

# Self-monitoring and Self-reactions for Reading Comprehension Scales: Initial Psychometric Studies

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### Abstract

The Self-Monitoring for Reading Scale (*Escala Automonitoramento para Ler* [EAU-L]) and Self-Reactions for Reading Comprehension Scale (*Escala Autorreações para a Compreensão de Leitura* [EAR-CL]) were elaborated to assess two key processes of the self-perceived behavior dimension of self-regulation for learning in middle school students. The first part of this study aimed to investigate the evidence based on the test content of these scales. Three expert judges and 16 students participated in the research. The results indicated that the scale items are intelligible and representative in theoretical and practical terms through qualitative and quantitative analyses. The second part of the study aimed to analyze the evidence based on the internal structure and reliability of the scales. In this phase, the participants were 522 students. Factor analyses indicated a single-factor structure for the EAU-L and a two-factor structure for the EAR-CL. Both scales obtained adequate reliability indices. New studies are planned to expand the psychometric quality of these scales.

**Keywords:** self-management, reading, self-observation, self-perception, motivation

### ESCALAS DE AUTOMONITORAMENTO E AUTORREAÇÕES PARA A COMPREENSÃO DE LEITURA: ESTUDOS PSICOMÉTRICOS INICIAIS

#### Resumo

A Escala Automonitoramento para Ler (EAU-L) e a Escala de Autorreações para a Compreensão de Leitura (EAR-CL) foram construídas para avaliar dois processos-chave da dimensão comportamento autopercebido da autorregulação para aprendizagem de estudantes do ensino fundamental II. O objetivo da primeira parte desta pesquisa foi investigar as evidências de validade baseadas no conteúdo dessas escalas. Participaram três juízes especialistas e 16 estudantes. Por meio de análise qualitativa e quantitativa, os resultados indicaram que os itens das escalas são inteligíveis e representativos em termos teóricos e práticos. O objetivo da segunda parte do estudo foi analisar as evidências baseadas na estrutura interna e a fidedignidade das escalas. Nessa fase, participaram da pesquisa 522 estudantes. As análises fatoriais indicaram uma estrutura unifatorial para a EAU-L e de dois fatores para a EAR-CL. Ambas as escalas obtiveram índices adequados de fidedignidade. São previstos novos estudos para ampliar a qualidade psicométrica dessas escalas.

**Palavras-chave:** autogestão, leitura, auto-observação, autopercepção, motivação

### ESCALAS DE AUTOSUPERVISIÓN Y AUTORREACCIONES PARA LA COMPRENSIÓN LECTORA: ESTUDIOS PSICOMÉTRICOS INICIALES

#### Resumen

La Escala de Autocontrol para la Lectura (*Escala Automonitoramento para Ler* [EAU-L]) y la Escala de Autorreacciones para la Comprensión Lectora (*Escala Autorreações para a Compreensão de Leitura* [EAR-CL]) se construyeron para evaluar dos procesos clave de la dimensión de la conducta autopercebida de la autorregulación en los estudiantes de la enseñanza fundamental. El objetivo de la primera parte del estudio fue investigar la evidencia basada en el contenido de estas escalas. Participaron tres jueces expertos y 16 estudiantes. Mediante análisis cualitativo y cuantitativo, los resultados indicaron que los ítems de las escalas son inteligibles y representativos en términos teóricos y prácticos. El segundo objetivo de la investigación fue analizar la estructura interna y confiabilidad de las escalas. En esta fase, participaron 522 estudiantes. Análisis factoriales indicaron una estructura de un factor para la EAU-L y una estructura de dos factores para la EAR-CL. Ambas escalas obtuvieron índices de confiabilidad adecuados. Se prevén nuevos estudios para ampliar la calidad psicométrica de estas escalas.

**Palabras clave:** autogestión, lectura, auto-observación, autoconciencia, motivación

In the first years of middle school, students are expected to have acquired a considerable level of criticality, so that, in the final years of this segment of primary education, it is possible to advance in the development of critical thinking and more autonomous behaviors (Ministério da Educação, 2019). Additionally, the school curricula foresee the insertion of new textual genres. This requires students to communicate the texts' contents and presupposes interdisciplinarity between the subjects of Portuguese Language, Science, Mathematics, among others (Ministério da Educação, 2019; Wexler et al., 2020). Students are also expected to achieve proficiency in reading comprehension so that they can complete this stage of formal education, which also gives them greater chances of being successful in subsequent levels of education – high school and higher education (Elleman & Oslund, 2019; Ministério da Educação, 2019; Wexler et al., 2020).

Self-regulated learning (SRL) is a tool to develop reading comprehension and reflects on the students' overall academic performance when introduced into pedagogical practices (Chen & Bonner, 2020; Elleman & Oslund, 2019; Kitsantas & Cleary, 2016; Li et al., 2018). In this study, SRL was approached to investigate the initial psychometric properties of two measurement instruments: the Self-Monitoring for Reading Scale (*Escala Automonitoramento para Ler* [EAU-L]), which assesses the self-regulation of students in self-monitoring strategies aimed at reading comprehension, and the Self-Reactions for Reading Comprehension Scale (*Escala Autorreações para a Compreensão de Leitura* [EAR-CL]), which assesses the adaptive and defensive self-reactions of students for hypothetical situations of difficulty in reading comprehension.

Self-monitoring and self-reactions are key processes in the SRL dimension called self-perceived behavior (Zimmerman & Risemberg, 1997). This dimension refers to the students monitoring themselves concerning the progress of school activities and affective reactions after assessing the results (Dembo & Eaton, 2000; Schunk & Usher, 2013; Zimmerman & Risemberg, 1997). Self-monitoring enables students to make adjustments throughout the task. Self-regulated students constantly question themselves regarding the effectiveness of their actions. Their conclusions serve to reassess the strategies applied to reading and to incorporate new resources to complete activities, these being procedural and motivational (Elleman & Oslund, 2019; Heirweg et al., 2020; Joseph et al., 2016; Kitsantas & Cleary, 2016; Schunk & Usher, 2013). Conversely, students that do not have the skills of self-regulation of reading monitoring have little autonomy to use learning strategies that are appropriate and contextualized to their requirements. It tends to happen even when they have basic knowledge and enough vocabulary to interpret and make inferences (Elleman & Oslund, 2019).

Another key process in the self-perceived behavior dimension of SRL is self-reactions. After completing the tasks, students assess their results, whether successful or not, which can generate positive feelings of self-satisfaction or negative self-dissatisfaction. From this self-assessment, students develop adaptive or defensive inferences that affect their future behavior in similar situations (Kitsantas & Cleary, 2016; Schunk & Usher, 2013). Self-regulated students commonly have adaptive self-reactions, which make it possible to overcome difficulties and

optimize performance through planning and reviewing study strategies, among others. Defensive self-reactions, in turn, are commonly associated with problems in SRL. These are identified through procrastination behaviors and have a negative impact on learning motivation. Students tend not to adhere to activities that refer to previous failures (Kitsantas & Cleary, 2016; Schunk & Usher, 2013).

Self-monitoring and adaptive and defensive self-reactions are widely investigated using the cyclical model of SRL (Chen & Bonner, 2020; Heirweg et al., 2020; Li et al., 2018; Schunk & Usher, 2013; Zimmerman, 2013). The structure of this model consists of the preparatory phase, characterized by the preparation of students to perform the task; the performance phase, marked by the execution of the activity; and the reflection phase, centered on the self-assessment of the results obtained (Schunk & Usher, 2013; Zimmerman, 2013). Self-monitoring is part of the performance phase and acts as self-directed monitoring of performance while the task is still in progress. Adaptive and defensive self-reactions are situated in the reflection phase. They derive from the affective repercussions generated by the self-assessment of the obtained result, with its parameters of appreciation derived from the goals established by the students in the preparatory phase and from associated external factors – for example, the school climate and the behavior of teachers (Chen & Bonner, 2020; Kitsantas & Cleary, 2016; Schunk & Usher, 2013; Zimmerman, 2013).

In a meta-analysis study, Li et al. (2018) found that the performance phase and the reflection phase had a medium effect on the school performance of Chinese students and that self-monitoring, in particular, had an effect of the same magnitude. These authors also found that the effect size of the cyclical model phases on school performance increases throughout the levels of primary education, indicating that the ability to self-monitor is progressively expanded during formal education. In turn, Elleman and Oslund (2019) indicated that self-monitoring is associated with the student's proficiency in reading comprehension.

By focusing on self-monitoring and affective reactions of Belgian primary school students, Heirweg et al. (2020) confirmed the functioning of SRL in a cyclical perspective, with self-monitoring in the performance phase and affective reactions linked to self-reactions in the reflection phase. These researchers also found that students with high performance in cognitive tasks, which were applied during the study, had a more efficient and structured approach by aligning self-monitoring of performance and self-assessment of results with the goals established in the preparatory phase of the SRL cycle. However, students with low and medium performance carried out the tasks without a clear idea of how they should proceed. These students were less effective in self-monitoring their progress in activities compared to the high-performing group and had a smaller repertoire of strategies.

The studies mentioned above indicate that self-monitoring contributes to the learning process, as self-reactions reflect on the prospective motivational quality of the students. This study aimed to investigate the initial psychometric properties of the EAU-L and EAR-CL. In the first stage of the study, we analyzed the evidence of validity based on the content of the scales.

In the second stage, we investigated their evidence of validity based on internal structure and reliability estimates (American Educational Research Association et al., 2014).

As hypotheses, it was conjectured that the items of the EAu-L and EAR-CL are intelligible, theoretically coherent, and compatible with the situations experienced by middle school students. These elements are characterized by evidence of content validity. Regarding the structure of the scales, it was expected that the evidence of validity based on the internal structure would identify a single-factor model in the EAu-L and a two-factor model in the EAR-CL, referring to adaptive and defensive self-reactions. Additionally, we assumed that these models present reliability estimates for the evaluated sample.

## **Content validity evidence study – Part 1: Study with expert judges**

### **Method**

#### **Participants**

Three professors who also work as researchers in psychological and educational assessment participated as judges of the items of the EAu-L and EAR-CL. The judges reported a mean of 16.66 years ( $SD = 13.87$  years) of experience, specifically with constructs linked to SRL and reading comprehension skills in primary education.

#### **Instrument**

- Judges' Evaluation Protocol: with this protocol, the content of the EAu-L and EAR-CL items was evaluated based on the content validity coefficient (CVC). The evaluation involved four validation criteria: clarity of language (CL), practical relevance (PR), and theoretical relevance (TR) – answered on a Likert-type scale, in which 1 meant “not very adequate” and 5, “very adequate”. The theoretical dimension (TD) was answered with “yes” or “no”. The protocol also provides a space for the judges' observations (Hernández-Nieto, 2002).

#### **Data collection procedure**

The first contact with the judges was made remotely, with the study also being carried out this way. E-mail was used as means of communication, and the link to access the Judges' Evaluation Protocol was sent, which was hosted on the Google Forms platform. Before evaluating the items, the judges consented to participate in the study by signing the consent terms.

#### **Data analysis procedure**

We used the software Microsoft Excel and the online tool Kappa Calculator.<sup>1</sup> In the judges' answers to the CL, PR, and TR, validation criteria analyzed the content validity coefficient – initial (CVCi), item mean divided by the maximum possible score; the content validity coefficient

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1 <https://www.statisticssolutions.com/kappa-calculator/>

of the constant (CVc), the product of the subtraction of the error in the CVc; and the CVC – total (CVcT), mean of the CVc subtracted from the mean of the CVc. A value of .80 or greater was considered adequate (Hernández-Nieto, 2002). To assess the responses of the three judges in the TD validation criterion, the Kappa Fleiss ( $k$ ) was applied, with its interpretation values based on Brennan and Prediger (1981):  $k = -1$ , perfect disagreement;  $k \leq .27$ , poor;  $k = .40$ , intermediate;  $k = .60$ , good;  $k > .75$ , excellent;  $k = 1$ , perfect agreement.

## Results

For the EAU-L, Table 1 shows that items 19 and 20 presented values below .80 in the three content validation criteria: CL, PR, and TR. In addition, item 20 obtained a  $k$  value qualified as inferior. These results justified its exclusion. Item 12 was excluded from the scale for not fulfilling CL, PR, and TD. Although items 5 and 6 presented CVcT values greater than .80 in all criteria and  $k$  values classified as perfect in the TD, the judges' observations regarding the lack of congruence with the educational reality supported the exclusion of these items. The reformulations applied in items 2 and 8 were justified by the classifications obtained in the criteria of CL and TD. The judges' observations substantiated the rewriting of items 11, 13, 14, and 15 to ensure that students understood their meaning. Once this stage of the study was completed, the EAU-L had 15 items.

**Table 1**

*EAU-L: Content Validity Coefficient*

Items – Self-Monitoring for Reading Scale	CVc			$k$
	CL	PR	TR	TD
1. I mark important ** what is written.	.83	.96	.96	1
2. I mark parts ** colleagues doing*.	<b>.76</b>	.83	.76	<b>.33</b>
3. I pay attention ** understand the text.	.83	.96	.96	1
4. I pay attention ** asks me to*.	.83	.83	.83	1
5. I read aloud ** understand the text.	.83	.83	.83	1
6. I read aloud ** request*.	.83	.83	.83	<b>.33</b>
7. I take notes in the text ** reading.	.96	.83	.96	1
8. I take notes ** doing this*.	<b>.69</b>	.83	.83	<b>.33</b>
9. I look for the meaning ** to understand.	.96	.96	.96	1
10. I look for the meaning ** asks me*.	.96	.96	.96	1
11. I read the text ** things in reading.	.96	.83	.96	1
12. I read the text ** in reading*.	.83	<b>.76</b>	<b>.76</b>	<b>.33</b>
13. I look at the figures ** the reading.	.83	.96	.96	1
14. I look at the figures ** the time*.	.89	.89	.89	1
15. I think about the things ** to understand.	.83	.96	.96	1
16. I relate the things ** I read.	.96	.96	.96	1

Table 1

## EAu-L: Content Validity Coefficient

Items – Self-Monitoring for Reading Scale	CVCC			<i>k</i>
	CL	PR	TR	TD
17. Making summaries ** to understand.	.96	.96	.96	1
18. I write text summaries ** asks me to*.	.83	.83	.83	1
19. I understand the text ** textual genre.	<b>.63</b>	<b>.76</b>	<b>.76</b>	1
20. I know several textual ** tested*.	<b>.76</b>	<b>.76</b>	<b>.76</b>	<b>.33</b>
CVCC	.81	.83	.84	
<i>k</i> (total scale)			.67	
Agreement between judges for the full scale			83.33%	
Original item	Reformulated item		Justifications	
2. I mark parts of the text in a different color because I see my colleagues doing it*.	2. I mark parts of the text in a different color because <u>that is what my colleagues do*</u> .		CVCC < .80	
8. I take notes while reading when I see my colleagues doing this*.	8. I take notes while reading when <u>that is what my colleagues do*</u> .		CVCC < .80	
11. I read the text several times because it helps to notice different things in reading.	11. I read the text several times because it helps <u>me to understand it</u> .			
13. I look at the figures and tables in the text because it helps me to understand it.	13. <u>I pay attention to</u> the figures and tables in the text because it helps me to understand the text.			
14. I look at the figures and tables that appear in the text to pass the time ( <i>observo as figuras e tabelas que aparecem no texto só para passar o tempo</i> ) <sup>a</sup> .	14. I look at the figures and tables that appear in the text to pass the time ( <i>olho as figuras e tabelas que aparecem no texto só para passar o tempo</i> ) <sup>a</sup> .		Judges' observations	
15. I think about the things that happen in the text, and that makes reading easier to understand.	15. I think about the things that happen in the text, and <u>this makes me understand it better</u> .			
Deleted items			Justifications	
5. I read aloud as it is an excellent way to understand the text.			Judges' observations	
6. I read aloud at the teacher's request*.				
12. I read the text many times to show that I am interested in reading*.				
19. I understand the text better when I know its textual genre.			CVCC < .80	
20. I know several textual genres just because they can be tested*.				

Note<sup>1</sup>. EAu-L = Escala Automonitoramento para Ler (Self-Monitoring for Reading Scale); CVCC = constant content validity coefficient; *k* = Kappa Fleiss; CL = clarity of language; PR = practical relevance – total; TR = theoretical relevance; TD = theoretical dimension; CVCC = content validity coefficient. In bold, CVC values below .80 and *k* < .40.

Note<sup>2</sup>. Item changes were highlighted by underlining the words.

<sup>a</sup> Item 14 appears in both languages because the changes made to the item in Portuguese did not change the writing of the item in English.

\*Item built to present inverted score.

\*\*Some excerpts from all items on the scales were suppressed in this paper.

In the EAR-CL, Table 2 indicates that, except for item 10, the other items presented adequate CVC values. Item 10 was reformulated in order to ensure its practical relevance. Item 4 was rewritten, with suggestions from the judges, to make it more understandable for students. Item 13 was excluded because it included two complex propositions related to pausing and resuming reading. After completing this stage of the study, the EAR-CL had 13 items.

**Table 2***EAR-CL: Content Validity Coefficient*

Items – Self-Reactions for Reading Comprehension Scale	CVCc			k
	CL	PR	TR	TD
1. I keep reading ** understand.	.96	.96	.96	1
2. I am looking ** the text.	.96	.96	.96	1
3. I strive to understand ** written.	.96	.96	.96	1
4. I look for similar ** having difficulties.	.96	.96	.96	1
5. I feel motivated ** the text.	.89	.96	.96	1
6. I want ** give up.	.96	.96	.96	1
7. I stop ** text*.	.89	.96	.96	1
8. I get nervous ** to understand.	.96	.96	.96	1
9. I feel annoyed ** the text*.	.96	.96	.96	1
10. I feel bored ** reading.	.83	<b>.76</b>	.89	1
11. I get angry ** reading.	.96	.96	.96	1
12. I think I will be able ** continue.	.96	.96	.96	1
13. I stop reading ** back to reading.	.96	.96	.96	1
14. I look for other ** complex text.	.96	.96	.96	1
CVct	.90	.90	.84	
k (full scale)			1	
Agreement between judges for the full scale			100%	
Deleted items	Justification			
13. I stop reading a little and then go back to reading.	Item contains two ideas.			

Note. EAR-CL = *Escala Autorreações para a Compreensão de Leitura* (Self-Reactions for Reading Comprehension Scale); CVCc = constant content validity coefficient; k = Kappa Fleiss; CL = clarity of language; PR = practical relevance; TR = theoretical relevance; TD = theoretical dimension; CVct = content validity coefficiente – total. In bold, CVC values below .80 and k < .40.

\*Item built to present inverted score.

\*\*Some excerpts from all items on the scales were suppressed in this paper.

## Content validity evidence study – Part 2: Target audience assessment

### Method

#### Participants

The sample consisted of 16 middle school students enrolled in a municipal public school in the state of São Paulo, aged between 11 and 15 years ( $M_{\text{age}} = 13$  years,  $SD = 1.31$ ). Four students from each school year were interviewed (sixth to ninth grade), with the sample for each year consisting of two boys and two girls.

#### Instruments

- Target Audience Assessment Protocol: this protocol is a semi-structured interview composed of two parts. Part 1 is intended to evaluate the students' comprehension of the instructions and answer options labels of the EAu-L and EAr-CL. Part 2 requires the students to assess the intelligibility of the items and make suggestions for improvement to align the sentences with the reality experienced in the school routine.

#### Data collection procedure

After obtaining authorization to carry out the study from the school, the principal and the Portuguese Language teacher selected the students. As selection criterion, the students needed to present established reading ability to ensure the EAu-L and EAr-L assessment quality. The selected students participated in the study by presenting the consent form signed by a parent or legal guardian and signing a consent form themselves. Individual interviews took place in a space provided by the school and were carried out at two moments, with intervals of one and two weeks. The students took a mean of 39.06 minutes to respond to the two parts of the study ( $SD = 8.77$  minutes).

#### Data analysis procedure

The software used was Microsoft Excel. In the students' responses to the objective components of the Target Audience Assessment Protocol, we verified the values of absolute frequency (AF). The students' observations were analyzed qualitatively (American Educational Research Association et al., 2014), emphasizing the intelligibility of the items and their representativeness regarding the representation of the key processes of the self-perceived behavior dimension of the SRL assessed by the scales in their school routine.

### Results

The frequency values – absolute and relative – presented in Table 3 show that the students understood the instructions for completing the EAu-L and did not identify similar contents or unknown words. The difficulties in comprehending the functioning of the answer options labels pointed by two students were resolved after explanations on how they should

complete it if they were to answer the scale in a real testing situation. Item 2 was excluded due to the identification of a similar item. The students considered that imitating a classmate's behavior when taking notes on the text was more representative than highlighting the textual material. Item 9 was reformulated based on an objective assessment of the comprehension difficulty indicated by one student and on the observations of the other students. At the end of this stage, the EAU-L had 14 items.

Also, in Table 3, it can be seen that the students understood the instructions for completing the EAR-CL. However, one student had difficulty understanding parts that referred to the guidelines for responding to the Likert-type scale. As observed in the EAU-L, this was due to the fragmented presentation of the EAR-CL in the parts that make up the Pilot Study Assessment Protocol. After showing the full scale to the student, it was possible to verify their comprehension of the instrument's objectives and the correct way to complete it.

Regarding part 2 of the EAR-CL assessment, items 10 and 11 were excluded, which, according to the students, contained similar content to item 9 (Table 3). The students' observations led to item 4, which was not recognized as a typical self-perceived behavior. According to this logic, item 13 was also removed from the EAR-CL. Some items were reformulated, aiming to simplify the sentences (items 6 and 7) and adjust them to how defensive self-reactions are experienced in the school routine (item 8). At the end of this study stage, the EAR-CL had nine items.

**Table 3**

*EAu-L and EAr-CL: Target Audience Study*

Self-Monitoring for Reading Scale		Self-Reactions for Reading Comprehension Scale	
Part 1: Statement and the answer options labels		Part 1: Statement and the answer options labels	
1. Understanding the instructions for completing the scale.	AF = 16 (100%)	1. Understanding the instructions for completing the scale.	AF = 16 (100%)
2. Identification of inaccurate passages.	AF = 0 (0%)	2. Identification of inaccurate passages.	AF = 1 (6.28%)
3. Unknown word identification.	AF = 0 (0%)	3. Unknown word identification.	AF = 1 (6.28%)
4. Understanding answer options labels.	AF = 14 (87.5%)	4. Understanding answer options labels.	AF = 15 (93.75%)
Part 2: Items		Part 2: Items	
1. Identification of similar content.	AF = 3 (18.75%)	1. Identification of similar content.	AF = 10 (62.5%)
2. Difficulty in understanding.	AF = 1 (6.28%)	2. Difficulty in understanding.	AF = 0 (0%)
Original item	Reformulated item	Original item	Reformulated item
11. I read the text several times because it helps to notice different things in reading ( <i>leio várias vezes o texto porque isso me ajuda a entender melhor a leitura</i> ).	I read the text several times because it helps to notice different things in reading ( <i>leio várias vezes o texto porque isso ajuda a perceber coisas diferentes na leitura</i> ).	6. I want to give up.	<u>I give up reading.</u>
Deleted items	Justifications	7. I stop reading the text*.	<u>I leave it to read later.</u>
2. I mark parts of the text in a different color because I see my colleagues doing it*.	Students opted for item 7 due to the similarity of content – “I take notes in the text because it helps me understand what I am reading”.	8. I get nervous, and it seems that it makes the text harder to understand.	<u>I get upset, and I want to stop reading.</u>
Deleted items	Justifications	4. I look for similar texts to inform myself about the subject and, thus, understand the text that I am having difficulties with.	It does not reflect the usual behavior of students.
		10. I feel bored, and I want to stop reading.	Students chose to exclude items 10 and 11 due to the similarity with the content of item 9 – “I feel annoyed, and I give up on reading the text”.
		11. I get angry and stop reading.	
		13. I look for other texts on the same subject to help me understand a complex text.	Content distances itself from the students’ school routine.

Note. EAu-L = Escala Autorregração para Ler (Self-Monitoring for Reading Scale); EAr-CL = Escala Autorregração para a Compreensão de Leitura (Self-Reactions for Reading Comprehension Scale); AF = absolute frequency.

Item 11 appears in both languages because the changes made to the item in Portuguese did not change the writing of the item in English.

\*Item built to present inverted score.

## Discussion

The results of this study indicate that the EAu-L and the EAr-CL present evidence based on the test content. They guarantee that their items represent self-monitoring and adaptive/defensive self-reactions for theoretical and practical reading comprehension. These aspects corroborate the hypotheses of this research regarding the intelligibility of the items and the representativeness of their content. Both scales are also understandable for students in the initial and final years of middle school.

The final list of EAu-L items comprised 14 sentences centered on self-monitoring strategies that facilitate the execution of tasks that require reading comprehension (Heirweg et al., 2020; Joseph et al., 2016). After the judges' analysis, items 19 and 20 (Table 1), which addressed aspects of metatextual awareness, were excluded from the scale. Although this metalinguistic skill is related to reading comprehension, it is recognized that the EAu-L should emphasize self-monitoring strategies that directly address reading comprehension to not deviate from the scale's objective, which would compromise its evidence of content validity (American Educational Research Association et al., 2014).

Also, in the EAu-L, in the investigation with the judges and target audience, it was found that items 2, 6, 12, and 20 – this last item contained the orientation to invert its score in the correction of the scale – did not evaluate the absence of self-regulation in monitoring strategies applied to reading comprehension (tables 1 and 2). These items attributed the use of strategies to fulfill requirements that were not linked to activities related to reading comprehension. Therefore, they did not fit the EAu-L proposal. Therefore, their exclusion was one more way to ensure evidence of content validity for the EAu-L.

In the EAr-CL, item 13 – I stop reading a little and then go back to reading (*paro um pouco a leitura e depois volto a ler*) – was excluded because it contains two ideas, which increases its complexity, especially for students who have some difficulty in reading comprehension and are not used to participating in testing processes. It is also recognized that self-report measures with Likert-type answer options labels, such as in the EAr-CL, by themselves require an exercise in metacognitive reasoning from respondents in their answer process. Therefore, items with more than one idea can interfere with the understanding of the content as they require additional cognitive effort from students (Carvalho & Ambiel, 2017). Another problem identified in this type of item is the occurrence of agreement/disagreement response bias – respondent's tendency to agree/disagree with the items systematically –, affecting the instrument's psychometric quality (Valentini & Hauck, 2020).

The five items representing the adaptive self-reactions of the EAr-CL allude to the high motivational levels of a prospective character. With this, it is assumed that students persist in tasks that involve texts that are difficult to comprehend. The initiative to seek help is also observed and considered a characteristic behavior of self-regulated students (Dembo & Eaton, 2000; Kitsantas & Cleary, 2016; Zimmerman, 2013). The four items of defensive self-reactions imply negative repercussions arising from self-dissatisfaction, emphasizing nervousness and the

feeling of annoyance. They also refer to demotivation, expressed by pauses in reading, which may be momentary or not, and by giving up. These defensive self-reactions are characteristic of students with problems in SRL (Chen & Bonner, 2020; Heirweg et al., 2020; Kitsantas & Cleary, 2016).

In the subsequent phase of this research, regarding the study of evidence of content validity, we analyzed the plausibility of the EAu-L and EAR-CL structures. Accordingly, the investigation of the adequacy of five items of the EAu-L as representative of the difficulties of self-regulation of the self-monitoring, based on the self-perceived behavior dimension (Table 1, items 4, 8, 10, 14, and 18), should be highlighted. These items presented the self-monitoring strategies that did not denote the deliberate intention to optimize reading comprehension. However, the teaching determination or the imitation of colleagues was carried out in a decontextualized way. We also investigated the reliability estimates of these models applied to middle school students.

## Validity evidence study based on the internal structure

### Method

#### Participants

The sample was composed of 522 middle school students enrolled in three public schools in the state of São Paulo. The age of the students ranged from ten to 18 years ( $M_{\text{age}} = 12.72$ ,  $SD = 1.26$  years). Students from the sixth ( $n = 132$ ), seventh ( $n = 159$ ), eighth ( $n = 128$ ), and ninth grades ( $n = 103$ ) participated in the research. Regarding distribution by biological sex, 280 students were female. In this sample, 90 students reported having a history of repeating.

#### Instruments

- EAu-L and EAR-CL: both scales are part of the Multidimensional Battery of Reading Comprehension Self-Regulation (*Bateria Multidimensional da Autorregulação para a Compreensão de Leitura [BAMA – Leitura]*). They assess key processes of self-regulation of middle school students for reading comprehension in the self-perceived behavior dimension. The EAu-L consists of 14 items that assess students' self-regulation in self-monitoring actions applied to reading comprehension activities. The EAR-CL has nine items that assess students' self-regulation through positive and negative self-reactions to hypothetical situations of difficulty reading comprehension. The answer key of the scales is a four-point Likert-type scale that ranges from not true (*nada verdadeiro*) to totally true (*totalmente verdadeiro*).

#### Data collection procedure

Study participants were students who presented the consent form signed by a parent or legal guardian and agreed to participate in the study by signing a consent form. The students over 18 years old were asked to sign the consent form for students who had reached the age of

majority. The research was carried out collectively during class time. The EAU-L and EAR-CL were applied in pencil and paper format. The students took an average of 20 minutes to complete both scales.

### Data analysis procedure

We used the softwares Factor (version 10.10.02) (Lorenzo-Seva & Ferrando, 2020) and MPlus version 7.11 (Muthén & Muthén, 2012) and the online tool Composite Reliability Calculator.<sup>2</sup> The procedures followed the steps below:

1. Investigation of factor retention – parallel analysis: the percentage values of mean variance of real data higher than random data were considered. For the EAU-L, the unidimensionality indicators evaluated were unidimensional congruence (UniCo) > .95, explained common variance (ECV) > .85, and mean of item residual absolute loadings (MIREAL) < .30 (Damásio & Dutra, 2017).
2. EAU-L: confirmatory factor analysis (CFA), with the weighted least square mean and variance (WLSMV) adjusted estimation method (Muthén & Muthén, 2012).
3. EAR-CL: exploratory structural equation modeling (ESEM), with Geomin oblique rotation method and WLSMV estimation (Muthén & Muthén, 2012).
4. Interpretation of the plausibility of models generated by CFA and ESEM.  $\chi^2/df$  ratio > 5; fit indices: root mean square error of approximation (RMSEA)  $\leq$  .09, with a confidence interval (CI) of 90%; confirmatory fit index (CFI) and Tucker-Lewis index (TLI)  $\geq$  .80 (Marôco, 2014). Factor loadings of less than .40 were adopted as the cut-off point for item exclusion.
5. Internal consistency of the EAU-L and EAR-L: composite reliability (CR) index interpretation: a value of .70 or above was considered adequate (Peterson & Kim, 2013).
6. Correlation between EAR-L factors: Spearman rank correlation analysis ( $\rho$ ). Interpretation values:  $\rho \leq$  .29, weak;  $\rho \cong$  .30 to .69, moderate;  $\rho \geq$  .70, strong (Dancey & Reidy, 2013).

### Results

For the EAU-L, the parallel analysis indicated the retention of one factor. The mean value of the variance of real data was 33.67%, and mean value of the explained variance of random data, 16.76%. Additionally, the single factor structure of the EAU-L was corroborated with the MIREAL unidimensionality indicator of .24.

The following indices were obtained from the first EAU-L model tested through CFA:  $\chi^2/df = 8.58$ ; RMSEA = .12 (0.112–0.129); CFI = .78; TLI = .75. Five items with factor loadings below .40 were excluded from the scale. Table 4 presents the structure of the EAU-L, containing nine items. The model's fit indices were classified as good; however, the  $\chi^2/df$  ratio was not adequate. The two EAU-L reliability indices presented good values.

2 [http://www.thestatisticalmind.com/calculators/comprel/composite\\_reliability.htm](http://www.thestatisticalmind.com/calculators/comprel/composite_reliability.htm)

In the EAR-CL, the parallel analysis indicated the retention of two factors. The mean values of variance of real data were 42.98% and 21.30%, and the mean values of explained variance of random data were 25.36% and 21.19%.

The two-factor model of the EAR-CL containing nine items proved to be plausible, with the  $\chi^2/df$  ratio qualified as adequate and the RMSEA, CFI, and TLI fit indices rated as very good. Factor 1 (F1), named positive self-reactions, contains five items (1, 3, 5, 7, and 9), and factor 2 (F2), named negative self-reactions, four items (2, 4, 6, and 8). The correlation between the factors was  $-.41$ , classified as a moderate magnitude. The reliability indices (CR) for the EAR-CL factors were adequate.

**Table 4**

*EAU-L and EAR-CL: Internal Structure<sup>3</sup>*

Self-Monitoring for Reading Scale	CFA 2	Self-Reactions for Reading Comprehension Scale	ESEM	
	F1		F1	F2
1. I mark essential parts * is written.	<b>.70</b>	1. I keep reading * understand.	<b>.73</b>	-.05
2. I pay attention * understand the text.	<b>.64</b>	2. I get nervous * to understand.	.10	<b>.54</b>
3. I take notes * I am reading.	<b>.74</b>	3. I am looking * understand the text.	<b>.43</b>	.25
4. I look for the * to understand.	<b>.61</b>	4. I give * reading.	-.25	<b>.67</b>
5. I read the text * in reading.	<b>.69</b>	5. I strive to understand what is written.	<b>.77</b>	.01
6. I pay attention * the reading.	<b>.61</b>	6. I get upset * stop reading.	.01	<b>.73</b>
7. I think about * understand better.	<b>.60</b>	7. I feel motivated * the text.	<b>.73</b>	-.01
8. I relate the things * texts I read.	<b>.48</b>	8. I leave * later.	-.23	<b>.53</b>
9. Writing summaries makes * to understand.	<b>.64</b>	9. I think I will be able * reading.	<b>.74</b>	.03
Plausibility indices of the CFA 2 model		Plausibility indices of the ESEM model		
$\chi^2/df = 5.46$ ; RMSEA = .09 (.078-.107); CFI = .95; TLI = .93.		$\chi^2/df = 2.65$ ; RMSEA = .06 (.040-.073); CFI = .98; TLI = .97.		
Reliability index		Reliability index		
CR = .86		F1: CR = .82; F2: CR = .71		

Note. EAU-L = Escala Automonitoramento para Ler (Self-Monitoring for Reading Scale); EAR-CL = Escala Autorreações para a Compreensão de Leitura (Self-Reactions for Reading Comprehension Scale); CFA = confirmatory factor analysis; ESEM = exploratory structural equation modeling; F1 = factor 1; F2 = factor 2; RMSEA = root mean square error of approximation; CFI = confirmatory fit index; TLI = Tucker-Lewis index; CR = composite reliability. Values in bold indicate factor loading above .40.

\* Some excerpts from all items on the scales were suppressed in this paper.

3 Contact the corresponding author of this paper to check the possibility of having access to the full scales.

## Discussion

This study indicates that the EAU-L and EAR-CL present evidence of validity based on the internal structure. This confirms the hypotheses of this study regarding the identification of one factor for EAU-L and two factors for EAR-CL, referring to adaptive and defensive self-reactions. Furthermore, both scales presented adequate reliability estimates. Concerning the EAU-L, the five items excluded in the first CFA indicated possible inadequacy to assess self-monitoring strategies in studying evidence based on the test content. They did not directly focus on using this key process in the procedures aimed at reading comprehension.

Regarding the final structure of the scales, by checking the answer options labels options very true (*muito verdadeiro*) and totally true (*totalmente verdadeiro*) of the EAU-L, students indicated that they self-regulate the monitoring of strategies to comprehend the reading. This assertion is supported by empirical and theoretical studies that characterize self-regulated students by their mastery of self-monitoring of school tasks (Heirweg et al., 2020; Kitsantas & Cleary, 2016; Schunk & Usher, 2013; Zimmerman & Risemberg, 1997). In contrast, by indicating the options little true (*pouco verdadeiro*) and not true (*nada verdadeiro*), difficulties or the absence of self-regulation in the monitoring of strategies used during the performance of tasks involving reading comprehension can be identified (Elleman & Oslund, 2019; Joseph et al., 2016; Schunk & Usher, 2013). In this case, it is recommended that the repertoire of learning strategies that the student has and how they are applied be investigated, which also includes their selection in the planning phase, preceding the execution of the task (Heirweg et al., 2020; Li et al., 2018).

Concerning the EAR-CL, the items remained the same as in the study of evidence of content validity. As expected, a two-factor solution was identified. The factor named positive self-reactions investigates adaptive self-reactions to difficulties in reading comprehension, emphasizing prospective motivational aspects. Adaptive self-reactions are characteristics of self-regulated students. Therefore, it is assumed that when respondents check the options very true (*muito verdadeiro*) and totally true (*totalmente verdadeiro*) they provide indications that they can self-regulate in difficult and complex situations, as they show themselves to be motivated to face these challenges, persist in the task, and make efforts (Chen & Bonner, 2020; Kitsantas & Cleary, 2016; Schunk & Usher, 2013).

The second factor of the EAR-CL, named negative self-reactions, alludes to defensive self-reactions, centered on the students' affective self-dissatisfaction responses to situations of difficulty in reading comprehension. Students with problems in SRL characteristically exhibit this behavior, lack of motivation and drop out (Chen & Bonner, 2020; Heirweg et al., 2020; Kitsantas & Cleary, 2016). Also, studies have noted difficulties for students to deal with nervousness (anxiety) and dissatisfaction, both linked to the self-assessment of failure results and associated with a drop in motivational quality (Dembo & Eaton, 2000; Schunk & Usher, 2013).

As a limitation, this study did not encompass the analysis of the existing relationships between the EAU-L and EAR-CL with the use of learning strategies, motivation, and emotional regulation for reading comprehension activities. This indication aims to expand the scales'

psychometric quality and elucidate how these constructs behave in the Brazilian educational context. This recommendation is also valid for professionals that intend to assess students' self-monitoring and self-reactions for reading comprehension. Among the aspects to be considered in future studies with the EAu-L and EAr-CL, it is highlighted that the assessment process of students with difficulties in self-regulation for reading comprehension should not only consider self-monitoring and self-reactions but should encompass the analysis of students' planning to perform reading tasks and the establishment of goals and their motivational components, such as the achievement of goals and self-efficacy. In particular, regarding self-reactions, it is recommended that students that self-evaluate themselves are identified, which includes beliefs arising from intrapersonal causal attributes.

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