Effects of self-regulated strategy instruction on the reading comprehension process and reading self-efficacy in primary students

Efectos de una instrucción estratégica-autorregulada en el proceso de comprensión y autoeficacia lectora del alumnado de educación primaria

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Abstract:

Self-regulation is an important factor in achieving successful reading comprehension. This study analyses the effects of a self-regulated strategy instruction programme versus a control group on reading comprehension performance, time spent applying strategies during the reading comprehension process and reading self-efficacy. The programme comprised two conditions (condition 1 and condition 2) in which the teachers provided direct and explicit teaching of self-regulation strategies before, during and after the reading process. In condition 2, explicit instruction in reading self-efficacy was added. In the control condition, teachers provided traditional instruction based on reading aloud, sequential reading, text questions and the use of dictionaries. A total of 180 Spanish primary school students from eight different Year 5 and 6 classes (aged 10-12 under the Spanish education system) were either assigned to one of the two experimental conditions (Condition 1: N = 47. Condition 2: N = 47) or to the control condition (N = 86). Pre-test/post-test/follow-up measures were taken (six weeks after the intervention) of reading performance, reading self-efficacy and time spent applying self-regulation

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strategies before, during and after reading through an online assessment. The results showed that the instructional programme had a positive and significant effect in the two experimental conditions compared to the control group in terms of reading performance and time spent applying self-regulation strategies *before and after* the reading process. However, no statistically significant differences were observed in the time spent applying strategies *during* reading and in reading self-efficacy, neither between the two experimental conditions nor between the experimental conditions and the control condition. The implications of these results and their contribution to educational practices are discussed.

Keywords: Reading comprehension, reading strategies, self-control, self-regulation, self-efficacy, primary education.

Resumen:

La autorregulación es un importante factor para garantizar una adecuada comprensión lectora. Este estudio analiza los efectos de un programa de instrucción estratégica-autorregulada frente a un grupo control en el rendimiento en comprensión lectora, el tiempo dedicado a aplicar estrategias durante el proceso de comprensión lectora y la autoeficacia lectora. El programa se desarrolla bajo dos condiciones (condición 1 y condición 2) en las que los profesores trabajaron la enseñanza directa y explícita de estrategias de autorregulación antes, durante y después del proceso lector. En la condición 2 se añadió una instrucción explícita en autoeficacia lectora. Mientras que en la condición de control los profesores impartieron la enseñanza tradicional basada en la lectura en voz alta, lecturas encadenadas, preguntas sobre el texto y uso del diccionario. Un total de 180 estudiantes de 8 clases de 5.º y 6.º de educación primaria (10-12 años) fueron asignados a las 2 condiciones experimentales (condición 1, N = 47 y condición 2, N = 47) y una condición de control (N = 86). Se tomaron medidas pretest-postest-seguimiento (6 semanas después de la intervención) del rendimiento lector, la autoeficacia lectora y del tiempo dedicado a aplicar estrategias de autorregulación antes, durante y después de la lectura a partir de una evaluación *online*. Los resultados mostraron un efecto positivo y significativo del programa instruccional en las dos condiciones experimentales frente al grupo control en relación con el rendimiento lector y el tiempo dedicado a aplicar estrategias de autorregulación *antes y después* del proceso lector. Sin embargo, no se observaron diferencias estadísticamente significativas en el tiempo dedicado a aplicar estrategias *durante* la lectura ni en la autoeficacia lectora entre las condiciones experimentales ni entre las condiciones experimentales frente a la condición de control. Se discuten las implicaciones de los resultados obtenidos y su aportación a las prácticas educativas.

Descriptores: comprensión lectora, estrategias lectoras, autocontrol, autorregulación, autoeficacia, educación primaria.

1. Introduction

Reading comprehension is a complex process that involves the building of thinking skills that activate cognitive, metacognitive and motivational resources to achieve a coherent representation of the meaning of the text, which is referred to by Kintsch as a situation model (Kintsch & Rawson, 2005). Active support in these thinking skills allows the reader to self-regulate their reading process. In fact, to form coherent cognitive representations, good readers use self-regulation strategies; are aware of the demands of the reading task; monitor their comprehension as they read; select the most relevant information; take action to resolve reading difficulties — for example, adjusting their reading speed as they read or reread a text —; and they ask questions to check their comprehension. In other words, they are flexible in their reading process (Minguela et al., 2015). However, readers with poor comprehension demonstrate little to no self-regulation of their reading comprehension (Berkeley & Larsen, 2018).

According to Zimmerman and Schunk (2015), a self-regulated reader is able to take control of their reading comprehension during a sequence of events: *before reading* by selecting strategies, planning and setting the aim of their reading; *during reading* by applying strategies and self-regulating their implementation; and *after reading* by reflecting on and relating the information to their prior knowledge. In this theoretical model, the reader needs to have a repertoire of self-regulation strategies that allow them to go beyond the surface meaning of the text and to progressively control and regulate their comprehension process (Vandevelde et al., 2013).

However, as self-regulated strategic control does not usually develop spontaneously, readers need direct and explicit instruction in self-regulation strategies and processes (Dignath & Veenman, 2021; Fonseca et al., 2018; Torrano et al., 2017). This type of instruction becomes even more significant during the transition from primary to secondary education as, by this time, students are expected to read independently in order to understand textual information (Berkeley & Larsen, 2018). However, in Spain, as indicated in the 2018 PISA reports, reading comprehension performance in Spanish students (477 points) is significantly lower than the OECD average (487 points) and the EU average (489 points) (OECD, 2019). One explanation for these poor results in reading performance could be a decline in motivation and confidence among Spanish students in their ability to use self-regulation strategies (Tonks & Taboada, 2011; Vandevelde et al., 2013). Research has shown that during the transition to secondary education, many students develop negative motivational beliefs about their ability to successfully complete tasks, leading to a reduction in reading self-efficacy beliefs (Olivares et al., 2016; Usher & Pajares, 2008) and greater difficulties when it comes to self-regulating their learning.

As a result of students struggling to apply self-regulation strategies during reading (Vandevelde et al., 2013), differences

have emerged in the use of these strategies (Veenman et al., 2006). This has led researchers and educators to explore how to develop instructional practices that produce a change in the reading process (Elleman & Oslund, 2019). In this area of research, various meta-analyses have identified knowledge gaps in the instruction of self-regulation processes in reading comprehension. For example, the meta-analysis by Ripoll and Aguado (2014) into interventions for improving reading comprehension in Spain highlights a lack of instructional programmes that identify the type of strategies that effectively improve reading comprehension in Spanish students. On an international level, a meta-analysis by Berkely and Larsen (2018), following a review of 30 years of research into reading comprehension, concludes that most interventions analyse the effects of self-regulated strategy instruction on reading performance but do not consider changes in the reading process and self-efficacy beliefs following the intervention. As a result, these interventions do not allow for the identification of a reading pattern that could explain their impact on improving reading comprehension (see the meta-analysis by Ellema & Compton 2017; Elleman & Oslund, 2019). These knowledge gaps are precisely the focus of this study.

The aim of this study is to analyse the effects of a self-regulated strategy instruction programme not only on reading comprehension performance but also on time spent applying self-regulation strategies and reading self-efficacy in Spanish primary school students in Year 5 and 6 (aged 10–12 under the Spanish education system) compared to a control group.

The instructional programme comprises two conditions (condition 1: SRS, *Self-Regulated Strategy Instruction;* condition 2: SRS&SE, *Self-Regulated Strategy Instruction and Self-Efficacy*). Both conditions received 13 sessions of instruction in self-regulation strategies before, during and after reading and summarising a text, with techniques such as modelling and thinking aloud. In addition, condition 2 (SRS&SE) included explicit instruction in reading self-efficacy. The aim was to comprehensively explore the effects of a self-regulated strategy instruction programme in improving reading comprehension performance and to analyse the effects on the reading process itself and the self-regulation strategies used in this process. In addition, the study aimed to determine whether self-regulated strategy instruction is enough in itself to promote self-efficacy or whether explicit self-efficacy instruction is also required. The control group received traditional teaching in their class group with no explicit instruction in self-regulation processes. Pre-test/post-test/follow-up measures were taken (six weeks after the intervention) of reading performance, reading self-efficacy and time spent applying strategies in a reading and text summary task. An online evaluation method known as a *reading log* was used to analyse the reading process in the context of real reading tasks in a school setting. Using this log, we aim to obtain an estimate of the general temporal organisation of the students' activities during their reading comprehension process

and to thereby determine, on an empirical level, whether instruction in the different stages of the self-regulation process produces a change in the students' strategic behaviour that improves their reading comprehension (Ellema & Compton, 2017; Elleman & Oslund, 2019).

The *first hypothesis* is that, after the intervention, students in both experimental conditions improve their reading comprehension performance compared to the control group. The *second hypothesis* is that both experimental conditions show a change in the strategies applied before, during and after the comprehension process. Lastly, the *third hypothesis* is a higher level of self-efficacy in the SRS&SE condition compared to the control condition and the SRS condition, which include no specific reading self-efficacy instruction.

2. Method

2.1. Participants

The study participants formed a total of 180 Spanish primary school students in Year 5 (N = 90) and Year 6 (N = 90), aged 10-12 under the Spanish education system, with a total of 97 girls and 83 boys. The students were from eight different groups/classes from two state-funded independent religious education centres located in the city of León (Spain). The groups/classes were randomly assigned to the two experimental conditions (SRS, SRS&SE) and the control group. One Year 5 class (N = 22, 13 girls and 9 boys) and one Year 6 class (N = 25, 16 girls and 9 boys) were assigned to the SRS experimental condition (total N = 47). One Year 5 class (N = 21, 11 girls and 10 boys) and one Year 6 class (N = 26, 16 girls and 10 boys) were assigned to the SRS&SE experimental condition (total N = 47). Two Year 5 classes (N = 47, 21 girls and 26 boys) and two Year 6 classes (N = 39, 20 girls and 19 boys) were assigned to the control condition (total N = 86).

The educational infrastructure of the two centres and their curricular organisation were similar. All students in the sample group were from a similar middle-class socio-economic background. Students with diagnosed special educational support needs were not included in the study.

In addition, with the aim of ensuring that there were no significant differences in the reading performance of students across the different conditions and between the two participating schools, before starting the intervention, students in the sample group took a reading process assessment test known in Spanish as the *test de evaluación de los procesos lectores-PROLEC-SE* (Reading Processes Assessment Test) (Ramos & Cuetos, 2000) and a comprehension strategy assessment test known in Spanish as the *test de evaluación de estrategias de comprensión-TEC* (Comprehension Strategies Assessment Test) (Vidal-Abarca et al., 2007). Both tools, in their original version, showed a high level of reliability with a Cronbach's alpha of .85 and .75, respectively, and construct validity through Pearson correlation, obtaining a strong correlation between them in their original versions (r = .72). In terms of the psychometric properties of these tools in this study,

reliability could not be determined given that only one of the two PROLEC-SE tasks for measuring text comprehension processes was used and, for both tools, each student only completed one of the two proposed texts. However, and in these conditions, it was verified that moderate construct validity between the tests was maintained (r = .36).

Comparative analysis of the reading performance assessed through both tests showed no statistically significant differences in the students' performance across the experimental and control conditions, both through PROLEC-SE (F = 1.221; p = .298) and TEC (F = 1.215; p = .299). Likewise, a similar level of performance in reading comprehension was proven in students from the two education centres, through both assessment tests (PROLEC-SE: F = .142; p = .707; TEC: F = .013; p = .910).

2.2. Assessment tools

Assessment of reading comprehension performance:

All students were assessed in pre-test/post-test/follow-up assessments using a *reading and text summary task*. Three texts were used on different topics (Olympic Games, Astronauts and Desert), which were counter-balanced in the assessment sessions by condition and group. The texts presented the same level of difficulty, ideas and words. During the task, students could read the text whenever they needed to.

A global measure, which has been used in previous studies (see Spörer & Brunstein, 2009; Spörer et al., 2009), was used to assess reading comprehension performance: *quality of the summary*. The assessor marked the quality of the summary on a scale of 0 to 5, according to the following criteria: 0 = no response; 1 = summary only includes wording copied from the original text and irrelevant details; 2 = summary includes some wording copied from the original text and some original wording, plus irrelevant details; 3 = summary includes original wording, some irrelevant examples and does not truly capture the essence of the text; 4 = summary includes original wording, contains no irrelevant examples but does not truly capture the essence of the text; 5 = summary includes original wording, contains no irrelevant examples and truly captures the essence of the text. The summaries were assessed through double-blind assessment, and an agreement index of .90, .93 and .97 was obtained for the pre-test, post-test and follow-up, respectively. Although text summaries are a common measure for assessing reading performance (Block & Pressley, 2003; Spörer & Brunstein, 2009; Spörer et al., 2009), to ensure that the quality of the summary was a suitable means of assessing reading comprehension, we assessed its construct validity in relation to the two instruments used at the start of the study, the PROLEC-SE and the TEC tests, obtaining a significant and moderate correlation in both cases, r = .35 and r = .32, respectively. This is similar to the correlation index obtained between the two reading comprehension assessment tests referred to in the previous section (r = .36).

Online assessment of comprehension strategies:

Reading comprehension strategies were assessed via self-reporting by the students in real time in a *reading log*. *The reading log* is an adaptation for this study of the *triple task technique* of Olive et al. (2002), which allows for *online reporting* of the strategies used by the students while they complete the reading and text summary task on pen and paper. As the students complete the task, they hear a beep approximately every 45 seconds. When they hear this noise (neither before nor after), they must tick the strategy that they are using by selecting from a list of 11 strategies that appear on the log sheet. These strategies were established based on the process followed by an expert reader for a reading and text summary task:

Before the task: I analyse the task; *I think* about the text that I'm going to read; I make *notes* about reading strategies or about how to write the summary.

During the task: I read; *I think* about what I've read, what I'm going to read or the summary; *I make notes about the reading*; *I write the summary*; *I read the summary*.

After the task: I assess the summary; *I assess the reading*. At each stage, the activity *Unrelated* to the task was included (which students could tick if, when they heard the beep, they were doing or thinking about something unrelated to the task).

The students were instructed and trained in using the different categories before the pre-test assessment. The reliability of the measure was verified using a test that contained 24 examples of thoughts and actions that a student like those in the study would have or do when they heard the beep. The reliability of the test obtained a Kappa value of over .90. This test is an adaptation for this study of the *writing log* assessment tool that has been validly used in previous studies (see Torrance et al., 2007; Fidalgo et al., 2008) as an online tool for assessing the process that a person goes through as they perform a specific task. The results of the reading log allow us to calculate the estimated average time spent on each strategy by all students, by multiplying the number of times that the participant indicated a particular strategy in their *reading log* by the average interval between the beeps (45 seconds).

Assessment of reading self-efficacy:

Reading self-efficacy was assessed using a *reading self-efficacy scale* developed by Olivares et al. (2016), which distinguishes between three dimensions of self-efficacy, considering the levels of semantic processing proposed by Kintsch (Kintsch & Rawson, 2005). The first dimension, *decoding self-efficacy*, assesses self-efficacy beliefs about decoding skills and reading fluency (3 items). The second dimension, *textual self-efficacy*, assesses beliefs about the ability to successfully build the textual basis of the text (8 items). The third dimension, *situation*

model self-efficacy, includes beliefs about the ability to build a mental model of the situation described in the text, integrating textual information with prior knowledge and aims (3 items). The scores for the different scales are calculated based on the total sum of the scores for the corresponding items weighted by the factorial weight of each item.

Before starting the reading and text summary task, the students were asked how confident they were that they could successfully complete in this task each of the actions described on the scale. The students responded on a scale of 0 (totally sure that they couldn't) to 100 (totally sure that they could). The scale proved to have good internal consistency (Cronbach's Alpha = .89). The confirmatory factor analysis produced a solid model with a CFI index of .971 and RMSEA of .05, with a 90% confidence interval of .04 and .06, with three agreement factors with the three dimensions of reading self-efficacy. As such, we can confirm that the confirmatory analysis produced a solid model, according to the following rules for evaluating the goodness of fit of the model: values of over .95 on the comparative fit index (CFI) and values of under .05 in root mean square error of approximation (RMSEA) indicate a good fit, and values of between .05 and .08 indicate an acceptable fit (Valdés et al., 2019). Furthermore, composite reliability of .62 was obtained in self-efficacy in decoding, .89 in textual and .70 in the situation model, with an average variance extracted of .35, .47 and .54, respectively.

2.3. Instructional programmes

The two conditions of the self-regulated strategy instruction programme (SRS and SRS&SE) followed the same instructional pattern or model (self-knowledge dimension and metacognitive self-regulation dimension). In addition, the SRS&SE condition included specific training in reading self-efficacy.

In the *self-knowledge of reading comprehension dimension*, students were explicitly instructed in cognitive reading comprehension strategies, mnemonic devices and knowledge matrices before, during and after a reading and text summary task (5 sessions). In *session 1*, prior knowledge about reading comprehension and different text types was activated. Students were instructed in *specific strategies* using three mnemonic devices. In the *before reading* stage (session 2), students worked on the mnemonic device IPOD (which in Spanish stands for: I identify the text type; I think; Reading objective; I develop a plan for the reading). In the *during reading* stage (session 5 and session 6), students worked on the mnemonic device ECO (which in Spanish stands for: I explore what I know about the theme and what the text can tell me; I understand each word and sentence and when I get stuck, I stop to solve the problem; I get the main idea of the text by following three steps: *discard* the irrelevant information, *generalise*, think of a sentence that sums up the theme of each paragraph and write it down, and *build* a summary in your own words). In the *after reading* stage (session 9), students worked on the mnemonic device END

(which in Spanish stands for: I assess my task; I mark how satisfied I am with the completed task; I think about how to do the next reading task).

The *metacognitive self-regulation of the process dimension* (8 sessions) began with the teacher performing cognitive modelling through *thinking aloud*. Modelling was performed before (session 3), during (session 7) and after (session 9) the reading and text summary task, plus a full modelling of all stages in the comprehension process (session 11). Using *thinking aloud*, the teacher verbalised how to use the IPOD, ECO and END mnemonic devices, sharing the thoughts and actions that regulated their action. The SRS condition received an exemplary modelling, and for the SRS&SE condition, the teacher modelled by performing the role of a student who was disengaged with the task but then completed it successfully by applying the instructed strategies. In addition, in the SRS&SE condition, the modelling included phrases to bolster *reading self-efficacy* beliefs before, during and after reading (*I've planned my reading really well!*). After each modelling by the teacher, *the students emulated* the process that they had observed (session 4, 8, 10 and 12) by using thinking aloud in a new reading and text summary task in front of the teacher. During the task, the students received feedback from both the teacher and their fellow students on the accuracy of their execution. In this stage, guided practice was promoted with activities of increasing difficulty. The teacher gradually provided less support, and in the final session of the programme (session 13), the students worked individually and with no support to read and summarise a text.

In addition to instruction in self-knowledge and self-regulation of reading comprehension, all stages and sessions of the SRS&SE condition focused explicitly on *building an optimal level of reading self-efficacy* by using the four sources of self-efficacy proposed by Bandura (1977): a) *past experiences of success* with tasks of varying difficulty, personal and individual evaluation of how successfully the task was completed at the end of each session and a control list where students recorded the steps followed in the task; b) *vicarious experiences of success* through the teacher modelling success in the role of a student and self-instructions; c) verbal *persuasion* and social feedback; and d) *positive physiological states* based on thinking aloud, evaluation of the degree of satisfaction with the learning in each session and free choice of the text used for individual practice.

2.4. Instructional method for the control group

The students in the control condition received the same number of reading and practice sessions as the experimental groups (13 sessions). The instructional sequence for the control group could be described as an implicit type of instruction, in which the students worked on reading aloud, individual reading and sequential reading. After reading, the teacher asked a series of questions linked to the theme of the text (explicit and implicit ideas in the text), and the students produced individual summaries of what they had read.

In addition, as the sole strategy for solving problems linked to vocabulary, the students were instructed in how to use a dictionary.

3. Process

Before the instructional programme was applied, training sessions were provided for teachers/tutors. To ensure equivalence across the groups, in the first session, the reading ability of all students was assessed and all students were taught how to use the reading log. In the second session, the pre-test assessment was performed on reading performance in a reading and text summary task, reading self-efficacy and the reading process followed by the students during the task. Following this, the teachers/tutors delivered 13 instructional sessions (January to April), in a contextualised manner in each class group (1 hour/session). During application of the programme, the teachers received individualised training in how to prepare each session (13 training sessions) and a script that detailed, in writing, the steps that needed to be followed in each session. To ensure that the instructional programme was properly delivered and tracked, the students' portfolios were monitored and an online log was created of audio recordings of 100% of the sessions. This log was then analysed by the first author of this article. Any students who did not attend all the instructional programme sessions were removed from the sample group. After the intervention, the post-test assessment was conducted and, six weeks later, the follow-up assessment was conducted. The same conditions, norms, stages and application times were controlled in all the assessment sessions, both in the control group and the experimental groups. The material collected in the assessments was given to two assessors who had received prior training in how to assess the material, determining the agreement indices in the necessary measures. After coding, the data were analysed using the SPSS statistical software suite.

4. Results

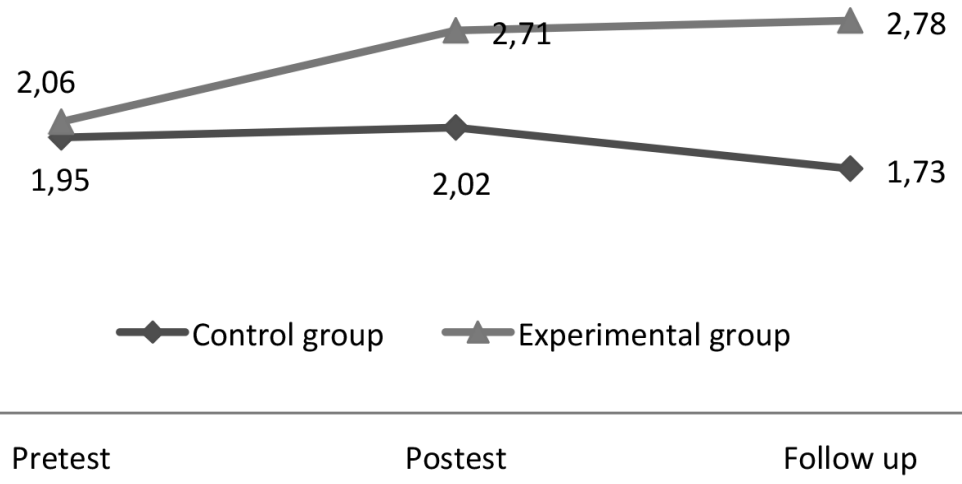
4.1. Reading performance results

Initially, in the pre-test, we explored if there were any gender-based differences in reading performance (Anova). We found that the girls had a significantly higher reading performance (mean = 2.40, sd = .85) than the boys (mean = 2.06, sd = .90) in the pre-test (p = .021).

As no significant differences were observed in reading performance between the two instructional programme conditions (SRS and SRS&SE), both conditions were treated as a single experimental group. Using the scores obtained in the summary, repeated measures ANOVA analysis of variance was performed, firstly considering time (pre-test/post-test) by condition (experimental/control) and secondly time (pre-test/follow-up) by condition. Analysis of the comprehension measures, considering the time factor interaction by condition, showed that the intervention had a clear effect on the quality of the summaries in the experimental group. The analysis showed a clear increase in the quality of the

summaries in the *experimental group* during the post-test ($F(1,168) = 13.1$, $p < .001$, $\eta 2 = .072$, d = .66). These results were maintained in the follow-up assessment ($F(1,168) = 39.0$, $p < .001$, $\eta 2 = .189$, d = .73) (Graph 1).

GRAPH 1. Averages obtained in text summary quality by the experimental group vs the control group.



4.2. Reading process results

Initially, in the pre-test, we explored if there were any gender-based differences in the process followed during the reading and text summary task (Anova). We found that the girls spent significantly more time reading ($p < .001$), making notes ($p = .002$) and thinking ($p = .029$) than the boys in the pre-test assessment.

We found no significant differences between the two instructional programme conditions (SRS and SRS&SE) in the process followed during the reading and text summary task; therefore, both versions were treated as a single experimental group. Table 1 shows the estimated average time that students spent on the activities in each condition and assessment stage.

Firstly, we performed a separate analysis in each condition (experimental and control) of the differences in the pre-test/post-test reading process and the pre-test/follow-up reading process, using the Wilcoxon signed-rank test with the *Z* value as statistical (statistically significant differences are marked with an asterisk in Table 2). We then performed a comparative

analysis of the differences between the experimental and control conditions, both in the post-test and the follow-up, using the Mann–Whitney *U* test (distribution-free test); structuring these results according to the three stages into which the reading and summary process is divided: before, during and after.

TABLE 1. Estimated average time (minutes) on different strategies by experimental group and control group.

		Pre-test		Pos-test		Follow-up	
		Experimental	Control	Experimental	Control	Experimental	Control
Before	**Task analysis**	.25	.31	.33*	.26	.30	.18**
	Thinking	.19	.16	.36**	.12	.30**	.06**
	Notes	.17	.16	.31*	.10	.21	.05*
During	**Reading**	2.16	2.17	1.97	1.94*	1.88	1.58**
	Thinking	.74	.57	.68	.39*	.44**	.22**
	Making notes	2.48	2.38	3.48**	2.35	2.80	1.63*
	Writing summary	6.17	5.25	5.84	4.95	6.42	4.73
	Reading summary	.41	.28	.39	.22	.34	.10**
After	**Assessing summary**	.34	.21	.56**	.21	.39	.15
	Assessing reading	.21	.10	.34**	.13	.30*	.08
	Unrelated	.92	.83	1.04	1.22*	.61**	.74

Note: Statistically significant differences compared to the pre-test for the experimental group and the control group *$p < .05$, **$p < .005$ (Wilcoxon).

4.2.1. Results in the reading process before the task

Analysis of the changes that occurred in the reading process before the task showed clear effects in the experimental group after instruction. The experimental group achieved significantly higher results in the post-test compared to the pre-test in the average time spent *analysing the task* ($p < .05$) and *thinking* about the reading and summary that they were about to do ($p < .005$) — a change that was maintained in the follow-up ($p < .005$) — and *making notes* to plan their reading ($p < .05$). While

there were no significant changes in the control group in the before reading activities analysed in the post-test, there was a significant reduction in the time spent *analysing the task* ($p < .005$), *thinking* ($p < .005$) and making *notes* ($p < .05$) in the follow-up compared to the post-test.

When we compared the experimental group and the control group, we found statistically significant differences in the post-test and the follow-up in favour of the experimental group. During the post-test, the experimental group spent significantly more time *analysing the task* ($p < .05$), *thinking* ($p < .005$) and *making notes* ($p < .005$) than the control group. These differences continued in the follow-up assessment, showing that the intervention had a clear effect on the experimental group, which continued spending more time than the control group *analysing the task* ($p < .005$), *thinking* ($p < .005$) and *making notes* ($p < .005$).

4.2.2. Results in the reading process during the task

The statistical analysis showed an increase in the experimental group in the average time spent *making notes* ($p < .005$) during the post-test and a reduction in the time spent *thinking* about what had been read or the text summary ($p < .005$) during the follow-up. However, there were no significant changes in the following activities: *reading the text*, *writing the summary* and *reading the summary*.

In turn, there was a reduction in the control group in the amount of time spent *reading the text* ($p < .05$) and *thinking* ($p < .05$) during the post-test assessment. However, there were no significant changes in *making notes, reading the summary and writing the summary*. Furthermore, during the follow-up assessment, there was a significant reduction in the control group in the time spent *reading the text* ($p < .005$), *thinking* ($p < .005$), *making notes* ($p < .05$) and *reading the summary* ($p < .005$).

When we compared the experimental group results and the control group results, we found statistically significant differences in favour of the experimental group. During the post-test, the experimental group spent significantly more time than the control group on activities such as: *thinking* ($p < .05$), *making notes* ($p < .005$), *writing the summary* ($p < .05$) and *reading the summary* ($p < .05$). These results were maintained in the follow-up assessment: *reading the text* ($p < .05$), *thinking* ($p < .005$), *making notes* ($p < .05$), *writing the summary* ($p < .005$) and *reading the summary* ($p < .05$).

4.2.3. Results in the reading process after the task

The analysis of changes compared to the pre-test in the reading process followed by the students after the task shows that the experimental instructional programme had a significant effect. The students in the experimental group spent significantly more time in the post-test *assessing their summary* ($p < .005$) and *assessing their reading* ($p < .005$); and the latter result was maintained in the follow-up ($p < .05$). In contrast, there were no significant changes in the control group, neither in the post-test nor the follow-up.

When we compared the experimental group and the control group, we found that the experimental group spent significantly more time than the control group *assessing their summary and assessing their reading*, both in the post-test ($p < .005$) and the follow-up assessment ($p < .005$).

4.3. Reading self-efficacy results

Initially, in the pre-test, we explored if there were any gender-based differences in reading self-efficacy, and we found that there were no statistically significant gender-based differences in the pre-test.

Since reading self-efficacy was treated differently in the two versions of the instructional programme (SRS and SRS&SE), these two versions were treated as two different experimental groups. Table 2 shows the descriptive statistics for reading self-efficacy by stage and condition.

Firstly, we analysed the differences in the pre-test measures between the three groups, using one-way ANOVA and Tukey's HSD test. The results of this analysis showed there were no statistically significant differences in the pre-test in terms of reading self-efficacy between the three groups. Secondly, to analyse the effects of the intervention on self-efficacy, we conducted two-way crossed ANOVA analysis: firstly, time 2 (pre-test/post-test) by condition 3 (SRS&SE, SRS, Control); and in a second analysis, time 2 (pre-test/follow-up) by condition 3 (SRS&SE, SRS, Control). For measures with statistically significant interaction, we conducted post hoc pairwise comparison analysis between the post-test and the follow-up scores in the three groups or conditions (SRS&SE, SRS and Control), controlling the error rate by using Tukey's HSD test. In addition, we conducted pre-test/post-test and pre-test/follow-up pairwise comparisons within each condition, with a significance level (alpha) of .05.

In relation to changes in reading self-efficacy, the analysis showed statistically significant differences between the three conditions in relation to self-efficacy in the situation model ($F(2,167) = 3.456$, $p < .034$, $\eta 2 = .04$) and, six weeks after the intervention, in the follow-up assessment ($F(2,167) = 3.276$, $p < .04$, $\eta 2 = .038$). In turn, the post hoc analysis in both the post-test and the follow-up assessment showed no statistically significant differences. That said, it did show a higher level of self-efficacy in the situation model close to the statistical significance of the two experimental conditions (SRS&SE and SRS) compared to the control group in the post-test ($p = .08$; $p = .07$; respectively). However, the post hoc comparisons in the follow-up assessment only showed an increase in the measure of self-efficacy in the situation model in the SRS&SE experimental group compared to the control group, once again close to statistical significance ($p = .07$).

It is interesting to note that, in all the dependent variables, we explored if the intervention had any differential effects in term of gender. However, in general, we found no consistent pattern of the intervention having a different effect on boys and girls.

TABLE 2. Descriptive statistics and results of the analysis of the self-efficacy measures, considering the time factor interaction (pre-test/post-test and pre-test/follow-up) by condition (SRS&SE, SRS, Control).

	SRS&SE			SRS			Control			Time (pre-test-post-test)			Time (pre-test-Follow-up)		
	Pre-test	Post-test	Fol-low-up	Pre-test	Post-test	Follow-up	Pre-test	Post-test	Follow-up						
	M (St)	M(St)	M(St)	M(St)	M(St)	M(St)	M(St)	M(St)	M(St)	*F*	*p*	η2	*F*	*p*	η2
Situation Self-efficacy	77.92 (16.26)	84.94 (16.96)	87.45 (8.73)	79.58 (13.40)	83.87 (17.29)	84.60 (13.74)	74.27 (19.71)	77.76 (22.21)	79.17 (19.61)	3.456	.034	.04	3.276	.040	.038
Textual self-efficacy	72.30 (15.39)	81.11 (16.90)	85.41 (11.01)	70.78 (13.68)	76.77 (17.49)	80.20 (12.39)	71.34 (16.38)	76.11 (18.71)	77.31 (15.84)	1.076	.343	.013	1.794	.170	.021
Decoding Self-efficacy	72.27 (20.53)	83.79 (19.31)	84.13 (16.54)	76.94 (16.37)	79.54 (18.49)	80.94 (16.01)	79.66 (20.28)	79.70 (20.41)	81.51 16.35)	.272	.762	.003	.402	.669	.005

5. Discussion and conclusions

The aim of this study was to analyse the effects of a self-regulated strategy instruction programme not only on reading comprehension performance but also on time spent applying self-regulation strategies and reading self-efficacy in Spanish primary school students in Year 5 and 6 (aged 10–12 under the Spanish education system) compared to a control group. The impact of the instruction provided important data on an instructional level by identifying changes in the strategies used by students to improve comprehension.

The results confirmed that self-regulated strategy instruction increased the students' reading comprehension performance in reading and text summary tasks. Compared to the control group, the experimental group showed a significant improvement in the quality of their text summaries after the intervention; and this effect continued six weeks after the instruction. The students were able to identify the main themes of the text, discarding secondary details, and to combine, group and connect similar ideas using concise wording. It has been proven that when students write about what they have read, it improves comprehension and promotes their self-regulation process (Gao, 2017).

In keeping with findings in other areas such as writing (Arrimada et al., 2018), this study seems to confirm the hypothesis that self-regulated strategy instruction produces a change in the strategic and self-regulated approach used by students to perform their reading task. Specifically, in the *before the task stage*, the experimental groups spent more time using strategies such as planning their reading, analysing the text, thinking about the reading that they were about to do, activating prior knowledge and making notes to achieve a better reading of the text. We found a similar pattern in the *post-task stage,* where, in the post-test and the follow-up, the experimental group significantly increased the time spent on strategies such as self-assessing their summary and reading, while no differences were found in the control group. However, no clear pattern seems to have emerged for the effects of the intervention in the *during the reading stage*. After the intervention, the experimental group only showed a significant increase in the time spent on the strategy of making notes during the post-test, while there was a reduction in the time spent on the strategy of thinking about the reading or the summary during the follow-up assessment. There were no significant changes in the activities of a self-regulated nature, such as reading the summary. The effects of the instruction were only apparent in the activity of note making while the students read or wrote their summary. This, in itself, suggests a more self-regulated approach than thinking about the summary and, in turn, suggests greater demand and cognitive effort than activities such as thinking and reading the summary. Perhaps, the instruction's lower impact on monitoring strategies could be linked to the cognitive complexity of the comprehension process. Specifically, in the *monitoring* stage, students need to repeatedly implement all the

cognitive processes required to build the situation model and to combine them with metacognitive control and supervision processes to deal with any problems that might arise during reading (Zimmerman, 2008). In this respect, perhaps the elevated cognitive demands of this stage could exceed the cognitive capacity of students of this age, and they would need more time practising to successfully apply the instructed strategies.

On a motivational level, the results are not able to fully confirm an increase in the level of self-efficacy in the group that received specific self-efficacy instruction compared to the control group and the experimental group. The results only showed an increase close to statistical significance in both experimental groups compared to the control group in relation to high-level cognitive processes such as building the situation model; an effect that was only maintained six weeks on in the SRS&SE group. The students demonstrated positive believes about their ability to complete a task where they evoked and constructed a representation of the information in the text, combining explicit textual information with their prior knowledge, aims, interests and beliefs. In relation to the proposed hypothesis, it appears that self-regulated strategy instruction in itself has a positive effect on the reading self-efficacy beliefs linked to the situation model. However, this increase only continued in the long term in the group that received specific self-efficacy instruction. This would suggest that if the desired outcome is a long-term change in reading self-efficacy patterns, this would require specific instruction focusing on reading self-efficacy (Bandura, 1977).

In conclusion, the results of this study confirm the importance of integrating explicit strategy teaching with self-regulation methods (Berkeley & Larsen, 2018). In addition, the need for this type of self-regulated strategy instruction is even greater considering it not only results in improved reading performance in the short and medium term but also produces a change in the reading pattern assumed by students. Specifically, this pattern becomes more strategic and self-regulated, which is an aspect that is lacking in students in general (see Fidalgo et al., 2014) and which would have a notable impact on improving students' reading skills.

The results of this study provide indications about the type of activities and strategies used by students before, during and after reading. However, one limitation of this study is linked to the effects of the instruction six weeks after the intervention and, as such, it would be interesting to analyse the effects of the instruction over a longer period. A further limitation pending confirmation is linked to gender-based differences in the reading process as, although some research points to potential gender-based differences in the self-regulated learning process (Torrano & Soria, 2017), the intervention in this study had the same effect on both boys and girls and, therefore, gender had no effect on the pattern of the results. In turn, comparing this study with other types of online measures, such as eye-tracking or assessment of the

thinking-aloud technique, could help to understand how readers adapt their strategies to different tasks (Hu & Gao, 2017; Karlsson et al., 2018; Krstić et al., 2018).

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