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RICERCHE

Valutazione della Struttura Fattoriale del Metacognitive Awareness of Reading Strategies Inventory (MARSI-R) nel contesto dei futuri insegnanti italiani.

Evaluating the Factor Structure of the Metacognitive Awareness of Reading Strategies Inventory (MARSI-R) in the Context of Italian Future Teachers.

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ABSTRACT ITALIANO

Questo studio valuta la struttura fattoriale del Metacognitive Awareness of Reading Strategies Inventory-Revised (MARSI-R) tra 445 futuri insegnanti utilizzando l'analisi fattoriale confermativa. I risultati mostrano forti relazioni item-fattore, ma gli indici di adattamento suggeriscono un adattamento marginale, indicando che il modello a tre fattori potrebbe richiedere un adattamento all'interno di questo contesto culturale. Questo studio sottolinea l'importanza della consapevolezza metacognitiva e sostiene la promozione dello sviluppo di competenze metacognitive critiche da parte dei futuri educatori per affrontare l'analfabetismo funzionale. Contribuendo alla validazione interculturale del MARSI-R, questa ricerca sostiene un approccio pedagogico che incoraggia la riflessione critica e le abilità di alfabetizzazione attraverso adattamenti culturalmente rispondenti agli strumenti di valutazione metacognitiva nei programmi di formazione degli insegnanti.

ENGLISH ABSTRACT

This study evaluates the factor structure of the Metacognitive Awareness of Reading Strategies Inventory-Revised (MARSI-R) among 445 future teachers using confirmatory factor analysis. Results show strong item-factor relationships, but model fit indices suggest a marginal fit, indicating that the three-factor model may need adaptation in this cultural context. In an era where education is increasingly shaped by standardised tools, the findings highlight the importance of considering contextual and cultural differences when applying assessment measures. This study underscores the significance of metacognitive awareness and promotes future educators' development of critical metacognitive skills for addressing functional illiteracy. By contributing to the cross-cultural validation of the MARSI-R, we advocate for a pedagogical approach that encourages critical reflection and literacy skills through culturally responsive adaptations of metacognitive assessment tools in teacher education programmes.

Introduction

Metacognitive awareness within reading comprehension is a crucial cognitive skill that underpins effective learning, self-regulation, and academic achievement. Within the context of education, it plays a key role in teachers' ability to guide students in developing self-regulated learning strategies.

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Given the increasing demands of modern education, teachers must possess a wide range of skills, including subject knowledge, pedagogical expertise, and essential soft skills such as metacognitive awareness.

Furthermore, it has been proposed that metacognitive reading strategies are crucial in developing the higher-order thinking skills needed for functional literacy (Villanueva, 2022). Therefore, valid and reliable tools to assess metacognitive awareness of reading strategies are key in identifying issues early, to implement relevant interventions and support to enhance the metacognitive skills needed to prevent literacy challenges.

The Metacognitive Awareness of Reading Strategies Inventory-Revised (MARSI-R; Mokhtari et al., 2018) is a self-report measure designed to assess students' metacognitive awareness and their perceived use of the reading strategies they use whilst reading. Specifically, it evaluates how students regulate, plan, and monitor their reading comprehension through different strategies. Given the importance of metacognition in both student learning and teacher training, ensuring the validity of the MARSI-R across diverse educational contexts is essential.

The MARSI-R has been used in various contexts (Deliany & Cahyono, 2020), yet naturally its factorial structure and applicability remain subject to contextual differences. The present study conducts a confirmatory factor analysis (CFA) on the MARSI-R within an Italian future teacher context to evaluate its factor structure and relevance for this specific population. By doing so, this research contributes to broader investigations into the validity of the MARSI-R, offering insights into how metacognitive reading strategies are perceived by teachers in training. These findings could have implications for the use of MARSI-R in higher education teacher training programmes, potentially influencing how metacognitive skills are assessed and developed in future educators.

Theoretical Background

Metacognitive awareness of reading strategies plays a crucial role in influencing reading and text comprehension. By enabling readers to be conscious of and regulate their thought processes, metacognition facilitates deeper and more meaningful engagement with the text, ultimately enhancing comprehension (Pahrizal et al., 2024). Amongst researchers, there has been an interest in the role of metacognitive awareness for students' reading comprehension. Research has demonstrated that metacognitive awareness plays a crucial role in enhancing reading skills and comprehension (Al-Kiyumi & Seyabi, 2021), in a variety of contexts (Khellab et al., 2022). In today's rapidly evolving educational landscape, teachers are expected to possess a diverse set of skills, including metacognitive skills (Demirel et al., 2015).

The continued promotion of metacognitive reading skills are particularly relevant in the Italian context, where large numbers of the population have been identified as having low literacy proficiency levels (OECD, 2023).

Future teachers with strong metacognitive awareness may be better positioned to implement instructional strategies that enhance these skills and in turn functional literacy, in their future classrooms.

An essential aspect of advancing the positive effects of metacognitive awareness is the creation and validation of a reliable tool to measure it, this has been a challenge that has been acknowledged in the field. As highlighted by the authors of the MARSI-R, MacNamara's analysis of this issue underscores the complexities involved. According to MacNamara, students' self-assessments often do not align with their actual performance, and their learning and comprehension strategies can vary significantly depending on the context, subject, goals, and tasks (MacNamara, 2011). This perspective, cited by the authors of the MARSI-R, highlights the challenges encountered during the development of the tool. Mokhtari et al. explain that the primary purpose of the MARSI-R is to assess students' metacognitive awareness or perceived use of reading strategies, particularly when reading academic texts. This focus makes the tool especially relevant to the current study, which examines Italian future teachers enrolled in university courses, thus required to engage in academic reading.

The MARSI-R uses a 5-point Likert scale format to assess the degree of knowledge and awareness students have regarding reading strategies. The scale ranges from 1, indicating that a student has never heard of the strategy before, to 5, which signifies that a student knows the strategy quite well and often uses it when reading. The intermediate points reflect varying levels of awareness, from merely having heard of the strategy to understanding its use in detail. The MARSI-R measures three categories of reading strategies: Global Reading Strategies (GRS), Problem-Solving Strategies (PSS), and Support Reading Strategies (SRS).

- GRS are intentional strategies that help set the foundation for effective reading. They involve planning and monitoring one's reading process, allowing the reader to establish a clear purpose, anticipate content, and create a structured approach to understanding the text. These strategies enable readers to engage with material in a meaningful and organised manner.
- PSS are applied when difficulties arise during reading. These strategies help readers navigate challenges in comprehension by encouraging self-monitoring, reflection, and adjustments in reading techniques. They involve active engagement with the text to resolve misunderstandings, clarify meaning, and enhance overall comprehension.
- SRS involve the use of external resources and tools to reinforce understanding and maintain engagement. These strategies help readers stay focused and actively involved in the reading process by incorporating supportive mechanisms that aid comprehension, retention, and critical analysis of the material.

The effective use of these strategies can lead to more successful reading comprehension and retention. The MARSI-R provides an effective tool for evaluating students' metacognitive awareness of reading strategies. By measuring the variety of strategies in their reading process, it offers valuable insights into their reading habits and cognitive processes. The instrument's design and the revised version's shorter length ensures that it is accessible and reliable.

Methodology

Sample

The questionnaire was administered to 445 future teachers enrolled at the University of Palermo, the sample consisted of a mix of 235 students in their first year of the Primary Education Sciences course, and 210 future teachers enrolled on the Teacher Qualification course, thus having a balanced mix of future teachers who are in the beginning stages of their training and more experienced students towards the end of their training. Of the sample, 86.7%, were female, and 12.6% were male, whilst the remainder preferred not to state.

Instrument description

The study used the self-report MARSI-R questionnaire by Mokhtari et al. (2018), the present study used this modified version of the MARSI-R, which is a shorter version of the original MARSI (Mokhtari & Reichard, 2002) that the authors produced by shortening the original scale from 30 to 15 based on their findings. The instrument was translated into Italian by an Italian native speaker before administration. The questionnaire consists of a total of 15 items within the instrument (shown in Table 1), within three subscales: Global Reading Strategies, Problem-solving Strategies, and Support Reading Strategies. There are five items in each of the three factors. Participants are asked to indicate the extent to which they use the various strategies on a 5-point Likert scale ranging from 1 ("I have never heard of this strategy before") to 5 ("I know this strategy quite well, and I often use it when I read").

Data collection

The data was collected through convenience, non-random sampling via an online questionnaire, Google Forms. The data was collected throughout 2 months. Participation was voluntary and consent was gained in order to use the responses.

Data preparation and statistical methods

After data collection, raw data from the 445 participants was cleaned, prepared, and processed in Jamovi 2.2.5 software, inclusive of data screening assumption checks for confirmatory factor analysis. Screening of the data revealed no issues regarding missing data, or concerning outliers. The statistical method used was confirmatory (CFA) to assess the factor structure of the MARSI-R and to examine whether the 3-factor model demonstrated a good fit in an Italian future teacher sample. CFA is a technique that is commonly used for scale and structure validation (Gallagher & Brown, 2013), being appropriate for the present studies' aims.

Results

Before conducting Confirmatory Factor Analysis (CFA), several assumptions were examined to ensure the appropriateness of the model estimation. Normality was assessed by examining skewness and kurtosis values for each variable. In Table 1, descriptive

statistics for the MARSI-R items are presented. It can be seen that skewness values ranged from -1.74 to -0.24, thus falling within the acceptable range of ±2. Kurtosis values ranged from -0.90 to 2.57, falling within the generally accepted range of ±7. Given that all values fell within the suggested cut-off values (Hoyle, 1995; Byrne, 2010), the collected data values are considered to be within normal distribution ranges as suggested. To assess the assumption of linearity, scatterplots were visually inspected for each variable against its corresponding latent factor, to determine whether relationships followed a linear pattern. In addition to the scatterplots, a Spearman's correlation matrix was computed for all observed variables to further investigate the strength and direction of relationships between them. Spearman's rho was chosen due to the ordinal nature of the Likert scale data. The correlation matrix revealed significant, positive correlations between all variable and their latent factors, ranging from r = .14 to r = .74, confirming the assumption of linearity. Multicollinearity was also ensured to be of no concern, as no correlations exceeded .74, thus not approaching 1. Based on these checks, the assumptions for CFA were considered satisfied.

TAB.1: DESCRIPTIVE STATISTICS

Item or Domain	Mean	Median	Skewness	Kurtosis
1. I have a purpose in mind when I read.	3,61	4	-0,573	-0,3553
2. I take notes while reading to help me understand what I read.	4,00	4	-1,045	0,9563
3. I anticipate the topic covered by the text before I read it.	3,28	3	-0,241	-0,4990
4. I preview the text to understand what it is about before I read it.	3,83	4	-0,716	-0,2826
5. I read aloud to help me understand what I am reading.	4,06	4	-1,034	0,3515
6. Discussing what I am reading with others allows me to check my understanding.	4,17	4	-1,168	1,0623
7. I go back on my way when I get distracted.	4,29	5	-1,103	0,6425
8. I underline or circle the most important information in the text	4,40	5	-1,743	2,5701
9. I adjust my reading speed based on what I am reading	3,92	4	-0,994	0,0546
10. I use reference materials such as dictionaries to help me understand what I am reading.	3,59	4	-0,468	-0,5056

11. I stop from time to time and think about what I am reading	4,04	4	-0,979	0,4125
12. I use typographic aids such as bold and italics to select key information.	4,00	4	-1,000	0,1176
13. I critically analyse and evaluate the information presented in the text.	3,92	4	-0,681	0,0118
14. I reread to make sure I understand what I am reading.	4,28	5	-1,188	1,0555
15. I try to guess the meaning of unfamiliar words or phrases.	3,33	3	-0,326	-0,9036
Global reading strategies	3,77	3,80	-0,603	0,3115
Problem-solving strategies	3,97	4,20	-0,905	0,7767
Support reading strategies	4,00	4,20	-0,989	1,2092
Total MARSI-R	3,92	4,00	-0,977	1,2806

Standardised factor loadings for the MARSI-R items to their latent factors (GRS, PSS, SRS) ranged from .48 to .78, with all loadings being statistically significant ($p < .001$). Full factor loadings output can be seen in Table 2, and the standard confirmatory factor analysis path diagram can be seen in Figure 1. Most items exceeded the recommended threshold of 0.50 (Hair et al., 2010), indicating strong item-factor relationships.

TAB.2: FACTOR LOADINGS

Factor	Indicator	Estimate	SE	Z	p	Standard Estimate
GRS	1MARSI	0.556	0.0585	9.50	<.001	0.469
	3MARSI	0.554	0.0569	9.74	<.001	0.481
	5MARSI	0.477	0.0522	9.13	<.001	0.443
	12MARSI	0.696	0.0532	13.09	<.001	0.605
	13MARSI	0.630	0.0461	13.68	<.001	0.639
PSS	7MARSI	0.548	0.0399	13.71	<.001	0.623
	9MARSI	0.720	0.0549	13.11	<.001	0.600
	11MARSI	0.783	0.0446	17.56	<.001	0.754
	14MARSI	0.622	0.0395	15.76	<.001	0.695
	15MARSI	0.527	0.0624	8.45	<.001	0.410
SRS	2MARSI	0.602	0.0470	12.81	<.001	0.597
	4MARSI	0.552	0.0543	10.17	<.001	0.484
	6MARSI	0.563	0.0448	12.56	<.001	0.581

	8MARSI	0.592	0.0450	13.15	<.001	0.607
	10MARSI	0.715	0.0499	14.34	<.001	0.647

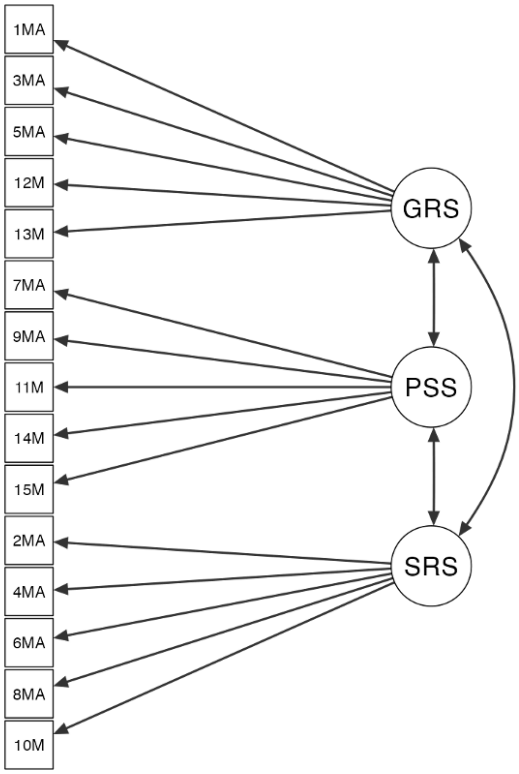

FIG.1: PATH DIAGRAM

To assess the model fit of the CFA output, chi-squared test, Root Mean Square Error of Approximation (RMSEA), Standardised Root Mean Square Residual (SRMR), comparative fit index (CFI) and Tucker-Lewis index (TLI) values were reported following the requirements of: χ^2 non-significant p-value, RMSEA < 0.08, SRMR £ 0.08, CFI and TLI > 0.90 (Hu & Bentler, 1999; Brown, 2015). The chi-squared test produced a significant output of ($\chi^2(87) = 337$, $p < .001$), thus indicating poor fit. However, as chi-square can be sensitive to larger sample sizes (Bergh, 2015), other model fit indices were also considered in the evaluation. Full output of the model fit values can be seen in Table 3. As can be seen, the CFI (.88) and TLI (.85) values were close, but did not quite meet the acceptable threshold value of .90. The RMSEA (.08) was at the upper limit of acceptable fit. The SRMR (.05) was

within the acceptable range, suggesting reasonable model fit despite limitations in other indices. These results indicate that the model provided a partial, borderline fit to the data, which suggests that modifications to the factor structure may be necessary for the present studies' population.

TAB.3: MODEL FIT OUTPUT

				RMSEA 90% CI	
CFI	TFI	SRMR	RMSEA	Lower	Upper
0.877	0.851	0.0540	0.0803	0.0714	0.0895

Discussion

It is understood that metacognitive awareness are crucial skills for students' reading comprehension. In this study, a factor analysis was conducted on the MARSI-R administered to Italian future teachers to evaluate the construct validity of the instrument in this specific population. The results suggest partial construct validity in the population of Italian future teachers. While the model demonstrated acceptable factor loadings, some model fit indices indicated that the three-factor structure of the MARSI-R did not fully align with the data, suggesting that further modifications may be needed for this particular context. Since metacognition plays a crucial role in instructional practices, ensuring that MARSI-R is a reliable tool for measuring these strategies in an Italian teacher context is particularly relevant. The present findings underscore the importance of metacognitive awareness and reading strategies for future teachers, given their strong association with reading comprehension, particularly as academic reading is a strong requirement for not only their training, but later on for continued professional development in their subsequent careers.

The aim of the present study was to assess the construct validity of the three-factor model MARSI-R model in an Italian future teacher context. Factor loadings for all items were moderate to strong and statistically significant, indicating strong item-factor relationships and providing support that the items within each subscale adequately measure and are related to their respective subscale. However, the model fit indices pointed to a marginal fit, with the chi-squared result indicating poor fit, while other model fit measures (CFI, TLI, RMSEA, SRMR) were either close to suggested cutoffs or borderline of the acceptable ranges. These findings are consistent with prior studies that have found similar issues with the MARSI-R in different populations.

The MARSI-R, proposed by Mokhtari et al., was designed to reduce the number of items of the original MARSI from 30 to 15, dividing items across the three factors: GRS, PSS, and SRS. Though the authors found this shorter version of the MARSI-R to demonstrate good model fit (CFI = .972, TF = .966, RMSEA = .046), subsequent investigations have revealed fit indices that fall just short of ideal values, reflecting

potential challenges in the model's universality across varied cultural and educational contexts. A 2023 study highlighted that empirical studies have struggled to replicate

Mokhtari et al.'s findings in their validation of the revised version of the instrument (Alamer & Alsagoafi, 2023). Similarly, our results echo the findings of researchers who conducted CFA on the MARSI-R within a population of 570 Spanish students, reporting a relatively inadequate fit for the three-factor model. Ondé et al. (2022) suggested it may be more appropriate to instead approach the MARSI-R as a unidimensional measure, using the total scale score as opposed to individual subscale scores (Ondé et al., 2022) and this was echoed by findings within a Turkish application of the MARSI-R (Börekci & Börekci, 2023).

The CFA results from this study indicate that the MARSI-R still holds promise as a measure of metacognitive awareness of reading strategies in Italian future teachers. The strong and significant factor loadings provide support for the applicability of the three-factor model. Furthermore, the SRMR model fit measure was well within the acceptable range. The borderline misfits of the other measures may indicate that the structure could require further refinement, such as evaluating the dimensionality of the constructs within this specific population. Overall, the present studies' findings reinforce that while it may be suitable for broader applications with some adjustments, careful attention should be paid to the cultural and contextual specificities of the population being studied.

Despite the borderline fit indices, this study makes a meaningful contribution to the cross-cultural validation of the MARSI-R by providing empirical evidence from an Italian future teacher population. Additionally, this study adds to the body of research questioning the universality of the three-factor structure, highlighting the importance of considering cultural and educational differences when applying standardised instruments (Beaton et al., 2000), reinforcing the need for ongoing evaluation and refinement of tools like MARSI-R. By identifying areas where model fit was less than ideal, this study lays the groundwork for future research to explore potential adaptations that may enhance the instrument's applicability in this context. The findings also lay the foundations for investigating how metacognitive reading strategies can be cultivated and assessed in teacher education programmes, ensuring that future educators are well-equipped for the modern-day demands of teaching.

Research has found relationships between metacognitive awareness and functional literacy, highlighting the importance of such skills (Özenç & Dikici, 2016). This supports the notion that in order to address functional illiteracy, the teaching of metacognitive skills must be included in educational systems. Our findings empashise that teacher education programs should incorporate culturally responsive metacognitive awareness measures to identify students experiencing challenges, thus potentially contributing to more effective literacy interventions across the educational lifespan. As educators develop stronger metacognitive awareness, they become better equipped to address the concerning rates of functional illiteracy and implicit dropout in the Italian educational system.

Regarding the limitations of the present study, the results are by nature limited to an Italian future teacher context, as well as this, though the sample size of 445 students is relatively large, future studies with even larger samples are important to offer increased

generalisability. Further studies utilising the MARSI-R are key for validating the measure across diverse contexts and populations. Additionally, future research could also explore the discussed adjustments to the model that could lead to improved fit indices and ensure the continued validity of the MARSI-R across these diverse settings.

Conclusion

The present study provides valuable insights into the use of the MARSI-R in this population of Italian future teachers, while the results offer some support for the validity in this context, they also highlight the need for further exploration and potential modification of the three-factor model for optimal application. The current study serves as an important step in understanding the validity of the MARSI-R in this context, but it also echoes previous findings and underscores the importance of continuing to refine and test measurement models in different educational settings. Whilst acknowledging the population-specific results from this study, we contribute useful knowledge to the body of information surrounding the MARSI-R, and metacognitive reading strategies.

Author notes

The present article was the result of the joint work of two authors. Specifically, S.O. Mercer wrote sections 2-Methodology, 3-Results and 4-Discussion. R. Orofino wrote sections Introduction, 1- Theoretical Background and 5-Conclusion.

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