

# ■ Development, factorial structure and reliability of the Multidimensional Scale of Emotional Regulation for Adolescents (MSERA): Preliminary analysis

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## Abstract

The evaluation of emotion regulation has been focused on the cognitive component and the emotion dysregulation. However, it is also important to include emotion identification and modulation of the response for the evaluation of the regulatory process. The aim of this study was to develop a multidimensional measure of emotion regulation process in adolescents and to examine its factorial structure and reliability. An instrumental study was performed with 887 Mexican adolescents aged 13 to 18. A preliminary version of the Multidimensional Scale of Emotion Regulation for Adolescents (MSERA) was developed based on focus groups and considering the assumptions of the theoretical models. The exploratory factor analysis yielded 56 items distributed in eight factors: Recognition of positive emotions, Expression of positive emotions, Emotional control, Suppression, Cognitive change, Physical reactions, Recognition of negative emotions and Difficulty to regulate. A confirmatory factor analysis using the Robust Unweighted Least Squares, corroborated the initial solution of eight factors and showed acceptable fit indexes, considering 47 items. Ordinal alpha coefficients obtained for the factors of the final model, indicated a good internal consistency (.85-.95). Results suggest that the MSERA can be used as a valid and reliable measure of emotion regulation in adolescents.

*Keywords: Adolescence; Emotion regulation; Validity; Reliability; Factorial structure.*

## Resumen

*Desarrollo, estructura factorial y fiabilidad de la Escala Multidimensional de Regulación Emocional para Adolescentes (MSERA).* La evaluación de la regulación emocional se ha enfocado en el componente cognitivo y la desregulación; sin embargo, es importante incluir la identificación emocional y la modulación de respuesta para la evaluación del proceso regulatorio. El objetivo de esta investigación fue desarrollar una medida multidimensional del proceso de regulación emocional en adolescentes y examinar su estructura factorial y fiabilidad. Se realizó un estudio instrumental con 887 adolescentes mexicanos de 13 a 18 años. Se elaboró una versión preliminar de la Escala Multidimensional de Regulación Emocional para Adolescentes (MSERA) basada en los grupos focales y en modelos teóricos. El análisis factorial exploratorio arrojó 56 ítems distribuidos en ocho factores: Expresión de emociones positivas, Control emocional, Supresión, Cambio cognitivo, Reacciones físicas, Reconocimiento de emociones negativas y Dificultad para regular. El análisis factorial confirmatorio con el método de mínimos cuadrados robustos no ponderados, corroboró la solución de ocho factores con 47 ítems, con índices de ajuste aceptables. Las alfas ordinales del modelo final (.85-.95), indicaron buena consistencia interna. Los resultados sugieren que el MSERA se podría utilizar como una medida válida y fiable, de la regulación emocional en adolescentes.

*Palabras clave: Adolescencia; Regulación emocional; Validez; Fiabilidad; Estructura factorial.*

From an ecological perspective of development, research and prevention of mental health problems involves understanding the process of emotion regulation (Cicchetti & Ng, 2014). Both, positive and negative emotion, as well as, successful regulatory skills have been associated with adaptive healthy development and resilience (Troy & Mauss,

2011), and when there are difficulties in regulating emotions in stressful situations or dysregulation it is associated with psychopathology (Bradley et al., 2011). Generating and emotion regulation have related to multiple developmental issues and process as maltreatment (Lavi, Katz, Ozer, & Gross, 2019) or attachment (Mikulincer & Shaver, 2019)

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during childhood and adolescence. So, emotion management is an important process for mental health (Cole & Hall, 2008). Emotions can be defined as biological responses, mostly of short duration that were originated from external or internal stimuli, which imply a perceptual and a quick appraisal process of a whole situation, then emotion can be considered also as a process by itself. Emotions have the capacity to regulate other processes and prepare the individual to act in favorable or unfavorable conditions, which imply a wide emotion regulation process (Cole & Hall, 2008; Cole, Martin, & Dennis 2004).

Study of emotions is complicated because of they are part of many developmental processes across lifespan as childhood and adolescence. Particularly, the emotion regulation has been associated with others constructs and processes, for example, coping (Connor-Smith & Compas, 2004), or emotional intelligence (Salovey, 2005). However, it is still necessary to define and investigate emotion regulation as a differentiate process (Cole, 2014) from others processes as coping and avoid the indiscriminate use of both constructs (Compas et al., 2017). Although coping is considered a controlled stress responses process and involves conscious, determined and intentional efforts, thoughts and behaviors (Lazarus & Folkman, 1984) in similar way to emotion regulation, it focuses on processes that occur exclusively in response to acute or stressful situations or circumstances, whereas emotion regulation is a complex process that includes a large range of emotional responses where both positive and negative emotions can arise across diverse situations, not only to stressful events (Compas et al., 2017). On the other hand, emotional intelligence, is a construct to refer identification and managing of emotions one's own and the others, so, imply perceiving, using, understanding and managing emotions in a social context (Salovey & Grewal, 2005), whereas, emotion regulation imply the control, modulation and expression of emotions of individual in many situations.

Emotion regulation has been defined in different ways from diverse perspectives. Thompson (1991) defined emotional regulation as the extrinsic and intrinsic processes responsible for monitoring, evaluating and modifying certain emotion reactions, specifically their intensity and their temporal characteristics, implying physiological, cognitive and behavioral regulatory processes. According to Gross (1998, pp. 275) emotion regulation refers to "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions". Besides emotion regulatory may be voluntary and involuntary, conscious and unconscious similarly to coping (e. g. Connor-Smith & Compas, 2004), influencing the emotion generative process. Eisenberg (2012, pp. 134), proposes that emotion regulation is a "process of initiating, avoiding, maintaining, modulating, or changing the occurrence, intensity or duration of internal feeling states, emotion-related physiological process and/or emotion-related cognitions and goals...", so emotion regulation is a continuous process that involved skills to manage and change emotional experiences related to physiological states across diverse situation.

Most of perspectives agree that emotion regulation includes emotional identification, which refers to examining and distinguishing emotions; its management, that imply control and manipulation of emotion and emotional reactions; and its expression, that involves behavioral and physiological responses of the individual to emotion. These three dimensions should be included for the evaluation of the emotional regulation process (Eisenberg, Spinrad, & Eggum, 2010; Thompson 1991), however, not all emotion regulation models integrate these dimensions.

There are several models of emotion regulation. For instance, the Integrative Model of Emotion Regulation (IMER) of Gratz and Roemer (2004), which focuses on the difficulty of regulating negative emotions. The Cognitive Model of Emotion Regulation (CMER) proposed by Garnefski and Kraaij (2007; 2018) refers to the cognitive way of handling the intake of emotionally arousing information and consider that cognitive strategies are different, and separate processes from behavioral coping strategies. These models, both IMER and CMER evaluate the regulatory process of specific situations; however, they have not been able to differentiate between the emotion regulation process from coping process. These models seem to use concepts as coping and emotion regulation interchangeably, whereas the Process Model of Emotion Regulation distinguishes these processes (Compas et al., 2017; Gross, 2015).

The Process Model of Emotion Regulation (Gross, 1998; 2015), proposes that emotion regulation process involves the generation of emotions and strategies and distinguishes five sets of emotion regulatory processes: situation selection, situation modification, attention display, cognitive change and response modulation. These sets of processes are grouped into two levels or broader strategies (Gross & John, 2003), the emotional regulation centered on the antecedent, which occurs before the emotion is generated, and emotional regulation centered on the response, which occurs after the emotion is generated.

The evaluation of emotional regulation has been carried out with measures that are based on these models. For example, the Difficulties in Emotion Regulation Scale (DERS, Gratz & Roemer, 2004), includes 36 items that assess clinically relevant difficulties in emotion regulation (global  $\alpha = .93$ , explained variance = 55.68%) for the strategies assessment like awareness, clarity, acceptance, control of impulses, ability to achieve in desired goals while experiencing negative emotion. Another measure is the Cognitive Emotion Regulation Questionnaire (Garnefski & Kraaij, 2007), a 36-item questionnaire that distinguishes nine cognitive emotion regulation strategies used in stressful experiences: self-blame, other-blame, rumination, catastrophizing, putting into perspective, positive refocusing, positive reappraisal, acceptance and planning (Cronbach's alphas ranging from .75 to .87).

Based on the Process Model of Emotion, the Emotion Regulation Questionnaire (ERQ) consists of 10 items covering only two factors: cognitive reappraisal (six items) and suppression (four items) and has been used in different populations, for example, in undergraduate students (e.g. Gross & John, 2003; Sala et al., 2012). A validation was carried out in a population of 18 to 80 years old in Spain (Cabello, Salguero, Fernández-Berrocal, & Gross, 2012) and also in a population of Croatia from 18 to 68 years old (Gračanin, Kardum, & Gross, 2019), in both versions the original dimensions of ERQ were confirmed, with good psychometric properties. The Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA), has been used with adolescents from several countries, such as youngsters from Australia (e.g. Gullone & Taffe, 2012) and Spain (e. g. Martín-Albo, Valdivia-Salas, Lombas, & Jiménez, 2018); the factorial structure has been maintained and it has shown good psychometric properties.

The ERQ (Gross & John, 2003) was also validated for the Mexican population, with children and adolescents aged 8 to 19 (Zamudio, 2017), and it did, also, maintain the 10 items distributed in two factors with an acceptable internal consistency for cognitive reappraisal ( $\alpha = .74$ ), and for marginal suppression factor ( $\alpha = .62$ ). A test-retest reliability of  $r = .47$  and  $r = .46$  respectively was reported. However, the author reports that there are still difficulties for a real comprehension in the assessment of the frequency and the identification of emotion regulation by Mexican children and adolescents.

DERS (Gratz & Roemer, 2004) was validated in Mexican adolescents (Tejeda, Robles, González, & Andrade, 2012), from the originally scale developed in adult population. This version was integrated with 24 items distributed in four factors, non-acceptance, goals, awareness and clarity showing a good psychometric property (explain variance = 45.30%; Cronbach's alpha = .93; test-retest reliability:  $r = .88$ ) but not all the original factors were loaded.

There are still few instruments developed with Mexican population for the evaluation of emotional regulation in adolescents. For example, the "*Instrument of Emotional Regulation for Adolescents*" (IREA by its acronym in Spanish; Ramírez, 2015), is a measure of 14 vignettes focused on coping strategies (active anxiety or impulsivity, anxiety or passive impulsivity, seeking support and avoidance as coping strategies, and distraction or minimization), however, it focuses on situations of distress, stress or anxiety rather than emotional regulation.

Summarizing, the emotion regulation is an important process during adolescence due its association with developmental trajectories and outcomes, different from coping, since it involves both positive and negative emotions across many situations (Eisenberg, 2012; Gross, 2015; Thompson, 1991). Although current literature refers to different models which assess emotion regulation in adolescents, only few measures have considered positive emotions (Gross & John, 2003), moreover, some of them have been focused on the regulation of negative emotions (Gross & John, 2003), moreover, some of them have been focused on the regulation of negative emotions (Garnefski & Kraaij, 2007; Gratz & Roemer, 2004; Ramirez, 2015). Nevertheless, the emotion regulation process includes emotions identification, management and expression, so they should be included for the evaluation (Eisenberg et al., 2010; Thompson 1991), most of the instruments to measure the emotion regulation have been focused on the cognitive component (Garnefski & Kraaij, 2007; 2018; Gross & John, 2003) or in the dysregulation process (Gratz & Roemer, 2004). Besides, as Cole (2014) has suggested, it is necessary incorporated to study of emotion regulation, some factors as social interaction, and the culture. Taking account the cultural and contextual differences of the countries in which were development the measures mentioned, and in order to provide a measure of emotion regulation suitable for Mexican adolescents, the aim of this study was to develop a multidimensional measure of emotion regulation process in adolescents and to examine its factorial structure and reliability.

## Method

### Participants

The sample comprised 887 adolescents aged between 13 and 18 years old ( $M = 15.08$ ;  $SD = 1.64$ ), of whom 49.50% were boys ( $n = 439$ ) and 50.50% were girls ( $n = 448$ ). The participants were students intentionally recruited from public high-schools ( $n = 462$ ; 52%) and public senior-high schools ( $n = 425$ ; 48%) located in different zones of Mexico City. A total of ten schools were selected: North zone ( $n = 151$ ; 17%); South zone ( $n = 249$ ; 28.1%), East zone ( $n = 258$ ; 29.10%); West zone ( $n = 229$ ; 25.80%). The distribution of participants by educational grade-level was: High school: second grade ( $n = 185$ ; 20.90%), and third grade ( $n = 278$ ; 31.30%); Senior-high schools: first grade ( $n = 82$ ; 9.2%), second grade ( $n = 242$ ; 27.30%), and third grade ( $n = 100$ ; 11.30%). Other sociodemographic data of the participants show that, 55.30% live in a nuclear family, 27.90% belong to a mono parental family, and only a 7.40% of adolescents live in an extended family. The rest of the participants live in another type of family.

### Instruments

The Multidimensional Scale of Emotion Regulation of Adolescents (MSERA), in its first version was integrated of 95 items with a five-item Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree. The aim of the scale is to evaluate the different strategies of emotion regulation that adolescents used for positive and negative emotions, including dimensions such as emotion recognition, cognitive processing and emotion expression. Some questions were included about socio-demographic information.

### Procedure

The development of the instrument was carried out in phases:

1. Literature review and analysis of instruments: A review of the measures of emotion regulation that have been used with the adolescent population in Mexico was carried out. Likewise, the proposed models for the study of emotion regulation were reviewed (Garnefski & Kraaij, 2007; Gratz & Roemer, 2004; Gross, 1998; 2015).
2. Focus groups: Two focus groups were conducted based on the proposed guide of Hamui and Varela (2012) in order to explore the identification of positive and negative emotions of adolescents, the emotional expression as well as the regulation strategies they employ. The first group consisted of 10 adolescents from 13 to 15 years old and the second group of 10 adolescents from 16 to 18 years.
3. Content analysis: Based on the results of the focus groups and the theoretical criteria, 95 items were developed in the following dimensions: cognitive change, emotional identification of positive and negative emotions, response modulation, emotional expression of positive and negative emotions, suppression and physiological reactions. The items were submitted to examination by ten expert judges to review the relevance of the items in the proposed theoretical dimensions.
4. Pilot test: A pilot test was carried out with 100 adolescents from 13 to 18 years ( $M = 15.44$ ;  $SD = 1.41$ ). Writing and application form were adjusted, and descriptive analyses were conducted. Pilot participants were not considered in subsequent analyzes of construct validity and reliability.
5. Final assessment: Authorization was requested from principals of educational institutions. Participants were informed about the purpose of the investigation and signed informed assent, so, their participation was voluntary and anonymous, according to ethical code of Mexican Society of Psychology (2009). The assessment was carried out by psychologists during school hours in groups of an average of 35 students under the researcher's supervision and the presence of a teacher and the full application lasted around 30 mins.

### Statistical analyses

Data analyses including exploratory factorial analyses (EFAs) and confirmatory factor analyses (CFAs) were performed with Factor program 10.10.01 (Ferrando & Anguiano-Carrasco, 2010). The total sample was randomly divided into two parts for cross validation. An exploratory factorial analysis was conducted to analyze the internal structure of MSERA with the first sample (N1) and after confirmatory factor analysis was done with second sample (N2). Data from N1 were used to analyze the item's psychometric properties previously to carried the factorial analyses: 1. Normality test skewness and kurtosis:

Those items were identified with skew and kurtosis values  $\pm 1.50$  were eliminated (Petscher, Schatschneider, & Compton, 2013); 2. Correlation of items: The correlation between item and total scale with coefficients  $< 0.20$  or  $> 0.80$  were also eliminated; 3. Discrimination capacity of the items: Student's *t*-test for independent samples was performed to compare groups with extreme values (Lloret, Ferreres, Hernández, & Tomás, 2014) and items with  $p > .05$  were excluded. The Kaiser-Meyer-Olkin (KMO) coefficients and the Bartlett's sphericity test ( $X^2$ ) were examined to verify the relevance of an exploratory factor analysis (Petscher et al., 2013). The test of the structure of MSERA was conducted with Unweighted Least Squares (ULS) method with promim rotation (Lloret, Ferreres, Hernández, & Tomás, 2017). To establish the number of factors to extract eigenvalues ( $>1$ ) with factor loadings  $\geq .30$  were considered significant (Lloret et al., 2014). A CFA was performed using the Robust Unweighted Least Squares (RULS) method based on the polychoric correlation matrix (Xia & Yang, 2019). Model fit was examined in terms of the chi-square quotient, the mean square approximation error (RMSEA), with a value less than .06 that indicates an acceptable fit of the model (Morata-Ramírez, Holgado-Tello, Barbero-García, & Mendez, 2015). The comparative adjustment index (CFI) was also used, whose values above .90 suggest a better model fit (Xia & Yang, 2019). A gamma index or GFI, and the GFI index adjusted based on the degrees of freedom was used, called the norm-adjusted goodness index (AGFI); like the GFI, its values oscillate between 0 and 1 and values of adjustment highest than .80 of this index can be considered good adjustments of the model to the data, similarly (Pérez-Gil, Chacón, & Moreno, 2000).

## Results

### Analysis of the items

The results of the content analysis showed that 80 items had high Kappa values (.70-1.0), ten items had moderate values .50-.70) and

only ten items had values less than .5. This was corroborated with the results of the Student's *t*-test, skewness, kurtosis and Pearson's correlation showed that ten of the 95 items should be eliminated (6, 14, 38, 40, 49, 55, 61, 78, 82, 86). With the 85 items of the Multidimensional Scale of Emotion Regulation for Adolescents (MSERA), an exploratory factor analysis was performed.

### Exploratory factor analyses

An exploratory factor analysis was performed based on the method proposed by Lloret et al. (2017), using the matrix of polychoric correlations with the unweighted least squares estimation method (ULS), with the sample 1 of 485 adolescents aged 13 to 18 years ( $M = 15.22$ ;  $SD = 1.59$ ), of which 242 were boys and 243 girls. The index of Kaiser-Meyer-Olkin and the Bartlett's sphericity tests, were acceptable ( $KMO = .82$ ,  $X^2 = 5347.8$ ;  $gl = 1540$ ;  $p < .001$ ).

Table 1 shows data of the items with factor loads highest than or equal to .40; this criterion grouped 56 items into eight factors that explain 49.30% of the total variance. The factors were defined as: F1. Recognition of positive emotions: The identification and distinction of the positive emotions that the individual is experiencing; F2. Expression of positive emotions: The behavioral manifestation of positive emotions and involves interaction with other people; F3. Emotional control: The perception of the individual about the domain of the emotions and the way of expressing them; F4. Suppression: The inhibition of the expressive behavior of the emotion that is being experienced; F5. Cognitive change: Modification of the perception of the situation in addition to directing attention within the situation in order to influence emotion; F6. Physical reactions: They are physical and physiological indicators of the emotional process in progress; F7. Recognition of negative emotions: The identification and distinction of the negative emotions that the individual is experiencing; and F8. Difficulty to regulate: The behavioral manifestation of negative emotions in an exaggerated way and that reflects difficulties in emotional regulation.

Table 1. Items loadings for 8-factor rotated solution. Continuation.

Items	Factors								<i>M</i>	<i>SD</i>	<i>SK</i>	<i>K</i>
	F1	F2	F3	F4	F5	F6	F7	F8				
59. When I feel positive emotions, I think about what makes me feel this way	.66								3.71	1.02	-.63	-.10
54. I can recognize when I'm glad	.54								4.12	.87	-1.13	1.44
60. I care about what I'm feeling	.57								3.96	1.01	-1.01	.80
65. When I feel happy, I remember other things that make me feel this way	.54								3.77	1.06	-.76	.03
48. I can recognize when I feel happy	.51								4.12	.87	-1.24	1.94
67. Others realize when I express my positive emotions	.42								3.69	1.03	-.70	.15
41. I recognize when I am feeling positive emotions	.43								4.00	.87	-.94	.97
77. I know how to express my positive emotions	.41								3.73	1.01	-.81	.42
45. I prefer to stay in situations that make me feel cheerful	.43								4.12	.91	-1.19	1.64
72. People have told me that when I'm happy note	.36	.34							3.79	1.06	-.75	.05
85. I openly show my positive emotions	.32	.31							3.51	1.09	-.48	-.43

Items	Factors								<i>M</i>	<i>SD</i>	<i>SK</i>	<i>K</i>	
	F1	F2	F3	F4	F5	F6	F7	F8					
18. When I feel sad, I think of things that make me feel better					.70					3.38	1.17	-.47	-.54
11. I think nice things to calm down when I feel angry					.64					3.36	.99	-.45	-.05
3. When I feel negative emotions, I think of nice things to calm down					.60					3.39	1.20	-.38	-.78
33. When I feel negative emotions, I try to think differently about the situation to feel better					.57					3.39	1.02	-.47	-.08
47. When I feel negative emotions, I focus on what can help me feel better					.57					3.36	1.01	-.26	-.45
16. When something makes me angry, I change it to feel better					.43					3.24	.99	-.39	-.06
50. When I feel negative emotions I try to calm down before responding					.45					3.25	1.17	-.29	-.77
76. I take the time to identify the emotions I feel					.3					3.19	1.10	-.11	-.60
94. When I feel fear, I start to cry								.79		2.32	1.11	.62	-.38
95. When I'm afraid I get paralyzed								.54		2.42	1.17	.51	-.56
79. When I'm sad I can't stop crying								.55		2.67	1.24	.37	-.82
88. I have a headache when I'm sad								.53		2.54	1.25	.42	-.84
92. I scream when I feel fear								.51		2.34	1.14	.70	-.34
84. I get dizzy when I feel fear								.47		2.12	1.11	.88	-.03
32. I cry when I'm furious								.44		3.11	1.39	-.12	-1.24
87. I cried when I feel angry								.41		3.39	1.28	-.44	-.95
93. I feel an emptiness in my stomach when I'm sad								.37		3.07	1.26	-.04	-1.06
90. When I'm afraid I talk to someone else								.37		2.94	1.13	.04	-.83
62. When I'm angry I blow up									.68	2.88	1.32	.17	-1.07
46. When I'm angry I feel that my head is going to explode									.58	2.78	1.26	.20	-1.01
57. I break things when I feel angry									.56	2.94	1.47	.03	-1.42
24. When I'm angry I feel my blood boil									.51	2.79	1.29	.28	-.99
39. When I'm angry my heart beats faster									.51	3.07	1.21	-.18	-.88
20. When I have negative emotions, I express them (I cry, scream, stop talking, break things, etc.)									.40	3.15	1.31	-.15	-1.05
69. When I feel anger, I start screaming									.40	2.56	1.24	.38	-.84
8. When I'm angry my stomach hurts									.37	2.34	1.31	.61	-.87
35. When I feel positive emotions, I am more sociable		.83								3.77	1.05	-.61	-.25
44. When I feel happy, I am more sociable		.83								3.81	1.06	-.75	.03
37. I like to talk when I'm happy		.65								3.95	1.03	-.94	.52
13. When I have positive emotions, I express them (smile, sing, dance, I am more sociable, etc.)		.40								4.18	1.03	-1.33	1.37
12. I know when I am feeling negative emotions							.68			3.95	.99	-1.07	1.03
4. I can identify the emotions I feel							.54			3.93	.94	-.89	.67
19. I can recognize when I'm sad							.52			4.06	.91	-1.27	2.02

Items	Factors								M	SD	SK	K
	F1	F2	F3	F4	F5	F6	F7	F8				
34. I can recognize when I feel angry							.40		4.10	.91	-1.33	2.13
28. I usually hide that I feel sad				.64					3.36	1.19	-.31	-.71
2. I keep others from realizing how I feel				.54					3.18	1.01	-.15	-.33
52. I keep others from noticing that I feel angry				.56					3.24	1.03	-.11	-.44
89. I openly show my negative emotions				-.39					2.65	1.08	.27	-.49
27. When I feel negative emotions, I prefer to be alone				.40					3.66	1.16	-.55	-.56
17. I avoid demonstrating when I feel angry				.40					3.05	1.10	-.18	-.60
53. When I feel negative emotions, I think I can control the situation			.50						3.15	1.02	-.13	-.29
71. When I feel positive emotions, I think I am under control			.47						3.35	1.07	-.43	-.38
25. I think I have control over my negative emotions			.40						3.06	1.06	-.19	-.45
81. I know how to express my negative emotions			.36						2.99	1.07	-.13	-.46
40. When I have negative emotions, I think I can overcome them quickly			.47						3.20	1.06	-.26	-.46
Items by factor	11	4	5	6	8	10	4	8	Total 56			
Percentage explained variance (%)	16.60%	10.90%	5.40%	4.10%	3.70%	2.90%	2.80%	2.70%	49.33%			

*N*1= 485; F1= Recognition of positive emotions; F2= Expression of positive emotions; F3= Emotional control; F4= Suppression; F5= Cognitive change; F6= Physical reactions; F7= Recognition of negative emotions; F8= Difficulty to regulate

### Confirmatory Factor Analysis

Based on the results of the EFA, a confirmatory factor analysis (CFA) was performed. Considering that some items showed factor loads less than 0.40 or loaded in more than one factor, nine items were excluded from the analysis (72, 85, 76, 93, 90, 8, 89, 81 and 40), trying to maintain a parsimonious model (Ferrando & Anguiano-Carrasco, 2010). A multifactorial model and the existence of eight latent variables were assumed. The adjustment of the eight-factor model of the scale was evaluated through a CFA using the Robust Unweighted Least Squares (RULS), with the sample 2 of 402 adolescents aged 13 to 18 years ( $M = 15.88$ ;  $SD = 1.41$ ) of which 197 were boys and 205 girls. All indicators showed acceptable fit:  $X^2 = 1154.68$ ,  $gl = 1120$ ,  $p = .22$  ( $N2 = 402$ );  $RMSEA = .008$  (.000-.010);  $CFI = .999$ ;  $GFI = .977$ ;  $AGFI = .968$ .  $RMSEA$  was considered, it is an adjustment index that works correctly regardless of the number of factors included in the model and which improves as the number of response points of the scale and sample size (Morata-Ramírez et al., 2015). The  $GFI$  and  $AGFI$  index closer to 1 reflect better adjustments, thus the results obtained in this model were acceptable (Pérez-Gil et al., 2000). The final model consisted of 47 items.

#### Reliability and correlations analyses

Table 2 shows means, standard deviations, and ordinal alpha by factor of the final model. Ordinal coefficient alpha is a suitable alternative to coefficient Cronbach's alpha to calculate the reliability based on Likert response items (Zumbo, Gadermann, & Zeisser, 2007). The highest mean was observed in suppression whereas the lowest was cognitive change. The coefficients by factor ranged high from .85 to .95. These coefficients are normally considered as good to very good in measurement practice.

Table 2. Means, standard deviations, and ordinal alpha coefficients by factor of MSERA

Factor	M	SD	Ordinal alpha
F1. Recognition of positive emotions	3.88	.60	.93
F2. Expression of positive emotions	3.94	.79	.87
F3. Emotional control	3.18	.70	.85
F4. Suppression	3.34	.69	.94
F5. Cognitive change	3.30	.62	.85
F6. Physical reactions	2.64	.73	.91
F7. Recognition of negative emotions	4.03	.62	.95
F8. Difficulty to regulate	2.91	.81	.91

*N*2 = 402

Pearson product-moment correlation analysis of the final version of the MSERA indicates coefficients with statistical significance ranging from  $r = .11$  to  $r = .55$ , and in most of the factors was moderate (Table 3). The Recognition of positive emotions factor showed the highest correlation with other factors of the scale, and the factor with the lowest correlation coefficients was Suppression.

#### Mean differences by gender and age

A one-way ANOVA was used to assess differences between groups by gender (boys and girls) and by age groups (13 to 15 years and 16 to 18 years) in the factors of the MSERA. Differences in suppression, physical reactions, and difficulty to regulate were observed, with the highest means in the girls' group. Differences were observed in the recognition of positive emotions, recognition of negative emotions, and emotional control, with the highest means in the age group of 16 to 18 years (Table 4).

Table 3. Correlations between factors of the Multidimensional Scale of Emotion Regulation for Adolescents

Factor	F2	F3	F4	F5	F6	F7	F8
F1. Recognition of positive emotions	.55**	.40**	.05	.50**	.11*	.40**	.02
F2. Expression of positive emotions	-	.25**	-.02	.32**	.21**	.24**	.16**
F3. Emotional control			.07	.44**	.01	.28**	-.03
F4. Suppression			-	.16**	.21**	.05**	.19
F5. Cognitive change				-	.04	.18**	-.12**
F6. Physical reactions					-	-.06	.53**
F7. Recognition of negative emotions						-	-.02
F8. Difficulty to regulate							-

$N2 = 402$ ; \*\*  $p \leq .01$

Table 4. Differences between groups by gender and age groups

Factors	Gender		F	p	Age		F	p
	Boys n = 197	Girls n = 205			13-15 years n = 266	16-18 years n = 136		
	M SD	M SD			M SD	M SD		
F1. Recognition of positive emotions	3.84 0.61	3.94 0.60	3.47	.063	3.84 0.62	3.98 0.56	3.84	.051
F2. Expression of positive emotions	3.94 0.77	3.98 0.80	0.73	.393	3.95 0.79	3.98 0.78	0.05	.815
F3. Emotional control	3.28 0.70	3.08 0.72	12.69	.001	3.10 0.73	3.34 0.67	13.32	.000
F4. Suppression	3.19 0.70	3.46 0.67	10.26	.001	3.35 0.70	3.29 0.69	0.91	.341
F5. Cognitive change	3.35 0.75	3.25 0.71	0.86	.355	3.25 0.76	3.39 0.65	3.67	.056
F6. Physical reactions	2.28 0.68	2.88 0.68	66.89	.001	2.60 0.78	2.55 0.66	2.23	.137
F7. Recognition of negative emotions	4.01 0.61	4.05 0.62	0.08	.774	3.96 0.64	4.16 0.54	9.02	.003
F8. Difficulty to regulate	2.77 0.76	3.03 0.83	9.65	.002	2.92 0.85	2.88 0.73	0.57	.450

$N2 = 402$

## Discussion

The aim of this study was to develop a valid and reliable multidimensional measure of emotion regulation process in adolescents examining and testing its internal structure with, both, exploratory factorial analysis and confirmatory factorial analysis, as well as, its internal consistency. Study of emotion regulation as a process, from the model proposed by Gross, allows the identification of strategies in specific stages of the emotion-generative cycle when an emotion is experienced (Gross, 1998), and the ERQ have been applied in many countries (e. g. Gračanin et al., 2019) showing systematically two dimensions (reappraisal and suppression), despite Gross (2015) integrated other elements to his model. On the other hand, other measures of emotion regulation as CERQ (Garnefski & Kraaij, 2007) show some psychometrics limitations such as moderate reliability indices, and the DERS (Gratz & Roemer, 2004), highlights negative emotions. Therefore, we designed the Multidimensional Scale of Emotion Regulation for Adolescents taking account some of their limitation and considerer the potential cultural differences between Latino American youth, particularly Mexican adolescents.

In this investigation, we included the identification of positive and negative emotions (Eisenberg, Fabes, Guthrie, & Reiser, 2000), the cognitive component of emotion regulation (Garnefski & Kraaij,

2007; Gross, 2015), and the expression of emotion (Gross & John, 2003). These elements are necessary to measure emotion regulation (Cole et al., 2004), and to distinguish between dimensions related to positive and negative emotions (Gross, 2015).

There is an agreement that emotion regulation includes the ability to access a range of emotions and modulate, control, reduce or increase the intensity and duration of an emotion (Cole et al., 1994; Gross, 2015; Thompson, 1991). However, some elements are still confused with the coping process (Compas et al., 2017). Therefore, the model proposed by Gross (1998) allows us to distinguish between emotion regulation and coping, considering the different strategies before, during or after the experience of an emotion, without limiting it to stressful situations (Compas et al., 2017; Gross, 2015).

An exploratory factor analysis was performed based on the parameters of the Bartlett's sphericity test and the Kaiser-Meyer-Olkin index (Lloret et al., 2014) that yielded a solution of eight factors composed of 56 items, and there was an appropriate distribution of items in most of the factors, two of these were integrated with four items. As a result, this scale included factors with cognitive strategies of emotion regulation (Garnefski & Kraaij, 2007), suppression of the emotional response (Gross, 2015), and difficulties to regulate emotions (Bradley et al., 2011; Gratz & Roemer, 2004), which allows to locate diverse strategies of regulation of positive and negative emotions (Thompson, 1991).

In addition, strategies such as the identification of positive and negative emotions, and emotional control that are considered important elements for the evaluation of this construct were integrated (Eisenberg et al., 2000; Gross & John, 2003). Through the CFA, a structure of eight factors was confirmed, composed of 47 items, without items that showed marginal values were excluded. The final model had adequate adjustment indexes such as the RMSEA, CFI, GFI and AGFI suggest that it is a balanced mode (Morata-Ramírez et al., 2015; Pérez-Gil et al., 2000). This model is theoretically consistent with the evidence on adolescents' emotion regulation strategies based on the Process Model of Emotion Regulation (Gross, 1998; 2015).

Nevertheless, compared to the ERQ (Gross & John, 2003), the MSERA integrated strategies related to the selection and modification of the situation, the deployment of attention and the modulation of the response, such as the identification of positive and negative emotions, and the emotional expression. Thus, these strategies complement the evaluation of the emotion regulation process. Furthermore, the results of the internal consistency analysis suggest that the reliability coefficients are adequate for the MSERA. Hence, this scale can be considered a reliable measure for the evaluation of the strategies of emotion regulation.

It is important to consider that emotion regulation patterns can influence the adaptive functioning of individuals under certain conditions, and such patterns can support adaptation or become symptoms of psychopathology (Cole et al., 1994; Troy & Mauss, 2011). The MSERA has strategies related to emotion dysregulation (Bradley et al., 2011) such as difficulty regulating emotions and physical reactions similarly to reported in another research (Gratz & Roemer, 2004; Tejada et al., 2012). Nevertheless, the MSERA is complemented with other strategies such as cognitive change, recognition of emotions, and emotion control that are considered successful (Garnefski & Kraaij, 2018; Gross, 2015; Troy & Mauss, 2011).

Emotion regulation includes the process of emotion identification that the adolescent realizes to emit, suppress or modify an emotional response, and the identification of emotions can lead to the use of successful strategies. In contrast to other instruments that assess emotion regulation with the approach of the cognitive component of emotion (Garnefski & Kraaij, 2007), in this scale, factors related to emotion identification and emotion control were observed. The predictive role of emotion control over problem behavior and social competence in adolescents has been reported (Eisenberg et al., 2000), whereby control is considered an important element in the process of emotional regulation (Thompson, 1991). This suggests that the implementation of cognitive control can lead to a successful emotion regulation (Gross, 2015).

Emotions management that arise in the context of everyday life (contexts and events that are not sources of stress), specifically represent the regulation of emotions. However, once a precipitating situation or context is identified as stressful and focused on negative emotions, the adaptation process is, in general, in the domain of coping (Compas et al., 2017; Connor-Smith & Compas, 2004). In contrast with other measures such as CERQ (Garnefski & Kraaij, 2007) and IREA (Ramírez, 2015), the scale structure developed in this research allows the distinction between emotion regulation and coping, since MSERA is composed of items that are not limited to specific situations and includes positive and negative emotions and includes positive and negative emotions.

In the comparison between boys and girls in the MSERA factors differences were observed in strategies related to negative emotions. Although the relationship between gender and cognitive emotional

regulation strategies has been reported (Garnefski & Kraaij, 2018), in this research both boys and girls seem to recognize their positive and negative emotions and similarly employed cognitive change. Gross and John (2003) reported that boys may be more likely to suppress sadness but less likely to suppress anger than girls, but this research shows that girls have difficulty regulating emotions and employ suppression more than boys. This suggests that it may be necessary to continue the study of emotion regulation and expand the evidence on the management of negative emotions and emotional dysregulation by gender in adolescence and in later stages of development, considering that dysregulation has been associated with the presence of psychopathology, such as depression, suicide attempt and alcohol abuse (Bradley et al., 2011).

Although emotional regulation changes throughout the life cycle, some authors have reported a lower relationship between age and specific emotional regulation strategies (Gračanin et al., 2019; Martín-Albo et al., 2018). In addition, it is important to consider the role of social context and culture (Cole, 2014), which could help explain the differences in emotional recognition and emotional control obtained in this study.

Compared with other measures that have been used for the evaluation of emotion regulation of Mexican adolescents (Ramírez, 2015; Tejada et al., 2012; Zamudio, 2017), the results obtained in this research reflect better characteristics of construct validity and reliability of the MSERA. In addition, this scale was developed integrating conceptual models and empirical information obtained from Mexican population in contrast to the measures that have been previously used with Mexican adolescents and that are validations of instruments constructed in other cultural contexts such as ERQ and DERS.

Finally, this research has some limitations. First, the results obtained of the analysis of the factor structure of the MSERA and its reliability cannot be generalized due the sample was not representative, so, it is necessary tested in adolescents of other regions of Mexico. Second, the MSERA should be tested on different kind of samples (for example, clinical samples) in order to continue with the scale validation process. Third, the results of this research should be replicated using several exploratory and confirmatory analyzes that complement the information of the psychometric properties of the scale and the model fit (Xia & Yang, 2019). Forth, in this study the sample by age groups was slightly skewed, so comparative studies by age are needed to provide more evidence on the regulation of emotions in adolescent groups. Fifth, this study reports the construction of a new instrument and the preliminary analysis of its factor structure and reliability, however, more studies about its psychometric properties are needed, for example, convergent validation, factor invariance, composite reliability, variance extracted average and test-retest reliability.

In conclusion, based on previous theoretical and empirical considerations, our study provide data on the validity of construct and reliability, which indicated that the MSREA is a multidimensional measure of emotional regulation that could be useful to evaluate adolescents.

## Conflict of interests

The author(s) of this paper state that there is no conflict of interest.

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