

Assessment rubrics, learning and academic well-being at university: a study in Neuro-physiotherapy from the study demands-resources model

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Título: Rúbricas de evaluación, aprendizaje y bienestar académico en la universidad: un estudio en Neurofisioterapia desde el modelo de demandas-recursos en el estudio.

Resumen: El desarrollo de habilidades manuales es fundamental en titulaciones de ciencias de la salud. Partiendo del modelo de Demandas-Recursos en el Estudio (DRE), se analiza cómo valora el estudiantado de Fisioterapia un conjunto de rúbricas de evaluación dirigidas a facilitar la adquisición de habilidades manuales en Neurofisioterapia, su relación con su engagement y burnout académico, satisfacción y resultados de aprendizaje. Participan 218 estudiantes (edad media 21.4 años) de una gran universidad española. Se analiza la relación y capacidad predictiva de tres conjuntos de variables (sociodemográficas, DRE, engagement y burnout académico) sobre la satisfacción y resultados académicos en la materia mediante análisis de correlación y regresiones jerárquicas múltiples. El estudiantado valora muy positivamente la utilidad de las rúbricas para aprender las habilidades implicadas, cuestión relevante dada su amplitud, especificidad y complejidad. Las variables DRE se correlacionan con el engagement-burnout, la satisfacción y resultados académicos. Se constata la validez predictiva e incremental de los diferentes bloques de variables sobre ambos criterios, especialmente del engagement y burnout académico. Los resultados enfatizan la utilidad de las rúbricas para promover el aprendizaje y satisfacción académica del estudiantado, así como el papel determinante del engagement y burnout académico sobre el bienestar, funcionamiento psicológico y resultados de aprendizaje.

Palabras clave: Rúbricas de evaluación. Habilidades prácticas. Bienestar y rendimiento académico. Modelo demandas-recursos en el estudio. Implicación y burnout académico. Neurofisioterapia.

Abstract: The development of manual skills is essential in health sciences degrees. Based on the Study Demands-Resources (SDR) model, this paper analyzes how Physical Therapy students evaluate a set of assessment rubrics aimed at promoting the acquisition of manual skills in Neuro-physiotherapy, and their relationship with students' academic engagement and burnout, satisfaction and learning outcomes. The participants were 218 undergraduates (average age 21.4 years) from a large university in Spain. The study analyzes the relationship and predictive capacity of three variable sets (socio-demographic, SDR, engagement and academic burnout) on satisfaction and academic achievement in the Neuro-physiotherapy subject. Pearson's correlation coefficients and multiple hierarchical regressions were used for analysis. The rubrics' usefulness for learning the manual skills involved is highly valued by students, a relevant issue considering their breadth, specificity and complexity. As expected, the SDR variables are correlated with engagement-burnout, and with satisfaction and academic results. The predictive and incremental validity of the different blocks of variables on both criteria, especially of engagement and academic burnout, is confirmed. The results emphasize the rubrics' usefulness to promote students' learning and academic satisfaction, as well as the determinant role of engagement and academic burnout on the students' well-being, psychological functioning and learning outcomes.

Keywords: Assessment rubrics. Practical skills. Academic well-being and achievement. Study demands-resources model. Engagement and academic burnout. Neuro-physiotherapy.

Introduction

This paper is addressed from the recent and emerging Study Demands-Resources (SDR) model (Bakker & Mostert, 2024; Salmela-Aro et al., 2022), derived from the theory of Job Demands and Resources (JDR) (Bakker & Demerouti, 2017), which explains the relationship and effects of job characteristics on employee well-being (e.g., burnout, motivation, engagement, sickness absenteeism) and performance, and has been ratified in different cultural and professional contexts (Bakker et al., 2003; Broetje et al., 2020; Chinellato et al., 2020; Lesener et al., 2019; Singh et al., 2020). The JDR theory has also been extensively studied in educational settings, highlighting that job resources (e.g., social support, autonomy, recognition, self-efficacy) enhance teachers' work engagement and organizational commitment, as well as the relationship between job demands (e.g., work overload, time

pressure, interpersonal conflicts) and their burnout levels (Maas et al., 2022; Naidoo-Chetty & Plessis, 2021; Skaalvik, 2020; Skaalvik & Skaalvik, 2018; Vermooten et al., 2021; Vizoso, 2022). In recent years, the SDR model has expanded this perspective, highlighting the interaction of school demands and resources in determining students' engagement and burnout, which constitute the determinants -positive and negative- of students' well-being, psychological functioning, and learning outcomes (Bakker & Mostert, 2024; Lesener et al., 2020; Salmela-Aro & Upadaya, 2014).

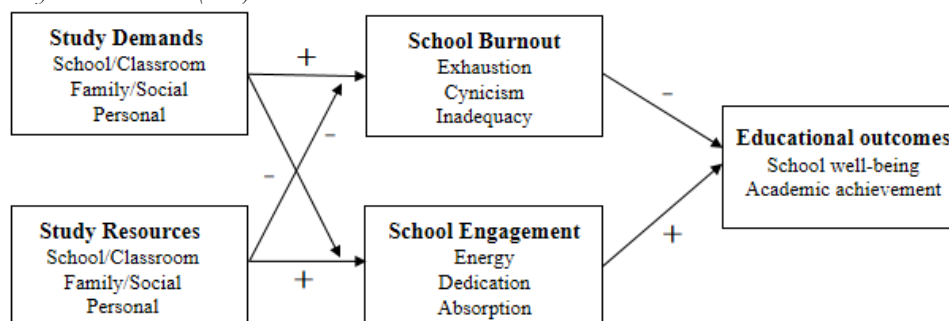
As shown in Figure 1, the model highlights as antecedents of the academic engagement a broad set of study resources or factors that can enhance students' academic motivation and engagement (e.g., teacher and peer support, family involvement, frequency and quality of the received feedback, autonomy level), thus promoting their well-being and better outcomes achievement. Opposite, study demands/requests (e.g., inadequate instructional planning, assignment overload, family pressure, conflicts with peers) correspond to factors that require the students to make high efforts and can promote the development of academic burn-

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out, negatively affecting their levels of well-being and learning outcomes. Thus, if resources overcome demands over time, students are more likely to maintain high levels of engagement; whereas if the opposite happens, emotional ex-

haustion, apathy and feelings of maladaptation, all of them characteristics of academic burnout, are more likely to emerge (Lesener et al., 2020; Salmela-Aro et al., 2022).

Figure 1
Study Demands-Resources (SDR) model.



In addition, the SDR model also highlights that resources and study demands/requests are positioned at multiple levels (contextual –school/classroom–, family, social –faculty and peers–, personal) and that they interact with each other. In other words, resources can generate positive effects on well-being and performance through their direct effects on engagement, but also by cushioning the negative effects of the study demands/requests. On the opposite end, demands can generate direct and indirect effects on both educational outcomes by either increasing students’ burnout or attenuating the positive effects of study resources, respectively. Finally, the model also proposes the existence of reverse causal effects: students with high engagement may mobilize their personal resources (e.g., emotional regulation) to maintain their academic involvement, whereas students with high burnout may self-generate more study demands/requests when carrying out their academic activity (Bakker & Demerouti, 2017; Salmela-Aro et al., 2022).

In recent years, many studies have shown that assessment rubrics are a particularly useful tool for promoting formative assessment in the classroom and for making summative assessment more objective and fair (Brookhart, 2018; Panadero et al., 2023; Panadero & Jonsson, 2013). These studies have also found that the students’ perception of the validity and usefulness of rubrics for learning is a fundamental determinant of the extent and manner in which they use them (Andrade, 2023; Bearman & Ajjawi, 2021; Chong et al., 2020), and of their relationship with their level of engagement and satisfaction with the corresponding subjects (García-Ros et al., 2021; Green et al., 2015; Holmes, 2018; Lombard, 2011; Yan & Brown, 2017). On the other hand, to the best of our knowledge, no previous studies have been conducted from the perspective of the SDR model in the field of Physical Therapy. Furthermore, no studies have yet analyzed the fulfillment of the SDR model assumptions in this field. These assumptions pertain to the relationship between resources and demands for study (inverse), the rela-

tionship between study resources with academic engagement (direct) and academic burnout (inverse), and the relationship between study resources with satisfaction and academic performance in the subject (direct) through engagement and academic burnout. These are the research questions that we pose in this study.

Assessment rubrics in higher education

The research and use of assessment rubrics, defined as “... a document that articulates the learning goals for a task and describes varying levels of mastery of those goals” (Andrade, 2023) has witnessed a remarkable surge in higher education over the past few decades. This growth has been observed in their efficacy as both summative assessment and grading tools, and as formative assessment instruments to facilitate learning and skill development (Brookhart & Chen, 2015; Castellanos-Ortega et al., 2022; Cockett & Jackson, 2018; Grundgeiger et al., 2023; Pérez-Guillén et al., 2022; Torres-Narváez et al., 2018; Yeung et al., 2016). Initially, research focused primarily on the usefulness of rubrics for summative purposes (Brookhart & Chen, 2015; Jonsson & Svingby, 2007; Reddy & Andrade, 2010), concluding that (1) the use of rubrics can improve the reliability of performance assessments, especially when rubrics are analytic, focused on specific topics, and supported by exemplars and rater training; (2) while rubrics alone do not guarantee valid performance assessment, the incorporation of a comprehensive validity framework during the rubric validation process can enhance validity; and (3) rubrics appear to have the potential to promote learning and improve instruction.

Subsequently, research began to analyze the usefulness of rubrics in enhancing students’ learning outcomes, self-regulation, attitudes and motivation toward learning (Andrade, 2023; Panadero & Jonsson, 2013). A recent meta-analysis (Panadero et al., 2023) revealed that the use of rubrics has a beneficial impact on academic performance, self-

regulated learning and self-efficacy for learning across the entire educational spectrum, especially in higher education (Brookhart, 2018). In a similar vein, this meta-analysis identifies the efficacy of rubrics in facilitating more efficient feedback and fostering realistic self- and peer-assessment, which often entails the deployment of metacognitive strategies (Brookhart, 2018; Panadero et al., 2013, 2023).

Finally, research has also focused on examining student and faculty perceptions and attitudes regarding the use and usefulness of rubrics (Andrade, 2023; Bearman & Ajjawi, 2021; Brookhart & Chen, 2015; Castellanos-Ortega et al., 2022; Chong et al., 2020). These studies emphasize that students find rubrics useful, especially those with a formative purpose rather than solely for grading (Bearman & Ajjawi, 2021; Brookhart, 2018; Brookhart & Chen, 2015; Cockett & Jackson, 2018; García-Ros et al., 2021; Messick, 1989, 1995; Reddy, 2011; Schuwirth & Van Der Vleuten, 2020). However, merely providing them does not ensure their use or improvement in learning (Cockett & Jackson, 2018). Consequently, the development and implementation of rubrics in the classroom must consider several crucial elements, including their alignment with learning objectives, the students' involvement in their development, the verification of their understanding by students, and their positive evaluation to guide learning (Andrade, 2023; Brookhart, 2018; Brookhart & Chen, 2015; Caretta-Weyer et al., 2024; Chong et al., 2020; Panadero & Jonsson, 2020). Conversely, studies examining the perceptions and attitudes of faculty members conclude that they predominantly view rubrics as a means of achieving more objective grading, albeit with a somewhat constrained formative value (Brookhart & Chen, 2015; Castellanos-Ortega et al., 2022; Manuel Batista-Foguet et al., 2004).

In conclusion, assessment rubrics are useful tools for both promoting learning and grading in higher education (Andrade, 2023; Brookhart & Chen, 2015; Garcés-Manzanera, 2022; Jonsson & Svingby, 2007; Panadero et al., 2023; Panadero & Jonsson, 2013; Reddy & Andrade, 2010). Therefore, when utilized in an optimal manner, they can facilitate learning, effective peer and self-assessment, and even self-regulated learning. Additionally, they can streamline the grading process and indicate whether and to what extent instruction has been adequate or inadequate (Brookhart & Chen, 2015; Jonsson & Svingby, 2007; Panadero & Jonsson, 2013).

Teaching manual skills in Physical Therapy

The acquisition of technical manual skills is essential in many university studies, especially in Health Sciences (e.g., Medicine, Nursing and Physical Therapy). These skills are often acquired in laboratory classes by simulating situations in which students practice them with their peers or mannequins (Handeland et al., 2021; Rossetini et al., 2017), while receiving feedback from faculty or their own peers (Schmutz et al., 2021). However, given the diversity and specificity of the maneuvers to be learned, the development and automa-

tion of these skills is complex (Castellanos-Ortega et al., 2021), requiring a large volume of supervised and autonomous practice, an issue especially observed in Neurophysiotherapy (Del Rossi et al., 2017; Sravanam et al., 2022). It is therefore vital to provide students with instructional resources that facilitate opportunities to practice beyond the classroom and encourage autonomous learning (George & Doto, 2001).

In this context, assessment rubrics can be particularly useful tools for conducting frequent formative assessments, providing students with higher quality feedback, facilitating autonomous practice, and assessing in a more valid and reliable way the learning and performance levels showed by students (Brookhart & Chen, 2015; Jonsson & Svingby, 2007; Panadero et al., 2023; Panadero & Jonsson, 2013; Reddy & Andrade, 2010).

Nevertheless, studies analyzing validity and usefulness of rubrics in Physical Therapy are scarce (Chong et al., 2020; Pérez-Guillén et al., 2022; Torres-Narváez et al., 2018), an issue even more noticeable in the field of Neurophysiotherapy (Tappan et al., 2020). These issues led us to develop a set of rubrics aimed at facilitating learning and assessing the acquisition levels of the practical skills involved in the execution of Neuro-physiotherapy maneuvers (neurodevelopmental, proprioceptive neuromuscular facilitation and child physical therapy) addressed in the Degree of Physical Therapy at the University of Valencia (García-Ros et al., 2024; García-Ros et al., 2021).

More specifically, from the perspective of the SDR model (Bakker & Mostert, 2024; Salmela-Aro et al., 2022), this paper analyzes the relationship between Physical Therapy students' perception of the validity and usefulness for learning of the rubrics developed and their levels of engagement and academic burnout, as well as their relationship and predictive capacity on their satisfaction and academic outcomes in the subject Physical Therapy in Clinical Specialties IV of the mentioned degree, where the Neuro-physiotherapy knowledge and skills are addressed. In recent decades, engagement and academic burnout have been two constructs of special relevance in psycho-educational research and intervention, given their important effects on students' well-being and academic outcomes (Almarghani & Mijatovic, 2017; Salanova Soria et al., 2005; Salmela-Aro & Upadyaya, 2014; Tuominen-Soini & Salmela-Aro, 2014; Upadyaya & Salmela-Aro, 2021). On the other hand, in recent years, research that jointly analyzes their effects on both educational outcomes has notably increased, constituting the essential components of the Study Demands-Resources model (Salmela-Aro et al., 2022).

Objectives and hypotheses

The general objective of this study is to determine the relationship between the students' evaluation (validity and usefulness) of a set of assessment rubrics developed to facilitate the learning of manual skills involved in Neuro-

physiotherapy and the variables proposed by the SDR model. This study considers three different study resources/demands: perception of the rubrics, self-efficacy for learning, and perceived control over time. It also considers the participants' engagement and academic burnout, as well as their academic satisfaction and results (quality of execution of Neuro-physiotherapy maneuvers).

More specifically, the study considers three complementary objectives: (a) from a conceptual viewpoint, to analyze the relationship between the sets of variables considered (socio-demographic, study resources/demands, engagement/academic burnout, and academic satisfaction/performance), verifying to what degree they conform to the predictions made by the SDR model; (b) from the educational intervention perspective, to determine the rubrics' utility and validity perception, and their relationship with the students' levels of engagement/burnout, as well as with their academic satisfaction and acquisition level of Neuro-physiotherapy manual technical skills; (c) considering both perspectives, to analyze the predictive and incremental validity of the different sets of variables on students' satisfaction and learning outcomes, paying special attention to their evaluation of the rubrics' validity and usefulness.

According to the basic principles highlighted by the SDR model, the working hypotheses proposed in the study are as follows:

H1.- In agreement with previous research, study resources (perception of rubrics, self-efficacy) and demands (perception of lack of control over time) will be significantly related to the students' levels of engagement and academic burnout, their satisfaction and academic achievement as predicted by the SDR model. More specifically, according to previous research (Denson et al., 2010; García-Ros et al., 2021; Rosário et al., 2012) the relevance given in this work to the students' validity and utility perception of the assessment rubrics will be related (1.1) to their levels of engagement in a significant and direct way, (1.2) to their levels of academic burnout in a significant and inverse way, and (1.3) to the satisfaction with the subject and (1.4) academic performance in a direct way. Additionally, (1.5) a significant inverse relationship between engagement and academic burnout will be shown, (1.6) the academic engagement will be significantly and directly related to both criteria, (1.7) while the academic burnout will be inversely related. Based on the SDR model and extensive previous research, self-efficacy for learning will also show positive significant relationships with the various educational outcomes considered (Rosário et al., 2012; Zimmerman, 1995). Conversely, the perception of lack of control over time will be negatively related to these outcomes (Claessens et al., 2007; García-Ros & Pérez-González, 2012).

H2.- According to the SDR model, study resources/demands (perception of rubrics, self-efficacy for learning, perception of lack of control over time) will significantly increase the predictive capacity of students' socio-

demographic variables (gender, age, dedication to study) on the academic satisfaction and performance in the subject.

H3.- The engagement and the academic burnout will significantly increase the joint predictive ability of the socio-demographic variables and study resources/demands on satisfaction and academic performance in the subject, mediating the effect of the latter on both criteria.

Materials and methods

Participants and procedure

In this research, students enrolled in the subject Physical Therapy in Clinical Specialties IV (PTCS-IV), a third-year compulsory subject of the Physical Therapy degree at the University of Valencia, were recruited. The main objective of this course is to equip students with the skills to evaluate and establish an effective therapeutic plan for individuals who have suffered from neurological diseases. This includes the development of manual skills and physical therapy procedures in the different phases of the cognitive-motor development, as well as methods of motor and proprioceptive reeducation for diseases of the Central Nervous System. The Human Research Ethics Committee of the University of Valencia approved the study protocol (Code H1543332503311), the academic heads of the department of Physical Therapy also authorized the development of the study, and informed consent was obtained from the participants.

In the first week of May 2022, students were invited to answer an online survey composed of different scales, in order to evaluate the variables considered in the study (socio-demographic: gender, age and dedication to study; resources/demands: perception of the rubrics' utility and validity, self-efficacy and perception of control over time; engagement and academic burnout; satisfaction with the subject). At the end of the academic year, their academic results were also collected. This study involved 218 students (age: $M = 21.4$, $SD = 2.8$, range = 20-34 years; 52.3% women; 82% full-time students) who had accessed to university through a SAT-level exam equivalent.

Previously, the rubrics had been developed by the faculty members of the PTCS-IV subject and an expert in educational psychology. Following the principles highlighted in research for the development of formative rubrics and good practices in their use (Andrade, 2023; Fraile et al., 2017; Jonsson, 2014; Panadero et al., 2016; Panadero & Jonsson, 2013), it was agreed (a) to consensually develop analytical rubrics for the set of maneuvers considered in the subject; (b) to integrate identical criteria, assessment levels and grading strategy, as well as a verbal guide to support execution for each maneuver; (c) to distribute the responsibility of elaborating the rubrics initial version according to the teaching staff specialization, and subsequently discuss them until a consensus was reached on the final version; (d) to have the rubrics reviewed by teachers of other clinical specialties and

seven students from previous courses, in order to check their clarity and ease of understanding; (e) to confirm their application consistency by the faculty (García-Ros et al., 2021).

The rubrics were used as a basic reference throughout the progress of the entire subject: (a) to facilitate learning the maneuvers both in laboratory classes supervised by the faculty and when practicing autonomously for studying, (b) to develop formative assessments and provide feedback to students, (c) to promote self-regulated learning and facilitate students to perform more realistic peer- and self-assessments, and (d) to be used as grading tools in the subject final practical exam -summative assessment- (García-Ros et al., 2021). The developed rubrics are available in open access in the institutional repository of the University of Valencia (Neurodevelopmental treatment: <https://hdl.handle.net/10550/79254>; Proprioceptive Neuromuscular Facilitation: <https://hdl.handle.net/10550/79257>).

Instruments and measures

Academic engagement was assessed with the Spanish adaptation of the *Schoolwork Engagement Inventory -SEI-* (García-Ros et al., 2018; Salmela-Aro & Upadaya, 2012). Integrated by nine items, the SEI assesses three complementary dimensions: Energy/Vigor (e.g., "At university, I am bursting with energy"), Dedication (e.g., "I am enthusiastic about my studies") and Absorption (e.g., "Time seems to fly when I am studying"). It also provides an overall engagement score, which is used in this study. Responses are rated on a five-level Likert-type scale (1 = never, 5 = always). The scale shows adequate internal consistency ($\alpha = .80$).

Academic burnout was assessed with the Spanish adaptation of the *School Burnout Inventory* for university students -SBI-U- (Boada-Grau et al., 2015; Salmela-Aro et al., 2009). It consists of nine items, with a six-level Likert-type response scale (1 = strongly disagree, 6 = strongly agree), which assess three complementary dimensions: Burnout (e.g., "I often feel overwhelmed by academic work"), Cynicism (e.g., "I feel I am losing interest in my academic tasks") and Inadequacy (e.g., "I often feel under-qualified to perform academic tasks"). The SBI-U also facilitates a global academic burnout score that is used in this study, showing adequate internal consistency ($\alpha = .76$).

Self-efficacy for learning was assessed with the corresponding subscale of the *Motivated Strategies for Learning Questionnaire* (Pintrich et al., 1993). It integrates eight items that assess students' confidence in their abilities to perform academic tasks (e.g., "I am confident that I will be able to understand the more complex material in this course"), with a seven-level Likert-type response scale (1 = never, 7 = always). Its internal consistency was .81.

The *perception of control over time* was assessed with the corresponding subscale of the *Time Management Behavior Questionnaire* (García-Ros & Pérez-González, 2012; Macan et al.,

1990). Composed of seven items with a five-level Likert-type response scale (1 = never, 5 = always), it assesses to what degree students perceive that they effectively control and manage their time (e.g., "I have to spend a lot of time on unimportant tasks"). Given the inverse nature of this factor, high scores indicate a feeling of lack of time control. Its internal consistency in the study was .78.

The *students' perception of rubrics* was assessed with a 15-item scale developed ad hoc, aimed at determining the validity/reliability and usefulness for learning the students attribute to them (e.g., "the rubrics allow to self-evaluate the execution of the maneuvers more realistically"). A Likert-type response scale with five levels (1 = strongly disagree; 5 = strongly agree) was used. Its internal consistency was .89.

Academic satisfaction was assessed with the university context satisfaction subscale of the *Multidimensional Students' Life Satisfaction Scale* (Schnettler et al., 2017), replacing the term "university" with "subject". It integrates eight items that assess satisfaction with studies (e.g., "I like the activities we develop in this subject") on a six-level response scale (1 = strongly disagree; 6 = strongly agree). Its internal consistency was .78.

Finally, three socio-demographic variables were also registered from participants (gender, 0 = male, 1 = female; age, years old at the time of the study; dedication to the study, 0 = part-time, 1 = full-time). At the end of the academic year, the students' grades in the subject final practical exam were collected.

Statistical analysis

First, the Pearson's correlation coefficient was used to analyze the bivariate relationships between the study resources/demands, engagement and academic burnout, and satisfaction and performance in the subject, controlling for the effects of the students' socio-demographic variables.

Secondly, two multiple hierarchical linear regressions were performed to determine the predictive and incremental validity of the different blocks of variables (socio-demographic, resources/demands, engagement/burnout) on academic performance and satisfaction with the subject, respectively. Both regressions consider three steps or predictive models in their development: Model 1, which integrates as predictors the students' socio-demographic variables (age, gender and dedication to study); Model 2, which additionally considers the variables related to resources/demands (perception of rubrics, self-efficacy and time control); Model 3, which integrates the previous blocks of variables and, additionally, engagement and academic burnout. All statistical analyses were performed with SPSS v. 26.0 (SPSS Inc., Chicago, IL).

Results

First, a preliminary analysis was conducted to determine the students' perception of the validity and utility of the assess-

ment rubrics. Table 1 presents the descriptive statistics of the students' responses to the items of the questionnaire developed for this purpose. In practically all cases, the average scores are very close to or above four. The higher values are shown in the items where rubrics were found that "allow to better know the criteria that will be used to assess us" ($M = 4.64$; $SD = 0.60$), "integrate the most important elements to be considered in the maneuvers" ($M = 4.47$; $SD = 0.62$), "help to understand the criteria involved in an adequate per-

formance" ($M = 4.33$; $SD = 0.65$) and "serve as a guide for the study/practice of the maneuvers" ($M = 4.30$; $SD = 0.77$). On the opposite side, despite a mean score that exceeds the central value of the response scale (3), the item where rubrics were found to decrease anxiety in the learning process and in the final practical exam ($M = 3.60$; $SD = 1.08$), exhibits a comparatively lower value. The mean score of the set of items ($M = 4.19$; $SD = 0.54$) evidences that the students value the developed rubrics positively.

Table 1

Descriptive statistics of students' validity and utility perception of the assessment rubrics.

<i>I think the rubrics ...</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>Sk</i>	<i>Ku</i>
1.- Integrate the most important elements to consider in the maneuvers	4.47	0.62	2	5	-0.84	0.32
2.- Allow to evaluate of the important competencies of this subject	4.26	0.69	1	5	-0.56	-0.13
3.- Integrate criteria that will be useful to me in my future professional career	3.98	0.79	1	5	-0.43	0.06
4.- Are reliable tools (allow to measure the quality of the maneuvers execution)	4.12	0.82	1	5	-0.85	0.74
5.- Allow a fair comparison between students on the practical assessment exam	4.08	0.85	1	5	-0.84	0.73
6.- Help to understand the criteria involved in an adequate performance	4.33	0.65	2	5	-0.56	-0.19
7.- Clarify how we have to perform each maneuver	4.24	0.73	2	5	-0.62	-0.10
8.- Make it easier to plan the study/practice of the maneuvers	4.19	0.80	2	5	-0.74	-0.04
9.- Allow to review what has been learned in order to make adjustments	4.25	0.71	2	5	-0.56	-0.27
10.- Facilitate realistic self-assessment of the maneuver's execution	4.09	0.84	2	5	-0.63	-0.29
11.- Serve as a guide for the study/practice of the maneuvers	4.30	0.75	2	5	-0.95	0.70
12.- Allow to discuss and determine what to improve in the maneuver's execution	4.01	0.79	1	5	-0.54	0.25
13.- Facilitate to perform the maneuvers in a more adequate way	4.20	0.80	1	5	-0.94	0.95
14.- Allow to better know the criteria that will be used to assess us	4.64	0.60	2	5	-1.68	2.30
15.- Reduce our anxiety in the learning process and in the final practical exam	3.60	1.08	1	5	-0.38	-0.46
<i>Total</i>	4.19	.54	2.20	5	-0.73	0.77

Note. M = Mean; SD = Standard Deviation; Min = Minimum; Max = Maximum; Sk = Skewness; Ku = Kurtosis.

Regarding the first working hypothesis, the Table 2 presents the descriptive and partial bivariate correlations between educational outcomes (academic performance and satisfaction), engagement/academic burnout and the resources/demands considered in the study, after controlling for the effects of the participants' socio-demographic variables. Study resources (perception of assessment rubrics, self-efficacy) show significant direct relationships with academic engagement and inverse relationships with burnout, while study demands (perception of lack of control over time) show the opposite. Both study resources are significant and directly related to both academic performance and subject satisfaction, while the relationship between lack of control over time and both criteria does not reach statistical signifi-

cance. A significant negative correlation was observed between engagement and academic burnout ($r = -.38$, $p < .001$). These variables exhibited the strongest correlations with both academic performance and satisfaction with the subject. Satisfaction and academic performance are significantly related to most of the variables, though not to each other nor to the perception of time control. Finally, the relationships between study resources and demands do not reach statistical significance. The highest correlations are observed between engagement and satisfaction with the subject ($r = .58$, $p < .001$), engagement and self-efficacy for learning ($r = .36$, $p < .001$), as well as between academic burnout and both satisfaction and academic performance ($r = -.35$, $p < .001$).

Table 2

Descriptive statistics and partial correlations between the study variables, controlling for gender, age and dedication to study.

<i>Variables</i>	<i>M</i>	<i>SD</i>	<i>Sk</i>	<i>Ku</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Perception of rubrics	4.19	0.54	-0.73	0.77	1						
(2) Self-efficacy for learning	4.97	0.80	-0.58	1.28	-.02	1					
(3) Perception of control over time	2.57	0.71	0.16	-0.16	-.02	-.12	1				
(4) Academic Engagement	3.49	0.55	-0.03	-0.01	.21**	.36***	-.20**	1			
(5) Academic Burnout	3.46	1.20	0.12	-0.71	-.18**	-.26***	.16*	-.38**	1		
(6) Academic Performance	6.70	1.68	-1.48	3.85	.15*	.24***	-.10	.18**	-.35***	1	
(7) Academic Satisfaction	4.86	0.62	-0.71	1.82	.24***	.21***	-.04	.58***	-.35***	.02	1

Note. M = Mean; SD = Standard Deviation; Min = Minimum; Max = Maximum; Sk = Skewness; Ku = Kurtosis. * $p < .05$, ** $p < .01$, *** $p < .001$

With respect to the socio-demographic variables, a significant inverse relationship was found between age and dedication to study ($r = -.29, p < .001$). Gender significantly correlated with academic performance ($r = .17, p < .01$) and satisfaction with the subject ($r = .20, p < .01$), while a very close to significance correlation was found between this variable and the perception of rubrics ($r = .13, p = .05$). In all cases, women presented higher scores. Age also showed a significant inverse relationship with both satisfaction ($r = -.23, p < .001$) and academic performance ($r = -.14, p < .05$). Finally, dedication to study was significantly related to satisfaction with the subject ($r = .19, p < .01$), with full-time students showing higher satisfaction.

In order to test the second and third working hypotheses, two separate hierarchical multiple regression analyses were conducted on satisfaction and academic performance in the subject. The results of these analyses are presented in Tables 3 and 4, respectively. In both cases, the three predictive models considered (Model 1: students' socio-

demographic variables; Model 2: which additionally includes variables related to study resources/demands; Model 3: which further incorporates engagement and academic burnout) were found to significantly predict both criteria. In addition, a marked improvement in the predictive capacity of each successive model was evident when compared to the previous one. Moreover, with regard to the second working hypothesis, the perceived validity and usefulness of the rubrics are integrated into the resulting regression equations for both criteria, as evidenced by the predictive capacity of Model 2 (academic satisfaction: $\beta = .24, p < .001$; academic performance: $\beta = .15, p < .05$). However, with regard to the third hypothesis, the perception of the rubrics is not retained in the resulting equations for Model 3 for either criterion, indicating that their effects are fully mediated by student engagement and academic burnout. Engagement is the strongest predictor of academic satisfaction ($\beta = .50, p < .001$), while academic burnout ($\beta = -.28, p < .001$) is the strongest predictor of academic performance.

Table 3

Hierarchical regression results for academic satisfaction.

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						.08	.08**
Constant	5.60***	4.89	6.31	0.36			
Gender	0.21**	0.05	0.37	0.08	.17**		
Age	- 0.04**	- 0.07	- 0.01	0.02	-.20**		
Dedication to study	0.07	- 0.15	0.29	0.11	.04		
Step 2						.18	.09***
Constant	3.81***	2.74	4.87	0.54			
Gender	0.17*	0.01	0.33	0.08	.14*		
Age	-0.05**	-0.07	-0.02	0.01	-.21**		
Dedication to study	0.04	-0.17	0.25	0.11	.03		
Perception of rubrics	0.27***	0.13	0.42	0.07	.24***		
Self-efficacy	0.16**	0.06	0.25	0.05	.20**		
Control over time	- 0.01	- 0.12	0.10	0.06	-.01		
Step 3						.42	.24***
Constant	3.46***	2.40	4.51	0.54			
Gender	0.17*	0.04	0.31	0.07	.14*		
Age	- 0.05***	- 0.07	- 0.03	0.01	-.23***		
Dedication to study	- 0.01	- 0.19	0.17	0.09	-.01		
Perception of rubrics	0.12	0.06	0.10	0.06	.10		
Self-efficacy	-0 .00	- 0.09	0.09	0.05	-.00		
Control over time	0.08	-0.02	0.17	0.05	.09		
Academic engagement	0.56***	0.42	0.69	0.07	.50***		
Academic burnout	-0.07*	- 0.13	- 0.01	0.03	-.14*		

Note. CI = confidence interval; LL = lower limit; UL = upper limit. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 4
Hierarchical regression results for academic performance.

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						.07	.07**
Constant	6.99***	5.04	8.95	0.99			
Gender	0.50*	0.06	0.94	0.22	.15*		
Age	-0.05	-0.13	0.03	0.04	-.09		
Dedication to study	0.63*	0.04	1.23	0.30	.15*		
Step 2						.14	.07***
Constant	3.22*	0.26	6.17	1.50			
Gender	0.40	- 0.03	0.84	0.22	.12		
Age	-0.05	- 0.13	0.03	0.04	-.09		
Dedication to study	0.60*	0.02	1.17	0.29	.14*		
Perception of rubrics	No	0.07	0.86	0.20	.15*		
Self-efficacy	0.47***	0.21	0.74	0.14	.23***		
Control over time	-0.17	-0.46	0.13	0.15	-.07		
Step 3						.21	.07***
Constant	6.27***	2.92	9.61	1.70			
Gender	0.55*	0.13	0.98	0.21	.17*		
Age	-0.07	- 0.15	0.01	0.04	-.12		
Dedication to study	0.53	- 0.03	1.09	0.28	.12		
Perception of rubrics	0.31	- 0.09	0.71	0.20	.10		
Self-efficacy	0.34*	0.06	0.62	0.14	.16*		
Control over time	- 0.09	- 0.39	0.20	0.15	-.04		
Academic engagement	- 0.06	- 0.49	0.37	0.22	-.02		
Academic burnout	- 0.40***	- 0.59	- 0.20	0.10	-.28***		

Note. CI = confidence interval; LL = lower limit; UL = upper limit. * $p < .05$, ** $p < .01$, *** $p < .001$

More specifically, the results of the regression on satisfaction with the subject (Table 3) also show that the three models considered significantly predict this criterion (Model 1, $F(3, 214) = 6.54, p < .001$; Model 2, $F(6, 211) = 7.59, p < .001$; Model 3, $F(8, 209) = 19.05, p < .001$). In this case, the socio-demographic variables (Model 1) explain 8.4% of the variance, Model 2 explains 17.7%, while Model 3 explains up to 42.2%. Model 2 significantly increases the predictive capacity of Model 1 ($\Delta R^2 = .09, F(3, 211) = 8, p < .001$), as does Model 3 with respect to Model 2 ($\Delta R^2 = .24, F(2, 209) = 44.13, p < .001$). The resulting final model integrates academic engagement ($\beta = .50, p < .001$), academic burnout ($\beta = -.14, p < .05$), gender ($\beta = .14, p < .05$), and age ($\beta = -.23, p < .001$).

On the other hand, the three models demonstrate a significant capacity to predict students' academic performance (Table 4) -Model 1, $F(3, 214) = 4.94, p < .01$; Model 2, $F(6, 211) = 5.90, p < .001$; Model 3, $F(8, 209) = 6.93, p < .001$. The socio-demographic variables (Model 1) explain 6.5% of the variance, Model 2 explains 14.4%, while Model 3 accounts for as much as 21% of the variance. Model 2 significantly increased the explanatory capacity of Model 1 on the criterion ($\Delta R^2 = .07, F(3, 211) = 6.48, p < .001$), as did Model 3 with respect to Model 2 ($\Delta R^2 = .07, F(2, 209) = 8.71, p < .001$). The resulting regression equation identifies the following significant predictors: academic burnout ($\beta = -.28; p < .001$), self-efficacy for learning ($\beta = .16; p < .05$) and gender ($\beta = .17; p < .05$). Furthermore, age ($\beta = -.12; p = .07$) and

dedication to study ($\beta = .12; p = .06$) exhibited values approaching significance.

Discussion

The primary objective of this study was to analyze the relationship between the extent to which the students enrolled in the Physical Therapy Degree program assess the validity and usefulness of a set of rubrics designed to facilitate the acquisition of manual skills in Neuro-physiotherapy, and the variables considered in the Study Demands-Resources model (study resources/demands, engagement and academic burnout, satisfaction, and academic results) (Bakker & Mostert, 2024; Salmela-Aro et al., 2022).

The preliminary findings of the study have shown that students perceive the assessment rubrics very positively, both in terms of their validity to assess the execution quality of the Neuro-physiotherapy maneuvers involved, as well as their usefulness to facilitate their learning. The scarce research on the use and effectiveness of rubrics in the field of Physical Therapy and, more specifically, for learning practical skills in Neuro-physiotherapy enhance the relevance of these results (Del Rossi et al., 2017; García-Ros et al., 2021; Sravanam et al., 2022). Our findings indicate that students place a high value on rubrics as a support for both formative and summative assessment. In this regard, the rubrics were developed and implemented with the objective of aligning them with the learning outcomes and ensuring their comprehensibility by students. They were established as a fun-

damental reference for providing feedback in the classroom, demonstrating that students perceive them as valuable tools for guiding their learning (Andrade, 2023; Brookhart, 2018; Brookhart & Chen, 2015; Caretta-Weyer et al., 2024; Chong et al., 2020; Panadero & Jonsson, 2020).

In light of the working hypotheses, the following section will elucidate the conclusions pertaining to the relationship and predictive capacity of the students' perception of the assessment rubrics with the set of variables considered in the SDR model.

H1.- Study resources (perception of rubrics, self-efficacy) and demands (perception of lack of control over time) will be significantly related to the students' levels of engagement and academic burnout, their satisfaction and academic achievement as predicted by the SDR model. More specifically, according to the relevance given in this work to the students' validity and utility perception of the assessment rubrics, this will be related (1.1) to their levels of engagement in a significant and direct way, (1.2) to their levels of academic burnout in a significant and inverse way, and (1.3) to the satisfaction with the subject and (1.4) academic performance in a direct way. Additionally, (1.5) a significant inverse relationship between engagement and academic burnout will be shown, (1.6) the academic engagement will be significantly and directly related to both criteria, (1.7) while the academic burnout will be inversely related. Furthermore, self-efficacy for learning will also show positive significant relationships with the various educational outcomes considered and the perception of a lack of control over time will be negatively related to these outcomes.

The results have confirmed this first hypothesis. First, all the correlations between the study resources and demands and the students' levels of engagement and burnout occur in the sense highlighted by the SDR model, as does so with the students' academic results and satisfaction with the subject (Bakker & Mostert, 2024; Salmela-Aro et al., 2022). In this study, the students' validity and utility perception of the assessment rubrics shows a significant direct relationship with academic engagement (1.1), with satisfaction with the subject (1.3) and with academic performance (1.4). In addition, a significant inverse relationship between the rubrics' perception and the students' academic burnout (1.2) is also found. On the other hand, as proposed by the SDR model, the self-efficacy for learning is also significantly and directly related with the engagement and with the students' academic satisfaction and performance, and inversely with their levels of burnout. Meanwhile, lack of control over time shows the opposite, with an inverse significant relationship with engagement and direct with academic burnout, as proposed by the SDR model. In addition, according to the working hypothesis, engagement and burnout are inversely related to each other (1.5), finding that engagement is significantly and directly related to satisfaction and academic performance (1.6), while academic burnout is inversely related to both criteria (1.7).

Concerning the socio-demographic variables, though it was not the focus of the study primary aim, and in agreement with previous research (Chen et al., 2020; Voyer & Voyer, 2014), gender related significantly with the academic performance and satisfaction, and the relationship was close to significance in case of the students' perception of rubrics. Women presented higher scores in all cases. Also, a significant inverse relationship was observed between the participants' age and their dedication to study (part-time/full-time), as well as with their levels of satisfaction with the subject and academic results. These findings also concur with previous research, which shows the inverse relationship between different indicators of academic success at university and later access to these studies, as well as with part-time dedication to these studies (Pascarella & Terenzini, 1991), for reasons such as greater family and work responsibilities, or having fewer study skills.

H2.- According to the SDR model, study resources/demands (perception of rubrics, self-efficacy for learning, perception of lack of control over time) will significantly increase the predictive capacity of students' socio-demographic variables (gender, age, dedication to study) on the academic satisfaction and performance in the subject.

The results also confirm this working hypothesis basically. First, it should be noted that the socio-demographic variables (Model 1) significantly predict both satisfaction and academic results in the subject, explaining 8.4% and 6.5% of the variance, respectively. The variables gender and age are significant predictors of the satisfaction with the subject, while the variables gender and dedication to study significantly predict performance. Females show higher levels in both criteria, full-time dedication significantly predicts better performance, while older age is related to lower academic satisfaction.

Focusing specifically on this second hypothesis, the hierarchical regression on academic satisfaction shows that the study resources/demands significantly increase the predictive capacity of the socio-demographic variables on this criterion ($\Delta R^2_{\text{Mod1-2}} = .09, p < .001$), jointly explaining 18% of the variance. In the resulting model, the students' perception of rubrics ($\beta = .24, p < .001$) and self-efficacy for learning ($\beta = .20, p < .01$) are introduced, as well as the socio-demographic variables gender and age in the way previously highlighted. Meanwhile, the regression on academic performance found that the study resources/demands also significantly increased ($\Delta R^2_{\text{Mod1-2}} = .07, p < .001$) the predictive capacity of the students' socio-demographic variables on this criterion, with both groups of variables jointly explaining 14% of the variance. In this case, in the resulting regression equation, self-efficacy for learning ($\beta = .23, p < .001$) and the students' perception of rubrics ($\beta = .15, p < .05$) are introduced in the expected sense, together with the variable dedication to study, thus also confirming the relevance and explanatory capacity of the study resources/demands on the academic results in the subject.

Therefore, considering these results as a whole, and in accordance with the conceptual framework of the SDR model, the study resources/demands are significant predictors of both satisfaction and academic outcomes in Neuro-physiotherapy, even after controlling for the effects of the students' socio-demographic variables. Hence, the evaluation of the assessment rubrics and the self-efficacy for learning are included in the resulting regression models on both criteria. In addition, it is also evidenced the incremental validity of the study resources/demands with respect to the students' socio-demographic variables on both criteria.

Focusing on the validity and usefulness that students ascribe to the rubrics, these results not only corroborate the conclusions of previous research, which point out that they constitute a fundamental determinant for students as a guide for learning (Andrade, 2023; Brookhart, 2018; Brookhart & Chen, 2015; Caretta-Weyer et al., 2024; Chong et al., 2020; Panadero & Jonsson, 2020), but also demonstrate a significant relationship and predictive capacity of rubrics on both satisfaction and the implementation of manipulative skills in Neuro-physiotherapy. These results support the integration of assessment rubrics, with appropriate consideration of the conditions for their development and application in the classroom, as an effective method of providing formative assessment and fostering self-regulated learning among students (Nicol & Macfarlane-Dick, 2006; Panadero et al., 2023).

H3.- The engagement and the academic burnout will significantly increase the joint predictive ability of the socio-demographic variables and study resources/demands on satisfaction and academic performance in the subject, mediating the effect of the latter on both criteria.

The results of the hierarchical regressions also confirm this hypothesis. First, when engagement and academic burnout are considered, the joint predictive capacity of the socio-demographic variables and study resources/demands on the academic satisfaction criterion increases significantly (and very highly) ($\Delta R^2_{\text{Mod}2-3} = .24, p < .001$). In particular, the resulting regression equation include both engagement ($\beta = .50, p < .001$) and burnout ($\beta = -.14, p < .05$) in the expected sense, that with the participants' gender and age variables, all together explain 42% of the variance of the criterion. On the other hand, considering the results obtained in the previous step of the hierarchical regression analysis (Model 2), it is also found that engagement and burnout fully mediate the effects of self-efficacy for learning and the students' perception of rubrics on the satisfaction with the subject. Taken together, these results reaffirm the relevance that the SDR model concedes to the engagement and academic burnout as basic determinants of students' psychological well-being and functioning (Lesener et al., 2020; Salmela-Aro & Upadaya, 2014).

Likewise, the results of the third step of the hierarchical regression on academic performance also show that engagement and academic burnout significantly increase the joint explanatory capacity of the socio-demographic variables

and the study demands/resources on this criterion ($\Delta R^2_{\text{Mod}2-3} = .07, p < .001$), although to a significantly lesser extent than in the academic satisfaction criterion. In this case, in the resulting model, the academic burnout ($\beta = -.28, p < .001$) is introduced as the best predictor, accompanied only by the self-efficacy for learning ($\beta = .16, p < .05$) and the students' gender ($\beta = -.17, p < .05$). On the other hand, based on the results obtained in the previous step (Model 2), it is evident that burnout and engagement would totally mediate the effects of the students' perception of rubrics and partially the effects of the self-efficacy for learning on the performance levels of the Neuro-physiotherapy maneuvers. These results also reaffirm the relevance given by the SDR model to the effects of burnout on students' academic outcomes, as well as the important role of academic self-efficacy on them (Honick & Broadbent, 2016; Multon et al., 1991; Robbins et al., 2004).

Hence, as highlighted by the SDR model, the results show that the engagement and the academic burnout are essential determinants of not only the academic satisfaction, but also the learning of manual skills addressed in Neuro-physiotherapy, although in this study they show a much higher explanatory and predictive capacity on the first criterion compared to the second. More specifically, the explanatory and predictive capacity of the other variables considered (socio-demographic and resources-demands) on academic satisfaction increased significantly, with both constructs introduced in the resulting regression equation -even showing a correlation with each other-, being academic engagement the best predictor of this criterion. In addition, academic burnout also constitutes the best predictor of the students' performance levels of the Neuro-physiotherapy maneuvers. Thus, the results are in line with the SDR model, supporting that engagement and academic burnout are critical positive and negative elements of the well-being, psychological functioning and academic outcomes of students (Lesener et al., 2020; Salmela-Aro et al., 2022; Salmela-Aro & Upadaya, 2014). It is worth noting that, in this study, engagement is the critical element (in the positive sense) for predicting satisfaction with the subject, while burnout (in the negative sense) with respect to performance in it.

Limitations and future research

We are aware that this study has limitations, including the need to consider longitudinal research designs and to use structural equation analysis techniques. These issues will be addressed in future work, considering additionally other study resources and demands (contextual, family, social and personal), analyzing their direct and interaction effects both on the levels of engagement and burnout, and on the criteria of academic well-being and learning outcomes of students. However, we also consider that the results and conclusions of this work are relevant from a conceptual and applied perspectives as highlighted in the preceding paragraphs. It is found that students perceive very positively the validity and

usefulness of the assessment rubrics for learning, and that the results converge with the predictions made by the theoretical model of Study Demands-Resources, evidencing the relationship of the resources/demands considered -especially for this work the validity and usefulness of the assessment rubrics- with the students' engagement and academic burnout, as well as emphasizing the relevance and predictive capacity of the latter two constructs on their academic satisfaction and learning outcomes.

Conclusions

In the end, the results of this study coincide basically with the results and conclusions of previous research, remarking both their conceptual and applied relevance. From the conceptual viewpoint, because: (a) they reaffirm the relationship of study demands/resources with students' engagement and academic burnout, as well as with their academic satisfaction and performance in the subject PTCS-IV; (b) they are consistent with the predictions of the SDR model regarding the link between academic engagement and burnout with the study resources/demands in the way expected, showing in this work significant relationships of both constructs with self-efficacy for learning, with the evaluation of the assessment rubrics and with the perception of control over time; (c) they also confirm the relationship and effects of the engagement and academic burnout on the students' well-being and academic outcomes, concretely in this study, of the engagement on academic satisfaction and of the academic burnout on performance (Salanova et al., 2005; Salmela-Aro et al., 2022). From an applied viewpoint, apart from the scarcity of such studies in the field of Physical Therapy (Pérez-

Guillén et al., 2022), the results reaffirm the relevance of assessment rubrics in enhancing formative assessment and feedback in the classroom, as well as in promoting self-regulated learning and facilitating autonomous learning. This is contingent upon adherence to the principles of good practice in their development and use, with the objective of promoting the use of rubrics by students to guide their learning process. In light of the aforementioned principles, it is imperative to ensure that students are actively engaged in the development of rubrics, ascertain their comprehension, and ensure the rubrics' alignment with the subject's learning outcomes. Hence, the rubrics serve as a crucial instructional tool for providing formative feedback by faculty members and for self- and peer-assessment (Andrade, 2023; Brookhart & Chen, 2015; Panadero et al., 2023; Panadero & Jonsson, 2013).

In this sense, in this study, it is especially noteworthy the high value given by students to their usefulness as a resource for the acquisition of the manual technical skills involved, even more if we consider the breadth, diversity and specificity of the Neuro-physiotherapy maneuvers to be learnt (Castellanos-Ortega et al., 2021; García-Ros et al., 2024).

Complementary information

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