

Participants

Participants were 574 secondary students from public (31.5%) and private (68.5%) schools in Córdoba (Argentina) because we attempt to represent mid-low and mid-high socioeconomic levels. The sample comprised 341 girls (59.4%) and 233 boys (40.6%), attending 8th and 9th grade of the General Basic School. The age range of students was 12 to 16 years (M = 13.73 years; DS = 0.84). Participants were ethnically homogeneous (mestizos) and were recruited on a voluntary basis, after obtaining research permission to administer the scales from the authorities of the schools (accidental sample; Kumar, 2005).

Materials

Sources of Self-efficacy in Mathematics Scale (SSMS; Usher & Pajares, 2009). This scale comprised 24 items that assess the four sources of self-efficacy (mastery experience, vicarious learning, social persuasion and physiological and emotional states). Participants are asked to respond by using a likert-type scale with five answer options where gradation goes from 1 "In total disagreement" to 5 "In total agreement". The original version of the scale has reliability studies (α ranging from .84 to .88), internal consistency validity studies (exploratory and confirmatory factor analysis), and convergent validity evidence (Usher & Pajares, 2009). In a previous study, the instrument was adapted to our context (Zalazar-Jaime et al., 2011) and internal consistency ranged from α= .61 to α= .83).

Math outcome expectations scale (MOES). The MOES is a Spanish adaptation (Cupani, 2010) of the Math/Science Outcome Expectations Scale (MSOES; Fouad, Smith, & Enochs, 1997). The scale comprised nine items that assess middle school students' beliefs about the potential consequences of achievement in math-related courses and activities. Participants rated each item (e.g., "If I learn math, I will have more options when choosing my major") on a 5-point scale, ranging from 1 (totally agree) to 5 (totally disagree). The original version of this instrument (Fouad et al., 1997) has reported adequate values for internal consistency (α = .88). Studies on the Spanish version (see Cupani, 2010 for a review) show evidence of internal structure (exploratory and confirmatory factor analysis) and internal consistency (α = .85). Reliability was acceptable in the present study, Cronbach's alpha was .84 for MOES scores.

Math Performance Goals Scale (MPGS). The MPGS is the Spanish adaptation (Cupani, 2010) of the subscale for Math/Science Intentions and Goals Scale (Fouad et al., 1997). The test has 10 items that assess middle school students' intentions to pursue and persist in math-related courses in high school. Participants rated each item (e.g., "This year I propose to get good grades in math") on a 5-point scale, ranging from 1 (totally agree) to 5 (totally disagree). The original version of this instrument has reported adequate values for internal consistency (α = .84). Previous studies on the Spanish scale (Cupani, 2010) have indicated that the test is reliable (α = .86) and valid (exploratory and confirmatory factor analysis). The Cronbach's alpha in this study was .86 for MPGS scores.

Logical-Mathematical Self-efficacy Scale (LMSS). The LMSS has six items, and participants are asked to rate each item (e.g., "To solve math equation") on a 10-point scale, ranging from 1 ("I am not confident at all in doing this") to 10 ("I am completely confident about

carrying out this activity successfully"). The LMSS belongs to the revised version of the Multiple Intelligences Self-Efficacy Inventory (MISEI; Pérez & Cupani, 2008). This test measures adolescents' self-efficacy beliefs with regard to academic activities associated with the Multiple Intelligences Model (Gardner, 1999). The revised version can be applied during adolescence (i.e., 13 to 16 years olds). The MISEI-R has adequate reliability (α = .76 to .92) and evidence of internal structure validity through exploratory and confirmatory factor analysis. In the present study, Cronbach's alpha was .88 for LMSS scores.

Procedure

The measures and the authorizations were collected during the same semester. The tests were administrated by the authors to the whole classes during the course of a regular school day. Participants received instructions about how to solve the questionnaires and they respond to all the questions. The different measures were taken with complete classes in three separate sessions, according to the theoretical and causal relations proposed by the SCCT: (1) SMSS, (2) LMSS, MOES, and (3) MPGS.

Analysis

SPSS software for Windows version 19.0 was used to prepare the data. Patterns of missing values were analyzed firstly in order to estimate if the distribution was at random (Tabachnick & Fidell, 2011). Medium average, standard deviation, distribution, asymmetry, and kurtosis were calculated for each item. To assess the index of skewness and kurtosis, the values over ±1.00 were considered as excellent while values less than ±2.00 as adequate (George & Mallery, 2011). Atypical univariate cases were identified by inspecting the z-score of each variable (z> ±3.29 was considered atypical). At the second step, confirmatory factor analysis was conducted to evaluate the feasibility of the model proposed with the four sources of self-efficacy

(Bandura, 1986; Usher & Pajares, 2009). The Model consisted of four correlated latent factors and 24 observable variables (six items per factor). CFA was carried out using MPLUS 6.2 which allows to apply *robust weighted least squares* method. Models fits were evaluated by the following indices: chi-square statistics, comparative fit index (CFI), the Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and weighted root mean square residual (WRMR). CFI and TLI values equal or greater than .90, RMSEA values between .05 and .08, and WRMR values below 1.00 (Yu & Muthén, 2002) indicate an excellent or acceptable model fit.

Structural equation modeling was employed to evaluate SCCT academic performance model, considering different learning experiences (self-efficacy sources), self-efficacy beliefs, outcome expectations, and goals. In order to estimate model fits a two-phase strategy was applied (Kline, 1998). Firstly, a measurement model was evaluated to analyze the latent structure of the measures. Secondly, a parcial structural model was evaluated to observe model fits and variance between variables. For this procedure, an item parcelization method was applied, considering the different indicators in each instrument. In fact, this method is helpful to ensure more stable estimations and a better model fitness (Bandalos, 2002). Thus, three items parcels were generated aleatory for each latent variable (self-efficacy, outcome expectations, and goals) and the sources of self-efficacy scale was used as observed variable.

Results

Confirmatory Factor Analyses (CFA)

A data screening was carried out prior to data analyses. Firstly, missing cases were examined. Results showed that missing cases in SSMS items varied between 0.2% (i.e. item 3, Physiological and Emotional States) to 1.6% (item 6,

Mastery Experience). Because the cases did not exceed 5%, missing data imputation was accomplished by mode substitution (Schafer, 1999). This imputation method was selected due to it allows to consider the 5 options (discrete) self-response scale, whereas other methods (e.g. estimation by maximization) tend to introduce continuous variables, changing the original distribution (Dominguez Lara, 2014). Just one atypical case was found (item 5, social persuasion). Skewness and kurtosis analysis for each item were made in order to check assumptions of normality within the sample. As a result of the study, 19 items showed higher levels of kurtosis and skewness ± 2.00, regarded as inappropriate (George & Mallery, 2011), and they were considered in posterior analysis.

CFA results showed an acceptable fit to the data (CFI .93, TLI .92, WRMR 1.53, RMSEA .08, RMSEA 90% CI .071 to .080). Standardized regression coefficients ($p \leq .01$) of Mastery Experience factor fluctuated from .66 to .87, the coefficient of Social Persuasion factor ranged from .69 to .81, coefficients for Physiological and Emotional States were from .63 a .75, and the standardized regression coefficient of Vicarious Learning ranged from .41 to .60 (see Figure 1).

Besides, composite reliability was estimated for each subscale of the instrument because this method uses items loads and weights, following the subjacent structural model, so that it presents less error variance. Values equal or greater than .70 were considered as acceptable (Nunnally, 1978). Value for mastery experience was $\rho = .89$, for vicarious experience was $\rho = .70$, for social persuasion was $\rho = .90$, and for emotional-physiological states was $\rho = .84$.

Evaluation model

Missing cases were analyzed. The results revealed that the percentage ranged between 5.1% (MHSS) and 8.5% (MPGS). Little's proof (1988)

FIGURE 1. **Confirmatory Factor Analyses. Measurement Model for the 24-Item Sources of Middle School Mathematics Self-Efficacy Scale. All path coefficients were statistically significant (**p<.01).**
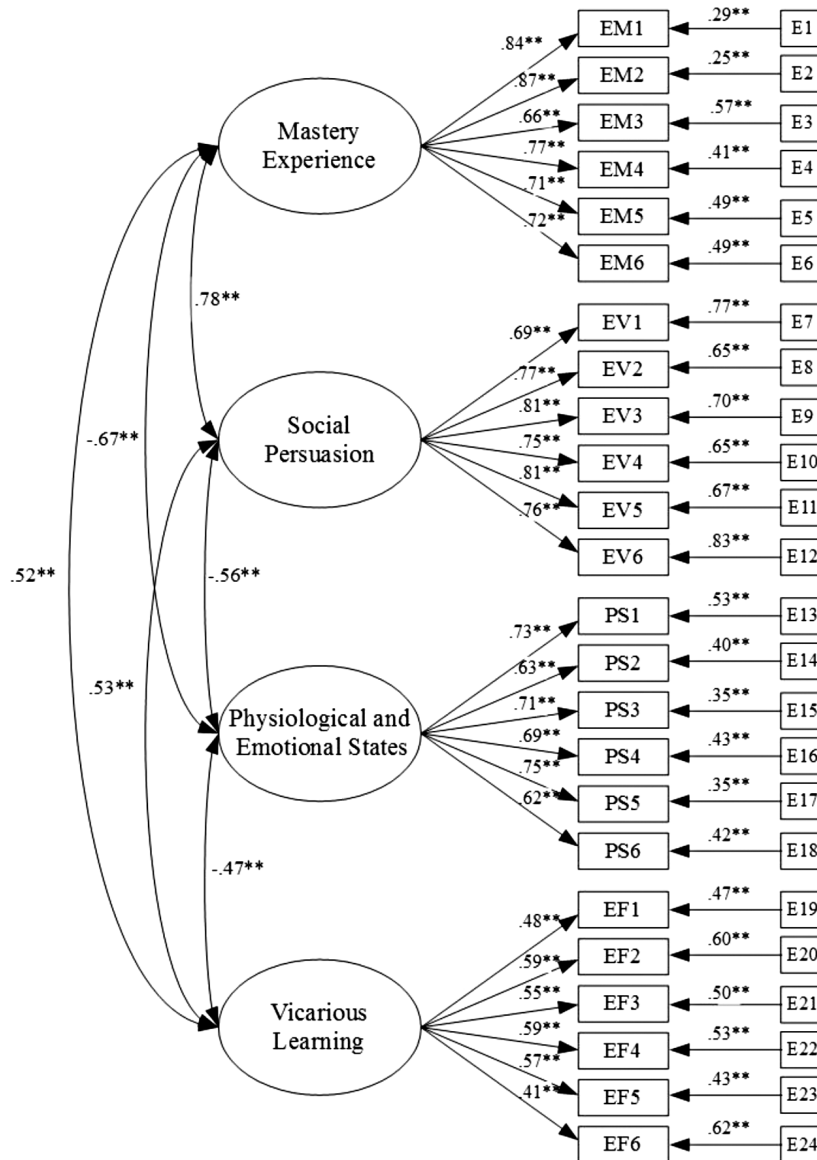
indicated that the pattern was completely missing at random (MCAR; $\chi^2 = 31.12$, df = 37, $p \geq$ .741). Raw scores for each subscale were then imputed using the multiple imputation method (n = 5). There were no values of skewness, kurtosis or outliers above the cut-off point. A bivariate analysis considering Pearson correlation coefficient was carried out with the purpose of figuring out the relationships between the sources (Table 1). According to literature, self-efficacy is associated with mastery experience (.68) and vicarious learning (.36) whereas it is negatively associated with physiological and emotional states (-.55).

TABLE 1. Realiability Coefficients (RC), Means (M), Standard Desviations (SD), and Correlations Among Measures

	Descriptive			Interrelation						
	RC	M	SD	MA	VE	SP	PS	LMSS	MOES	MPGS
Mastery Experience (MA)	.89[a]	18.96	5.53	1.00	.39**	.67**	-.56**	.68**	.30**	.33**
Vicarious Learning (VL)	.70[a]	18.7	4.14		1.00	.41**	-.34**	.36**	.39**	.37**
Social Persuasions (SP)	.90[a]	16.87	5.77			1.00	-.46**	.60**	.33**	.29**
Physiological and Emotional States (PS)	.84[a]	14.89	5.34				1.00	-.55**	-.22**	-.24**
Logical-Mathematical Self-Efficacy (LMSS)	.88[b]	39.01	1.46					1.00	.45**	.39**
Math Outcome Expectations (MOES)	.84[b]	31.26	6.70						1.00	.42**
Math Performance Goals (MPGS)	.86[b]	35.47	6.79							1.00

**p = < .01. [a] Composite reability coefficients (ρ); [b] alpha de cronbach (α).

Confirming the Measurement Model. Three latent variables were included in the measurement model together with nine indicators as observed variables. The quantity of indicators per factor was three. The indices showed the model had an optimal fitness (CFI = .99, TLI = .98, RMSEA = .05 90% CI .030 .064, SRMR = .03, χ^2 = 52.800, df = 24, p = .00) and all factors significantly loaded on to latent variables. Therefore, the fitness of the model appears strong enough to allow report and interpretation of the standardized path estimates (Browne, MacCallum, Kim, Anderson, & Glaser, 2002). The standardized path ($p \le .05$) ranged from .83 to .87 for Self-efficacy; from .76 to .86 for Math Outcome Expectations; and from .77 to .85 for Math Performance Goal.

Partial Model Evaluation. Results indicated the model fit the data well (CFI = .97, TLI = .95, RMSEA = .06 90% CI .049 .072, SRMR = .04, χ^2 = 152.89, df = 52, p = .00), and it explains 27% of the variance in Math Performance Goal. Besides, learning experiences explain 57% of the variance in self-efficacy beliefs in Mathematics and there is a contribution from mastery

experience experience (.40), social persuasion (24), vicarious learning (.09) and, negatively, from physionlogical and emotional states (.-21). Only vicarious learning (.28) and physionlogical and emotional states (.11) explained 31% of the variance in Math outcome expectations. The residuals were also moderate (median = .20, range = −.03 to .46). Figure 2 depicts the path coefficients for the proposed relationships among the variables in the theoretical model.

Discussion

The aim of this study was to assess the factorial structure of the self-efficacy sources scale and to evaluate the model of achievement proposed by the SCCT. We focused on Math because of the poor performance obtained by Argentinean secondary students and the concern to address how the different constructs of the SCCT operates in a particular context.

The theoretical structure of the four sources of self-efficacy model was corroborated as feasible
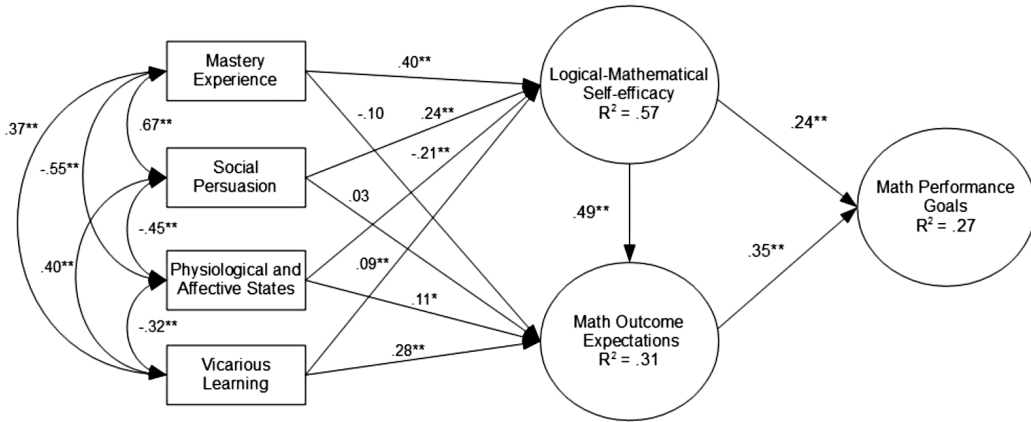
for our population (confirmatory factor analysis). However, these results differ from those already reported in our context (Cupani, Zalazar-Jaime et al., 2010), in which the four sources and 24 indicators (items) model do not properly fit the data. We believe that this difference is due to the parameters estimation used in this study. In fact, AFC studies generally used the maximum likelihood method (ML). Although this technique considers that the observed variables are continuous and normally distributed, these requirements are not met when the observed data are discrete (ordinal variables, for instance). Consequently, it could generate problems in model fit: the chi-square is enlarged, the parameters are underestimated, and standard error estimates tend to be biased downward (Muthén & Kaplan, 1985, 1992). By contrast, the *robust minimum weighted squares* (WLS) method (used in our study) is considered the most appropriate to deal with categorical (Likert scales, for example) or not normally distributed data (Raykov & Marcoulides, 2006), and when the sample size is not large enough (≥ 200) (Muthén, du Toit, & Spisic., 1997; Flora & Curran, 2004).

Reliability rates in this study were satisfactory and the factors presented values higher than ≥ .80

(Nunnally, 1978), except from vicarious learning even if its reliability factor was acceptable (.70). These findings are also consistent with previous studies (Lent et al., 1991). A plausible explanation could be related to the multidimensional nature of the sources self-efficacy construct, which cannot be assessed through an unique subscale (Usher & Pajares, 2008). Moreover, as suggested by Bandura (1997), another possible explanation could be the fact that teenagers may be less likely to be influenced by learning models, giving little relevance to them. Thus, future studies in our context should consider the influence of the social support that comes from parents, teachers, close friends, and classmates as separate factors. According to the literature, close friends and classmates may have a more important role than adults (teachers and parents) because of the similarity in personal characteristics (such as age and sex; Demaray & Malecki, 2002). Furthermore, despite the importance of one source or another, they all together have a differential effect on students' academic performance (Kenny, Blustein, Chaves, Grossman & Gallagher, 2003; Baker, 1999; Schultheiss, Palma, Predragovich, & Glasscock, 2002).

On the other hand, structural equation model indicated that the model proposed by Lent et

al. (1994) fits adequately to the local population in our study. In fact, as observed by Bandura (1997) and other researchers (Lent, Brown, Cover, & Nijjer, 1996, Lent et al, 1991; Lent, Lopez, Brown, & Gore, 1996), the self-efficacy sources contributed to explain an important percentage of the variance in Math self-efficacy beliefs: mastery experience, social persuasion, and vicarious learning contributed positively, whereas pshysiological and emotional states negatively.

The SCCT consider that the sources of self-efficacy contribute to develope the outcome expectations. In this study, we partially corroborate the assertion. Indeed, the vicarious learning sources and the pshysiological and emotional states showed a contribution to the outcome expectations development. As it has been observed in other local studies (Cupani & Lorenzo, 2010, Cupani & Pautassi, 2013) and international research (Ferry et al., 2000; Navarro, Flores & Worthington, 2007), the mastery experience did not contribute significantly to expectations. These contradictory results could be explained by the lack of articulation between learning experiences and outcome expectations within the Social Cognitive Theory (Bandura, 1986) and the SCCT (Lent et al., 1994).

Another plausible explanation could be related to the way in which outcome expectations is operationalized. As Fouad & Guillen (2006) have argued, the measures only consider the symbolic dimension, excluding self-evaluation (e.g., If I do well in Mathematics or Science, I'll feel better), and physiological aspects (e.g., I will be anxious if I don't do well in Mathematics or Science) and focusing mainly on the positive results of actions at the expense of the negative aspects (Swanson & Gore, 2000). Future research should explore how these sources of self-efficacy contribute to develope outcome expectations using a scale that measures different dimensions of the construct. Despite the fact that the sample was accidental and not probabilistic, other aspects should be kept in mind as potential limitations to generalize these results. One potential limitation is that part of the students belongs to private rather than public institutions. It should be noted that public education in Argentina is characterized as free and unrestricted, while private education requires payment of a monthly fee and, generally, has a higher workload and infrastructure. Thus, these distinctive features could suggest that the degree of parental involvement and students' commitment in the learning processes may be greater in private schools than in public schools (Beltran, 2012). Likewise, these particular aspects could support the idea that the education provided by private schools may have higher quality and students could find more learning opportunities. However, this assumption was not supported by other studies (Suarez, Torella, Perazza, & Yacov, 2011). A third limitation is that the associations found in this study between sources of self-efficacy and self-efficacy beliefs cannot be generalized to other academic domains. In other words, the sources that contribute to enhance confidence in mathematics can be different from those sources needed to enhance confidence in other academic domains, such as writing or learning a foreign language (Usher & Pajares, 2009).

In summary, results encourage further research. In fact, the sources of self-efficacy scale appear to be a feasible option to assess self-efficacy among Argentinean adolescents. In future studies, it could be relevant to focus on comparing how self-efficacy sources contribute to the development of self-efficacy beliefs in mathematics across different groups (considering separately gender, skills, and socioeconomic level as grouping factors). Moreover, forthcoming studies should adapt this scale to other domains, such as language and science, and explore how other variables (i.e. personality traits) contribute indirectly to self-efficacy beliefs development.

References

Allexsaht-Snider, M., & Hart, L. E. (2001). "Mathematics for all": How do we get there? *Theory Into Practice*, *40 (2),* 93-101.

Anderson, S. L., & Betz, N. E. (2001). Sources of social self-efficacy expectations: Their measurement and relation to career development. *Journal of Vocational Behavior*, *58*, 98-117.

Baker, J. A. (1999). Teacher–student interaction in urban at-risk classrooms: Differential behavior, relationship quality, and student satisfaction with school. *The Elementary School Journal*, *100*, 57-70.

Bandalos, D. L. (2002). The effects of item parceling on goodness-of-fit and parameter estimate bias in structural equation modeling. *Structural Equation Modeling*, *9 (1),* 78-102.

Bandura, A. (1986). *Pensamiento y Acción*. Barcelona: Martínez Roca.

Bandura, A. (1997). *Self-efficacy: The excercise of control*. New York: Freeman.

Bates R., & Khasawneh S. (2007). Self-Efficacy and college students' perceptions and use of online learning systems. *Computers in Human Behavior*, *23*, 175-191.

Beltran, M. (6 de julio de 2012). Escuela pública, colegio privado: ¿decadencia versus calidad? *Perfil*. Recuperado de http://www.perfil.com/ediciones/elobservador/-20127-691-0007.html

Blanco, A. (2011). Applying social cognitive career theory to predict interests and choice goals in statistics among Spanish psychology students. *Journal of Vocational Behavior*, *78*, 49-58.

Britner S. L., & Pajares F. (2006). Sources of science self-efficacy beliefs of middle scholl students. *Journal of Research in Science Teaching*, *43 (5),* 485-499.

Browne, M. W., MacCallum, R. C., Kim, C. T., Andersen, B. L., & Glaser, R. (2002). When fit indices and residuals are incompatible. *Psychological methods*, *7 (4),* 403.

Chiu, M. M., & Xihua, Z. (2007). Family and motivation effects on mathematics achievement: Analyses of students in 41 countries. *Learning and Instruction*, *18 (4),* 321-336.

Cupani, M., & Gnavi, G. A. (2007). Un modelo social-cognitivo del rendimiento en Matemática: estudios de tres escalas. *Perspectivas en Psicología*, *4 (1),* 19-27.

Cupani, M., & Lorenzo, J. (2010). Evaluación de un modelo social-cognitivo del rendimiento en matemática en una población de preadolescentes argentinos. *Infancia y Aprendizaje, 33 (1),* 63-74.

Cupani, M., & Pautassi, R. M. (2013). Predictive Contribution of Personality Traits in a Sociocognitive Model of Academic Performance in Mathematics. *Jornal of Career Assessment*, *21 (3),* 395-413.

Cupani, M. (2010). Validación de una nueva escala de Expectativas de Resultado y Metas de Rendimiento para Matemáticas. *Interdisciplinaria*, *27 (1),* 111-127.

Cupani, M.; Zalazar-Jaime, M. F., & Garrido, S. (2010). Análisis factorial confirmatorio de la escala de fuentes de autoeficacia para matemáticas. II Encuentro de Docentes e Investigadores de Estadística en Psicología. Facultad de Psicología, Universidad de Buenos Aires.

Demaray, M. K., & Malecki, C. K. (2002). The relationship between perceived social support and maladjustment for students at risk. *Psychology in the Schools*, *39*, 305-316.

Domínguez Lara, S. A. (2014). ¿Matrices Policoricas/Tetracoricas o Matrices de Pearson? Un estudio metodológico. *Revista Argentina de Ciencias del Comportamiento*, *6 (1),* 39-48.

Ferry, T. R., Fouad, N. A., & Smith, P. L. (2000). The role of family context in a social cognitive model for career-related choice behavior: A math and science perspective. *Journal of Vocational Behavior*, *57*, 348-364.

Flora, D. B., & Curran, P. J. (2004). An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. *Psychological methods*, *9 (4),* 466.

Fouad, N. A., & Guillen, A. (2006). Outcome expectations: Looking to the past and potential future. *Journal of Career Assessment*, *14 (1),* 130-142.

Fouad, N. A., Smith, P. L., & Enochs, L. (1997). Reliability and validity evidence for the Middle School Self-Efficay Scale. *Measurement and Evaluation in Counseling and Development*, *30*, 4-16.

Gardner, H. (1999) *Intelligence Reframed. Multiple intelligences for the 21st century*. New York: Basic Books.

George, D., & Mallery, P. (2011). *IBM SPSS Statistics 21 step by step: A simple guide and reference (13th ed.)*. Boston: Pearson Education.

Graham, S. (1994). Motivation in African Americans. *Review of Educational Research*, *64*, 55-117.

Jaafar, W. M. W., & Ayub, A. F. M. (2010). Mathematics Self-efficacy and Meta-Cognition Among University Students. *Procedia Social and Behavioral Sciences*, *8*, 519-524.

Joët, G., Usher, E. L., & Bressoux, P. (2011). Sources of self-efficacy: An investigation of elementary school students in France. *Journal of Educational Psychology*, *103 (3),* 649-663.

Johnson, R. D. (2005). An empirical investigation of sources of application-specific computer-self-efficacy and mediators or the efficacy-performance relationship. *International Journal of Human-Computer Studies*, *62*, 737-758.

Kenny, M. E., Blustein, D. L., Chaves, A., Grossman, J. M., & Gallagher, L. A. (2003). The role of perceived barriers and relational support in the educational and vocational lives of urban high school students. *Journal of Counseling Psychology*, *50*, 142-155.

Klassen, R. (2004). A cross-cultural investigation of the efficacy beliefs of South Asian immigrant and Anglo non-immigrant early adolescents. *Journal of Educational Psychology*, *96*, 731-742.

Kline, R. B. (1998). *Principles and practices of structural equation modeling.* New York: Guilford.

Kumar, R. (2005). *Research Methodology. A Step-By-Step Guide for Beginners* (2nd ed.). Singapore, Pearson Education.

Lent, R., Brown, D., & Hackett, G. (1994) Toward a Unifying Social Cognitive Theory of Career and Academic Interest, Choice, and Performance. *Journal of Vocational Behavior*, *45*, 79-122.

Lent, R. W., & Fouad, N. A. (2011). The self as agent in social cognitive career theory. In P. J. Hartung & L. M, Subich (eds.), *Developing self in work and career: Concepts, cases, and contexts* (pp. 71-87).Washington, DC: American Psychological Association.

Lent, R. W., & Sheu, H. (2010). Applying social cognitive career theory across cultures: Empirical status. In J. G. Ponterotto, J. M. Casas, L. A., Suzuki & C. M Alexander, (eds.), *Handbook of multicultural counseling* (3rd ed.) (691-701). Thousand Oaks, CA: Sage.

Lent, R. W., Brown, S. D., Brenner, B., Chopra, S. B., Davis, T., Talleyrand, R., & Suthakaran, V. (2001). The role of contextual supports and barriers in the choice of math/science educational options: A test of social cognitive hypotheses. *Journal of Counseling Psychology*, *48*, 474-483.

Lent, R. W., Brown, S. D., Cover, M. R., & Nijjer, S. K. (1996). Cognitive assessment of the sources of mathematics self-efficacy: A thought-listing analysis. *Journal of Career Assessment*, *4 (1)*, 55-46.

Lent, R. W., Brown, S. D., Nota, L., & Soresi, S. (2003). Testing social cognitive interest and choice hypotheses across Holland types in Italian high school students. *Journal of Vocational Behavior*, *62 (1),* 101-118.

Lent, R. W., López, F. G., & Bieschke, K. J. (1991). Mathematics self-efficacy: Sources and relation to science-based career choice. *Journal of Counseling Psychology*, *38*, 424-430.

Lent, R. W., López, F. G., Brown, S. D., & Gore, P. A. (1996). Latent structure of the sources of mathematics self-efficacy. *Journal of Vocational Behavior*, *49*, 292-308.

Lent, R. W., Paixao, M. P., Da Silva, J. T., & Leitao, L. M. (2010). Predicting occupational interests and choice aspirations in Portuguese high school studentes: A test of social cognitive career theory. *Journal of Vocational Behavior*, *76*, 244-251.

Lent, R. W., Singley, D., Sheu, H. B., Schmidt, J. A., & Schmidt, L. C. (2007). Relation of Social-Cognitive Factors to Academic Satisfaction in Engineering Students. *Journal of Career Assessment*, *15 (1),* 87-97.

Little, R. (1988). A test of missing completely at random for multivariate data withmissing values. *Journal of the American Statistical Association*, 1198-1202.

López, F. G., & Lent, R. W. (1992). Sources of mathematics self-efficacy in high school students. *The Career Development Quarterly*, *41*, 3-12.

López, F. G., & Lent, R. W. (1992). Sources of mathematics self-efficacy in high school students. *Career Development Quarterly*, *41*, 3-12.

López, F. G., Lent, R. W., Brown, S. D., & Gore, P. A. (1997). Role of social-cognitive expectations in high school students mathematics-related interest and performance. *Journal of Counseling Psychology*, *44*, 44-52.

Matsui, T., Matsui, K., & Ohnishi, R. (1990). Mechanisms underlying math self-efficacy learning of college students. *Journal of Vocational Behavior*, *37*, 225-238.

Middleton, J. A., & Spanias, P. A. (1999). Motivation for Achievement in Mathematics: Findings, Generalizations, and Criticisms of the Research. *Journal for Research in Mathematics Education*, *30 (1),* 65-88.

Muthén, B., & Kaplan, D. (1985). A comparison of some methodologies for the factor analysis of non-normal Likert variables. *British Journal of Mathematical and Statistical Psychology*, *38*, 171-189.

Muthén, B., & Kaplan, D. (1992). A comparison of some methodologies for the factor analysis of non-normal Likert variables: A note on the size of the model. *British Journal of Mathematical and Statistical Psychology*, *45*, 19-30.

Muthén, B., du Toit, S.H.C., & Spisic, D. (1997). Robust inference using weighted least squares and quadratic estimating equations in latent variable modeling with categorical and continuous outcomes. Unpublished technical report.

Navarro, R. L., Flores L. Y., & Worthington R. L. (2007). Mexican American middle school students' goal intentions in mathematics and science: A test of social cognitive career theory. *Journal of Counseling Psychology*, *54 (3),* 320-335.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.

O'Brien, K. M., Dukstein, R. D., Jackson, S. L., Tomlinson, M. J., & Kamatuka, N. A. (1999). Broadening career horizons for students in at-risk environments. *Career Development Quarterly*, *47*, 215-229.

Operativo Nacional de Evaluación (ONE, 2010). *Censo de Finalización de la Eduación Secundaria. Informe de Resultados*. DINIECE, Ministerio de Educación de la Nación.

Pajares, F., Johnson, M. J., & Usher, E. L. (2007). Sources of writing self-efficacy beliefs of elementary, middle, and high school students. *Research in the Teaching of English*, *42*, 104-120.

Pérez, E., & Cupani, M. (2008). Validación del inventario de autoeficacia para inteligencias múltiples revisado (IAMI-R). *Revista Latinoamericana de Psicología*, *40 (1),* 47-58.

Programme International Student Assessment (PISA, 2006). *Organisation for Economic Cooperation and Development-OECD*. Washington, DC: NCES.

Raykov, T., & Marcoulides, G. A. (2006). *A First Course in Structural Equation Modeling* (Second Edition). Mahwah, NJ: Lawrence Erlbaum Associates.

Schafer, J. L. (1999). Multiple imputation: a primer. *Statistical Methods in Medical Research*, *8*, 3-15.

Schultheiss, D. E. P., Palma, T., Predragovich, K., & Glasscock, J. (2002). Relational influences on career paths: Siblings in context. *Journal of Counseling Psychology*, *49*, 302-330.

Stevens, T., Olivárez, A., & Hamman, D. (2006) The role of cognition, motivation, and emotion in explaining mathematics achievement gap between hispanic and white students. *Hispanic Journal of Behavioral Sciences*, 28, 161-186.

Suárez, G., Torella, J. A., Perazza, R., & Yacov, R. (2011). *Mapas y Recorridos de la Educación de Gestión Privada en la Argentina*. Buenos Aires: Aique Grupo Editor.

Swanson, J. L., & Gore, P. A. (2000). Advances in vocational psychology theory and research. In S. D. Brown & R. W. Lent (eds.), *Handbook of counseling psychology* (3rd ed., pp. 233-269). New York: John Wiley.

Tabachnick, B. G., & Fidell, L. S. (2011). *Using Multivariate Statistics (6th ed.)*. Needham Heights: Pearson.

Tokar, D. D., Buchanan, T. S., Subich, L. M., Hall, R. J., & Williams, C. M. (2012). A structural examination of the Learning Experiences Questionnaire. *Journal of Vocational Behavior*, *80*, 50-66.

Usher, E. L., & Pajares, F. (2006). Sources of academic and self-regulatory efficacy beliefs of entering middle school students. *Contemporary Educational Psychology*, *31 (2),* 125-141.

Usher, E. L., & Pajares, F. (2009). Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology*, *34 (1),* 89-101.

Usher, E. L., & Pajares, F. (2008). Self-efficacy for self-regulated learning: A validation study. *Educational and Psychological Measurement*, *68*, 443-463.

Yu, C. Y., & Muthen, B. (2002, April). Evaluation of model fit indices for latent variable models with categorical and continuous outcomes. *In annual meeting of the American Educational Research Association, New Orleans, LA*.

Zalazar-Jaime, M. F., Aparicio, M. M. D., Ramírez Flores, C. M., & Garrido, S. (2011). Estudios preliminares de adaptación de la escala de fuentes de autoeficacia para matemáticas. *Revista Argentina de Ciencias del Comportamiento*, *3 (2),* 1-6.

Resumen

Evaluación del modelo de rendimiento de la Teoría Social Cognitiva de la Carrera: aportes de las experiencias diferenciales de aprendizaje

INTRODUCCIÓN. El propósito de este estudio consistió en evaluar la estructura de la escala de fuentes de autoeficacia en matematica (Usher & Pajares, 2009) y el modelo de rendimiento académico propuesto por la Teoría Social Cognitiva de la Carrera (SCCT, Lent, Brown & Hackett, 1994), considerando las fuentes de autoeficacia (también denominadas como experiencias diferenciales de aprendizaje), creencias de autoeficacia, expectativas de resultado y metas. **MÉTODO**. Participaron 574 adolescentes argentinos (edades comprendidas entre 12 a 16 años, *M* = 13.76 años). **RESULTADOS**. El análisis factorial confirmatorio indicó un ajuste aceptable a los datos. Respecto de la consistencia interna, se observó que las cuatro fuentes de autoeficacia mostraron valores apropiados (>.70). Sin embargo, tal como sucede en otros estudios, la fuente de experiencia vicaria continúa presentando bajos coeficientes de confiabilidad. Por su parte, el modelo de ecuaciones estructurales indicó que el modelo de rendimiento propuesto por la SCCT se ajusta adecuadamente a la población local de estudio. La contribución de las fuentes de autoeficacia sobre las creencias de autoeficacia fue consistente con lo reportado por la literatura. En el caso de las expectativas de resultados, se observó que solo las fuentes de aprendizaje vicario y estados fisiológicos y emocionales presentaron

contribuciones significativas. **DISCUSIÓN**. Se discuten los resultados, analizan las limitaciones y se proponen nuevos estudios.

Palabras claves: *Autoeficacia, Fuentes de autoeficacia, Matemática, Teoría Social Cognitiva, Teoría Social Cognitiva de la Carrera, Rendimiento académico, Adolescentes argentinos.*

Résumé

Evaluation d'un modèle de performance academique d'après la théorie sociale cognitive d'orientation scolaire et professionnelle. Contributions des experiénces d'apprentissage différentiel

INTRODUCTION. Cet article vise à évaluer la structure de l'échelle des sources d'auto-efficacité en mathématiques (Usher & Pajares, 2009) et le modèle de performance scolaire proposé par la théorie sociale cognitive de l'orientation scolaire et professionnelle (SCCT, Carême, Brown & Hackett, 1994). Avec ce propos, nous avons tenu en compte les sources de l'auto-efficacité (aussi appelées 'expériences différentielles d'apprentissage'), les croyances d'auto-efficacité, ainsi que les expectatives sur les résultats et les buts. **MÉTHODE.** Notre échantillon était composée de 574 adolescents argentins (âgés de 12 à 16 ans, M = 13,76 ans). **RÉSULTATS.** L'analyse factorielle confirmatoire a indiqué un ajustement acceptable aux données. En ce qui concerne la cohérence interne, les quatre sources de l'auto-efficacité ont montré des valeurs appropriées (> 0,70). Pourtant, de la même manière que dans des autres études, la source de l'expérience indirecte présente un coefficient de fiabilité faible. De son côté, le modèle d'équation structurelle a indiqué que le modèle proposé par la théorie SCCT s'adapte convenablement à l'étude de la population locale. La contribution des sources de croyances d'auto-efficacité aux croyances d'auto-efficacité a été cohérent avec ce qui est rapportée dans la littérature. Dans le cas des résultats, seules les sources d'apprentissage indirect et les états physiologiques et émotionnels ont montré des conclusions significatives. **DISCUSSION.** Les résultats sont discutés, les limitations sont analysés et des études complémentaires sont proposées.

Mots clés: *Auto-efficacité, Sources d'auto-efficacité, Mathématiques, Théorie de la cognition sociale, Théorie sociale cognitive de l'orientation scolaire et professionnelle, Résultats scolaires, Adolescents argentins.*

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