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Influence of Teaching Styles on Motivation and Engagement in Pelvic Floor Proprioception Learning Among Sports Science Students

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ABSTRACT

This study examined how three teaching styles from Mosston's Spectrum, command (Style A), reciprocal (Style C), and self-check (Style D), influence university students' motivation, enjoyment, and perceived applicability when learning pelvic floor proprioception in Physical Education (PE). Sixty-three Sports Sciences students participated in a three-week quasi-experimental intervention applying the three styles in consecutive sessions. After each, students completed a validated questionnaire assessing implementation, enjoyment, motivation, and teaching ability. The reciprocal style (C), which promotes peer interaction and feedback, consistently received the highest ratings across affective dimensions, fostering engagement and psychological safety. The command style (A) showed strong implementation but lower enjoyment, while the self-check style (D) offered autonomy yet limited interaction. No gender differences were found. Overall, findings emphasize the value of student-centered, interactive approaches in PE teacher education (PETE), with the reciprocal style particularly effective for teaching sensitive proprioceptive content such as pelvic floor awareness.

KEYWORDS

Pelvic floor; autonomy; peer feedback; Mosston's Spectrum; teaching method

Introduction

Teaching is founded on the premise that any behavior is rooted in a chain of decision-making. The spectrum model categorizes the teaching process into 11 different styles, based on the locus of decision-making between teacher and learner. The first five styles (from A to E) focus on the ability to reproduce, while the last six styles (from F to K) center on the ability to produce (Mosston & Ashworth, 2008).

In the first five styles, learners build their understanding through memory, identification, sequencing, or reliance on procedures, which are essential knowledge for sports practice (Mosston & Ashworth, 2008). In this sports practice context, proprioception involves the awareness of the body's position and motion, relying on input from internal sensory structures (Hillier et al., 2015). Proprioception is not merely a passive reception of sensory

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signals; it demands attention, control, movement planning, and sensory processing, all of which are shaped by memory and learning (Chiyohara et al., 2023).

The importance of selecting an appropriate teaching style becomes particularly evident when addressing content that demands high levels of body awareness, attentional focus, and emotional comfort. Although the literature widely highlights the importance of proprioceptive training for rehabilitation, sports performance, injury prevention, and motor function enhancement (Yılmaz et al., 2024), this content has rarely been addressed as a specific instructional topic within Physical Education (PE). Proprioceptive learning can be particularly challenging when involving internal or less visible structures, as these tasks require heightened sensory awareness, attentional control, and precise motor coordination. In this regard, certain types of proprioceptive content may represent particularly demanding learning scenarios. Among them, pelvic floor proprioception stands out as a relevant example, as unlike traditional motor tasks, pelvic floor exercises involve muscles that are difficult to identify, poorly understood by many individuals, and often require specific instruction for effective activation (Evans, 2005). These characteristics, together with the current lack of pedagogical research on proprioceptive learning in PE, highlight the need to explore teaching strategies that can effectively support students' engagement with this type of content. In addition, it is important to acknowledge the potential involvement of cognitive functions, such as decision-making, attention, explicit awareness, and familiarity with evaluation, in proprioceptive learning processes (Seo et al., 2023).

Given the internal and often abstract nature of proprioceptive content, students may require more than procedural repetition to fully engage with the learning experience. In such cases, the emotional climate of the session (shaped by the teaching style) can influence not only task execution but also students' willingness to participate and reflect (Reyes et al., 2012). Teaching methods that facilitate peer support and interaction may help normalize the content, reduce anxiety, and promote a deeper, more confident engagement with the learning process (Namaziandost et al., 2024).

From a motivational perspective, Self-Determination Theory provides a useful framework for understanding how teaching styles can influence students' engagement and learning experiences. According to this theory, the satisfaction of three basic psychological needs (autonomy, competence, and relatedness) is essential to foster intrinsic motivation and positive learning outcomes. Autonomy refers to the individual's sense of control over their actions; competence involves feeling effective and capable; and relatedness concerns feeling connected to others (White et al., 2021). Exploring how different teaching styles satisfy these psychological needs may help explain their differential effects on students' affective responses.

Combining these concepts, the first five spectrum styles appear well-suited for efficiently teaching proprioception-related content. A proficient teaching approach could enhance task performance, elevate the sense of competence, and subsequently boost motivation toward the subject (Ntoumanis, 2001). Understanding and applying appropriate teaching styles is not only a methodological decision but also a critical pedagogical tool for enhancing student learning. When teaching strategies are aligned with the cognitive and emotional demands of the content, they can significantly impact students' motivation, engagement, and overall learning experience (Reyes et al., 2012). Experiencing different teaching methods as students can substantially shape how future PE professionals approach teaching. When university students in sports sciences experience high levels of motivation and

engagement through specific teaching styles, they may be more likely to adopt and apply these effective methods in their professional practice (Mayo-Rota et al., 2025). This experiential learning not only could enhance their teaching efficacy but also positively impacts the motivational climate they create for their future students, fostering a cycle of motivation and engagement in PE classes.

While proprioception is a key component of PE, little is known about how different teaching styles affect student engagement with proprioceptive content, especially when the topic is novel, sensitive, and cognitively demanding. Although the spectrum of teaching styles offers a structured framework for instructional decision-making, the specific impact of each style on teaching proprioception content and increasing the motivation of the students toward the subject remains an open question. Therefore, this study tries to address this gap, adopting an exploratory perspective by analyzing how different teaching styles influence students' motivation, engagement, and perceived applicability when learning pelvic floor proprioception – a topic often underrepresented in PE curricula and associated with emotional discomfort or limited prior knowledge.

The objective of this work is to identify which teaching style, within the cluster that focuses on memory thinking, impacts learner adherence to content, task performance, and motivation for learning in PE classes related to proprioceptive content.

Materials and methods

Participants

Each participant signed an informed consent form, with the study approved by the Technical University of Madrid (Approval number 20,240,117) in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans and the European Data Protection Regulation.

A total of 85 university students ($n = 53$ males, $n = 32$ females) with a mean age of 22.8 ± 2.24 years from the Sports Sciences degree, enrolled in the subject of *Physical Activity Design, Intervention, and Evaluation*, participated in this study.

To include their perceptions in the data analysis, the following inclusion criteria were stated: (i) students must be enrolled in the *Physical Activity Design, Intervention, and Evaluation* subject, (ii) no previous pelvic floor training experience, (iii) attendance at all three theoretical sessions and all three practical sessions corresponding to the three styles, respectively. Finally, data from 63 students (39 males and 24 females) were included in the analysis. The remaining 22 participants were excluded from the analysis due to incomplete attendance at the required theoretical and/or practical sessions.

Design and procedures

This study followed a quasi-experimental intervention design with an exploratory approach, in which the independent variable (teaching style) was systematically manipulated across three instructional sessions.

The students performed three teaching-related sessions with the same content, where three out of the five teaching styles proposed within the reproduction cluster by the Spectrum (A, C, D) were applied, respectively. Style A (command) emphasizes teacher-

Table 1. Chronogram of the sessions carried out.

Week 1	Week 2	Week 3
Theory lecture: Style – 1	Theory lecture: Style – 2	Theory lecture: Style – 3
Practice lesson: Style – 1	Practice lesson: Style – 2	Practice lesson: Style – 3

Note. Styles 1–3 represent the sequence position (Weeks 1–3) rather than fixed teaching styles. The three teaching styles were selected from the reproduction cluster of Mosston's Spectrum (Styles A, C, and D), and their order was counterbalanced across four groups to control for potential order effects. Each group followed a different sequence: Group 1 (A-C-D), Group 2 (C-D-A), Group 3 (D-A-C), and Group 4 (A-D-C). Thus, each teaching style appeared equally across all temporal positions.

led instruction; Style C (reciprocal) fosters peer feedback and interaction; and Style D (self-check) encourages independent practice.

Styles A, C, and D were selected because they represent a meaningful progression of teacher-to-student decision-making within the reproduction cluster of the Spectrum model. Style B was excluded due to its similarity to Style A, offering minimal pedagogical contrast. Style E was deemed unsuitable for this context because it relies on tasks with multiple entry levels of difficulty, whereas all students began at the same level with completely new content. Additionally, limiting the intervention to three styles helped avoid excessive repetition of content. Delivering the material five times could have introduced redundancy and diminished the motivational climate in later sessions, potentially compromising the authenticity of students' responses.

The contents of the sessions were about proprioception and training of the pelvic floor muscles. This topic was chosen for two reasons: (i) it was new content for all of them, where they started from the same level, and (ii) it was based on proprioception, where the students had to be very concentrated and very conscious of carrying out the tasks with precision. To minimize order effects, the sequence of teaching styles was counterbalanced across groups. Participants were drawn from four existing university classes (approximately 20–22 students per class), with each class assigned a different sequence of teaching styles. While Table 1 presents the general 3-week structure (one style per week), the specific teaching style implemented in each week varied by group. The sequences were rotated as follows: Group 1 (A-C-D), Group 2 (C-D-A), Group 3 (D-A-C), and Group 4 (A-D-C). Thus, each teaching style appeared equally often in each temporal position (Week 1, Week 2, and Week 3), helping to control for potential order and carryover effects. Styles 1–3 in Table 1, therefore, represent placeholders rather than fixed teaching styles. Each session lasted around 50 min. The sessions were supervised and approved by three professors, experts in the methodology of teaching in PE with more than 10 years of lecturing and research experience.

The researchers informed participants about the teaching style through a theory lecture before practice to enhance understanding and engagement, ensure consistency, and facilitate self-reflection. This preparation helps participants engage more effectively and follow the methods accurately. While it might influence perceptions, presenting each style neutrally and equally minimizes bias. Additionally, making participants aware that they will evaluate the styles promotes an objective mind-set. This approach standardizes the learning experience, allowing differences in outcomes to be attributed to the teaching styles rather than varying levels of understanding, thus ensuring the study's validity.

Instrumentation

To measure motivation toward the subject, the Spanish version of the Questionnaire of Students' Experiences and Perceptions of Teaching Styles, which has been validated and used in previous research (Kulinna & Cothran, 2003), was utilized. This questionnaire is based on a 1 to 5 Likert scale addressing four parameters: (i) Implementation (how often do they implement this teaching style in their classes/trainings, rating 1 never to 5, always), (ii) Fun (I think this way of teaching would make class fun for my students, rating 1 totally disagree to 5, totally agree), (iii) Motivation (I think this way of teaching would motivate students to learn, rating 1 totally disagree to 5, totally agree) and (iv) Teaching ability (my teaching ability to implement this Style would be 1 low ability to 5 high ability). Participants filled out this questionnaire after completing all sessions (three times in total, one for each type of Style).

Statistical analysis

A linear mixed model (LMM) for repeated measures was conducted to analyze the differences across teaching styles (A, C, or D) in students' perceptions of implementation, fun, motivation and teaching ability during PE lessons, considering participant (ID) as a random factor. ICCs were calculated to test the variability of the random factor (intra-subject variability). The repeated measures (each style in each week) and gender were considered as fixed factors of the model. Post hoc comparisons were run using Bonferroni's test, and the effect size (ES) values were calculated when significant differences were identified, using Cohen's d and considering 0.2–0.49 as a "small effect," 0.5–0.79 as a "moderate effect," and ≥0.8 as a "large effect" (Cohen, 1988). Descriptive data were presented by the means and standard errors. Statistical significance was set at 0.05. All analyses were carried out with the free statistical software, Jamovi (version 1.6.15) (jamovi, 2021)

Results

To analyze students' perceptions across the different teaching styles, LMMs were conducted for each dependent variable. Although the intraclass correlation coefficients (ICCs) for Implementation, Fun, and Motivation were low or negligible (ICC = 0.122, <0.001, and <0.001, respectively), the LMM approach was applied uniformly to all variables to maintain methodological consistency. This decision is supported by the results for the Teaching Ability variable, which showed a higher ICC (0.299), a conditional R^2 of 0.318, and a significant model effect ($p < 0.001$). These values indicate notable between-subject variability, thereby validating the multilevel approach for the overall analysis.

Descriptive values of the student's perceptions for all variables on every Teaching Style are presented in Table 2. A significant main effect of teaching style was found on the variables Implementation $F(2, 122) = 8.85$, Fun $F(2, 183) = 25.5$, and Motivation $F(2, 183) = 18.7$, with all comparisons reaching statistical difference ($p < 0.001$ for all). Post hoc analyses indicated that students reported implementing Style A and Style C more frequently than Style D ($t = 3.85$, $p < 0.001$, ES = 0.49; $t = 3.40$, $p = 0.003$, ES = 0.48, respectively).

Table 2. Descriptives (mean and standard error, SE) of students 'responses to the Questionnaire of Students' Experiences and Perceptions of Teaching Styles (measured with a 1 to 5 Likert scale).

	Style A						Style C						Style D					
	Male		Female		Total sample		Male		Female		Total sample		Male		Female		Total sample	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Implementation	3.46	0.162	3.5	0.206	3.48	0.131	3.18	0.162	3.63	0.206	3.4	0.131	2.67	0.162	2.96	0.206	2.81	0.131
Fun	2.79	0.156	2.79	0.2	2.79	0.126	3.9	0.156	3.92	0.2	3.91	0.126	2.74	0.156	2.87	0.2	2.81	0.126
Motivation	2.87	0.16	2.96	0.2	2.92	0.13	3.87	0.16	3.96	0.204	3.92	0.13	3.03	0.16	2.92	0.204	2.97	0.13
Teaching Ability	3.67	0.131	3.83	0.167	3.75	0.106	3.56	0.131	3.83	0.167	3.7	0.106	3.51	0.131	3.46	0.167	3.49	0.106

Regarding the Fun variable, students believed that teaching the content using Style C would be significantly more enjoyable for their future students compared to both Style A ($t = 6.23$, $p < 0.001$, ES = 0.76) and Style D ($t = 6.14$, $p < 0.001$, ES = 0.82).

A similar pattern was observed for Motivation, with Style C perceived as more effective than Style A and Style D in motivating students to learn ($t = 5.45$, $p < 0.001$, ES = 0.63; $t = 5.14$, $p < 0.001$, ES = 0.54, respectively).

No statistically significant differences were observed between teaching styles for students' perception of their teaching ability ($p = 0.087$). Furthermore, no significant effects of gender were found for any of the measured variables ($p > 0.05$ for all variables).

Discussion

This study aimed to examine the influence of different teaching styles (specifically Styles A, C, and D from the Spectrum model) on university students' motivation, enjoyment, implementation, and teaching ability of proprioception-based content in PE. Our results demonstrated significant differences in students' perceptions across these styles, particularly highlighting the motivational benefits of Style C.

Style C, which involves reciprocal social interaction, brought out the highest ratings in motivation and enjoyment, aligning with existing literature that emphasizes the motivational benefits of approaches that seek socialization and peer collaboration (Yoncalik et al., 2009). Through this Style, students provide feedback to their peers, while they execute the task, allowing them to learn to identify and correct errors immediately, internalize the content, contrast and assess performance, practice communication skills, and expand socialization (Mosston & Ashworth, 2008).

These results can be interpreted through the lens of Self-Determination Theory, as Style C may fulfill students' needs for autonomy, competence, and relatedness, which are key drivers of intrinsic motivation (White et al., 2021). Style C (reciprocal) appears to support all three needs best: students make decisions about feedback (autonomy), actively engage in skill assessment (competence), and interact with peers (relatedness). Style A (command), by contrast, heavily restricts autonomy and relatedness, as it centers on direct instruction with minimal peer interaction, though it may support competence through clear structure. Style D (self-check) offers some autonomy and competence by allowing students to self-assess, but lacks the social dimension, potentially limiting the sense of relatedness. Furthermore, the perception of Style C as more motivating and enjoyable suggests that when students are more actively involved in their learning process, particularly through making the practice decisions and giving and receiving feedback, rather than receiving direct instruction or task replication, their affective response improves. This supports previous findings in the PE context, where autonomy-supportive styles have been associated with greater enjoyment and engagement (Leo et al., 2022).

Beyond motivational aspects, the effectiveness of Style C may also relate to embodied learning principles. As proprioceptive tasks require focused attention and sensory-motor integration (Hillier et al., 2015), reciprocal teaching may reduce cognitive load by externalizing feedback and providing real-time correction, thus supporting more efficient sensorimotor learning.

Interestingly, Style A, though effective in terms of task implementation, was perceived as less fun and less motivating. This finding supports prior observations that highly teacher-

centered methods, while good for immediate performance replication, might not promote long-term engagement or intrinsic interest (Kulinna & Cothran, 2003). Nevertheless, scientific literature shows different perspectives. In the study by Sánchez and colleagues (Sanchez et al., 2012), most participants preferred the use of Style A over other styles that promoted greater student autonomy for performing Pilates exercises. On the other hand, in traditional Greek dance classes (where Style A is the most commonly used), the implementation of Styles C and D led to greater increases in learners' intrinsic motivation, enjoyment, and autonomy (Pitsi et al., 2015). Therefore, it seems that the effectiveness of one style over another depends on the content being taught and the preferences of the students. As Mosston and Ashworth state, no teaching style is superior to the others, but rather, different teaching styles are appropriate for achieving different outcomes (Mosston & Ashworth, 2008). Taking into account that proprioception training demands high focus and conscious effort (Hillier et al., 2015), Style A may offer benefits in structured practice yet lacks the motivational spark needed for sustained learning interest.

Style D, characterized by inclusion and moderate student choice, was also consistently rated lower. Despite offering some degree of individualization, it may lack the structure of Style A or the engagement of Style C. These results may indicate that partial autonomy without clear guidance might not be sufficient to enhance student motivation or perceived efficacy in learning proprioceptive skills, which require both attentional control and sensory feedback integration (Seo et al., 2023).

No significant gender differences were found across styles, suggesting that the observed effects were generalizable across genders, at least in this sample. Furthermore, perceptions of teaching ability were not significantly different between styles, indicating that while teaching style affects motivation and enjoyment, it might not influence students' self-perceived competence in applying those styles themselves. These results align with the study of Rivas and Mateos (2017), which also reported no significant differences in PE teachers' perceived competence when implementing various teaching styles in PE classes.

An additional consideration is the nature of the content itself (pelvic floor proprioception) which may have shaped participants' perceptions of each teaching style. This content is both anatomically specific and sensitive, often unfamiliar and rarely addressed openly in educational settings, as it is frequently perceived as a taboo subject (Witkoś & Hartman-Petrycka, 2019). Its novelty likely required a high degree of concentration and self-awareness, potentially increasing students' embarrassment or discomfort, particularly in group settings. In this context, Style C (reciprocal), with its emphasis on peer collaboration and structured feedback, may have created a more supportive and less intimidating environment. This style allows students to share responsibility and normalize the learning process through interaction, which may have normalized the topic and reduced discomfort by fostering a sense of shared experience and social support. This environment likely enhanced psychological safety, encouraging more open engagement. In contrast, the more directive nature of Style A (command) or the isolated focus of Style D (self-check) may have intensified feelings of self-consciousness, limiting emotional comfort, and reducing perceived motivation or enjoyment. Therefore, the sensitivity and unfamiliarity of the pelvic floor topic may have favored teaching approaches that emphasize interpersonal connection and emotional reassurance, such as the reciprocal style.

Taken together, these findings reinforce the importance of integrating more interactive and student-centered teaching methods in sports science education, particularly

when introducing complex or unfamiliar content like proprioception. While all styles have merit depending on learning objectives and students' preferences, the reciprocal-style C appears to offer the most balanced benefits in terms of motivation and student satisfaction.

These insights may also apply to other types of novel, complex, or sensitive content. Similar demands may also be present in other types of proprioceptive learning tasks that require high levels of body awareness, attentional focus, and sensory integration, such as balance training, joint position sense, or coordination exercises. In these contexts, teaching styles that promote interaction, feedback, and active student involvement, such as the reciprocal style, may enhance motivation and engagement by facilitating both cognitive and sensorimotor processing. Therefore, the observed benefits of more interactive and student-centered approaches may not be limited to this specific content, but could be relevant across a broader range of proprioceptive learning situations in PE and sport settings.

Understanding how teaching styles influence student motivation and emotional safety is key to promoting effective learning across diverse PE topics. Future research could expand on these findings by exploring long-term retention and practical application of skills taught under different styles, as well as including neurophysiological or performance-based measures to validate subjective perceptions.

Equipping future PE teachers with the ability to recognize and adapt teaching styles to match the demands of specific content and student needs may enhance both instructional quality and learner outcomes (Johansen et al., 2015). This pedagogical flexibility should be a central focus in initial PETE. Despite the persistence of traditional, teacher-centered approaches in current instructional practices (Banville et al., 2021) research has shown that styles across the entire Spectrum, including both reproduction and production clusters, contribute meaningfully to students' physical, cognitive, and affective development (Simonton et al., 2024). Moreover, Sports Sciences university students' emotional experiences while implementing different styles can shape their future instructional PE choices (Simonton et al., 2024), underscoring the need for them to actively engage with, reflect on, and internalize a range of pedagogical approaches during their initial training. Gaining both theoretical knowledge and practical exposure to a variety of teaching methods not only prepares future educators to navigate diverse classroom contexts but also helps them develop the confidence and critical judgment required to select and apply the most effective strategies. This comprehensive preparation supports the creation of dynamic learning environments that are adaptable, inclusive, and responsive to the varied needs of their future students.

Limitations

Some limitations should be taken into account and addressed in further research. First of all, while the results provide valuable insights, the sample size was relatively small and restricted to students from the same academic setting. Future research could benefit from involving a broader and more diverse group of students to help improve the findings' generalizability.

Second, the measurement method selected, even though a validated and widely used questionnaire, relied on a 1 to 5 Likert scale. While this format is common and practical, it may limit how detailed the responses are. Students often tend to choose the middle option (usually a 3), especially when unsure or neutral, which can reduce the sensitivity of the data and make it harder to detect more precise differences between perceptions.

A potential limitation is the influence of social desirability bias, as the reciprocal style involved peer interaction and feedback. Students may have rated this style more favorably due to social expectations or comfort in collaborative settings, regardless of its objective instructional impact.

Finally, the study focused on students' subjective responses and did not include more objective indicators of learning or content retention. While this was partly due to the nature of the content (pelvic floor proprioception, which is difficult to assess through traditional performance tests), it would have been helpful to include interviews or other qualitative methods to better understand students' learning processes and long-term retention of this proprioceptive content.

Conclusions

This study demonstrates that different teaching styles within the Spectrum model influence how university students in Sports Sciences perceive motivation, enjoyment, and implementation of proprioception-related content. Specifically, reciprocal Style C was rated highest in terms of implementation, enjoyment, and motivation, highlighting the benefits of peer interaction and active student involvement in the learning process. Style A (command), while effective for task implementation, was perceived as less enjoyable and motivating, suggesting that highly structured, teacher-centered approaches may limit students' affective engagement.

Style D (self-check), which offers moderate student autonomy, also received low ratings. This suggests that, while the style provides opportunities for individualization, it may lack either the structure of Style A or the interpersonal engagement of Style C needed to optimize students' learning experience, particularly for proprioceptive content that demands high concentration and body awareness.

Moreover, the affective atmosphere created by the teaching style may influence not just motivation but also students' readiness to engage with the task, especially when dealing with unfamiliar or intimate content. Styles that foster social support and shared responsibility can enhance students' confidence and commitment.

No significant gender differences were observed, and students' perceptions of their teaching ability did not vary significantly across styles, indicating that teaching style more strongly affects motivation and enjoyment than perceived competence.

These findings reinforce the importance of providing future PE teachers with opportunities to experience and reflect on a range of teaching styles during their initial training. This not only helps them expand their teaching toolkit but also supports their ability to make thoughtful, context-aware decisions in real classroom situations, which can lead to more engaging and effective learning experiences for their future students.

Practical implications

This study highlights the value of selecting teaching styles that align with both the learning objectives and the nature of the content. Reciprocal Style C, which promotes autonomy, peer interaction, and engagement, proved particularly effective for teaching sensitive and unfamiliar topics like pelvic floor proprioception. Its collaborative structure may help reduce discomfort and encourage participation.

PETE programs should prepare future educators to recognize when collaborative or structured methods are most appropriate, equipping them to adapt their teaching strategies based on content sensitivity and student needs.

Author contributions

CRediT: **Celia Rodríguez-Longobardo:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft; **Pilar Sainz de Baranda:** Supervision, Writing – review & editing; **Miguel Ángel Gómez-Ruano:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – review & editing.

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