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Perceived social support and self-regulated learning: A systematic review and meta-analysis

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ABSTRACT

Self-regulated learning (SRL) is conceived as an active, constructive process aimed at the attainment of personal learning goals. It is considered essential for academic achievement and life-long learning. Distal and proximal social influences, among which perceived social support (PSS) has been receiving increasing attention, are thought to play a key role in the development and display of SRL. In this paper, we aim to summarize the available data on the relationship between PSS and SRL by reviewing published studies that include samples comprising students at different stages of education, ranging from elementary school to university. We conducted a systematic literature review and meta-analysis, seeking to examine the association between PSS and SRL, by considering the possible moderating effects of different support provisions and sources. In addition, we tentatively propose explanations for the relationship based on broadly supported theoretical models of PSS and SRL.

1. Introduction

Self-regulated learning (SRL) is conceived as an active, constructive process which consist of thoughts, feelings and actions that are planned and proactively and reactively adapted for the attainment of personal goals. The SRL process includes feedback loops that integrate triadic areas of regulation (personal, behavioral, and environmental). Personal self-regulation involves monitoring and adjusting cognitive and affective states, while behavioral self-regulation involves self-observation and strategic adjustment of performance processes, and environmental self-regulation involves observation and adjustment of environmental conditions or outcomes (Panadero, 2017).

Appropriate knowledge and use of learning strategies are considered key components of SRL. Four principal types of learning strategies have been distinguished: cognitive, meta-cognitive, motivational, and resource management (Pintrich et al., 1991). Cognitive strategies are used to encode, comprehend, and retrieve data for specific learning goals, and they encompass activities involving rehearsal, selection, elaboration, and organization. Rehearsal consists of repeating the information the student wants to remember; by using selection strategies, students separate relevant from secondary, redundant, or confusing information, to facilitate deeper processing of the former; elaboration implies adding meaning to the learning material by making symbolic constructions; organizational strategies are based on identifying or assigning structure to learning material. Metacognitive strategies include activities that help students plan, monitor, and evaluate their learning. Motivational strategies consist of procedures for managing self-motivation (e.g., goal orientation self-management or self-efficacy self-talk), and resource management strategies serve to actively control different resources (e.g., time, study environment, effort, and help-seeking).

These types of skills conform a basic competence which is considered key to academic success and life-long learning (Ananiadou & Claro, 2009; Beishuizen & Steffens, 2011). Research involving diverse educational levels and situations has consistently found that SRL is positively associated with academic engagement (Danielsen et al., 2011; Reeve, 2012), adjustment (Cazan, 2012; Cazan & Stan, 2015; Koivuniemi et al., 2017), and achievement (Dent & Koenka, 2016; Mega et al., 2014; Robbins et al., 2004).

Distal and proximal social contexts are assumed to have an essential influence in the development and display of SRL. First, socializing agents act to model and guide the acquisition of self-regulatory skills (Schunk & Zimmerman, 1997). In addition, in line with the self-determination theory developed by Ryan and Deci (2000), satisfaction of students' basic psychological needs for autonomy (i.e., to feel a sense of volition), competence (i.e., to experience oneself as effective in interactions with

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the environment), and relatedness (i.e., to feel loved, appreciated, and connected with important others) is a necessary basis of self-motivation and self-regulation, and supportive educational conditions are thus required for these outcomes (Boekaerts, 2006). According to the self-system model of motivational development (SSMMD), supportive social environments are particularly important in this regard (Newman, 2000; Skinner et al., 2008), as they are assumed to supply warmth, structure, respect and confidence. Thus, we expect that close interpersonal relationships may play a fundamental role in inducing and enhancing the display and maintenance of SRL skills, as they are expected to provide social support when required. In fact, perceived availability of social support from significant others (teachers, family, and peers) is considered to enhance academic adjustment (Martínez-López et al., 2019; Rodríguez et al., 2017) and achievement (Tinajero et al., 2020).

Perceived social support (PSS) is conceived as the awareness and evaluation of resources provided through social interaction, leading to a relatively stable sense that the individual is valued and will be assisted by others if necessary (Cutrona & Russell, 1987; Sarason et al., 1990). PSS from the primary agents of socialization (namely teachers, family, and peers) seems to contribute to the degree to which basic psychological needs are satisfied (Şimşek & Demir, 2013; Tian et al., 2016) and to include perceived availability of different types of resources (i.e., socioemotional and instrumental) (Cutrona & Russell, 1987; Wills & Shinar, 2000), and it is therefore expected to have an important influence on SRL. In general terms, PSS is thought to moderate the appraisal of situations as threatening and to enhance self-confidence to cope with new challenges. Perception of the availability of social support is also a source of sense of belonging, security and recognition of self-worth (Cohen et al., 2000; Schwarzer & Knoll, 2007).

In accordance with the matching hypothesis, specific provisions of support from social relationships are thought to be particularly effective in the face of certain types of demands or stressors (Wills & Shinar, 2000). In this regard, the taxonomy proposed by Weiss (1974) distinguishes six main types of support provisions: reassurance of worth (recognition of one's competence, skills, and value by others), guidance (advice or information), attachment (emotional closeness), reliable alliance (tangible support), social integration (belonging to a social group), and opportunity for nurturance (being depended on or needed by others). Thus, we can expect that these support provisions will be related in different ways to the various facets of SRL. Provisions of a more socio-emotional nature (e.g., attachment) may be particularly valuable for stimulating self-regulation of academic emotions and motivation, while more instrumental provisions (e.g., guidance) may play a more important role in enhancing cognitive, metacognitive and resource management strategies (Cutrona & Russell, 1987; Wills & Shinar, 2000). Moreover, as proposed by Pierce et al. (1991), different types of relationships could be regarded as more appropriate for specific provisions. For example, friendships would mainly be provided integration, while teachers and parents would be expected to provide guidance (Table 1).

In the present paper, we explore perceived global social support, perceived support from different sources and specific provisions of support (as classified by Weiss, 1974) in relation to SRL. We posed the following research questions: (1) how does perceived social support affect SRL? (2) does the effect of perceived support on SRL vary depending on the type of sources and/or provisions of support? Obtaining an integrated view of the available evidence on the relationship may help to unravel the psychological processes involved and refine interventions used to enhance academic adjustment and achievement. No previous studies have systematically summarized this evidence. The following more specific objectives were formulated:

- To explore how global perceived social support and different sources and provisions of support are related to self-regulated learning.
- To collect evidence about possible mediating and moderating factors of the relationship between perceived social support and self-regulated learning.
- To propose tentative arguments that apply to processes that may explain the relationship between different types of perceived support and self-regulated learning.

2. Methods

2.1. Literature search

The PRISMA (Page et al., 2021) and Cochrane (Higgins et al., 2022) guidelines for elaborating systematic reviews were followed in order to summarize evidence accurately and to provide a reliable basis for decision-making. A literature search was performed using four databases: Web of Science, Scopus, PsycINFO and ERIC. The search was performed between April and May 2018, and it was regularly updated through search alerts created in the databases. The latest update was completed in February 2023. The key search terms used were "Self--regulated learning", "Learning strategies" and "Metacognition". For each of these three terms, the Boolean operator AND was used to combine these with the following six terms: "Social support", "Family support", "Parent* support", "Peer* support", "Friend* support", and "Teacher support". No date restrictions were applied. The reference lists of the studies selected from the databases were also screened manually, to prevent research gaps or bias, and a further 11 eligible documents were identified.

The Covidence systematic review software (Babineau, 2014) was used to identify duplicates and to screen studies. The records were selected according to the inclusion/exclusion criteria listed in Table 2. Two team members independently and blindly screened titles and abstracts of 551 documents and excluded those that did not match the eligibility criteria. The same two team members then examined the full

Table 1
Theoretical correspondence between sources and provisions of support.

Provisions	Sources of support		
	Teachers	Family	Peers
Reassurance of worth	Recognition of one's competence, skills, and value by others		
Guidance	Advice or information		
Attachment		Affect, emotional closeness	
Reliable alliance		Tangible support	
Social integration			Belonging to a social group
Opportunity for nurturance		Being depended on or needed by others	

Note. Provisions of a more socioemotional nature are indicated in bold, adequacy of sources of support for provisions are indicated by shaded cells.

Table 2
Eligibility criteria for screening documents.

Inclusion criteria	Exclusion criteria
1. The relationship between perceived social support and self-regulated learning must be addressed in the document. 2. The sample should consist of students enrolled in K-20 formal education. 3. The articles must be written in English, Spanish, French or Portuguese.	1. Studies involving social support networks or received social support. 2. Participants receiving non-attendance instructional methods, external practices or extra-curricular courses or activities. 3. Gifted or talented participants. 4. Participants with disabilities, mental disorders, or physical illness. 5. Participants, whose chronological age does not correspond to the educational level. 6. Population in non-ordinary circumstances (violence, pregnancy, etc.).

texts of the pre-selected studies and decided whether they were finally eligible for inclusion in the review.

The details of this process are depicted in a flow diagram (Fig. 1).

All disagreements during the pre-selection and selection phases were resolved through discussion, and consensus was reached by all authors of the review. Inter-rater reliability, measured using Cohen's kappa coefficient, was intermediate ($k = 0.43$) at the preselection stage (title and abstract screening) and high ($k = 0.81$) at the selection stage (full text review). The methodological quality of the studies considered for inclusion in the review was examined. The NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies, JBI Checklist for Analytical Cross-Sectional Studies, JBI Checklist for Qualitative Research and the Cochrane template for quality assessment were used for reference purposes, as appropriate. The studies were categorized as low quality (8 %), intermediate quality (15.2 %) or high quality (76.8 %).

2.2. Statistical analysis

A meta-analysis was performed considering the association between PSS and SRL. SRL strategies (i.e., cognitive, metacognitive, motivational and resource management) and PSS sources and provisions were considered globally, as further divisions would have yielded a very small sample of studies. Although the narrative synthesis included 38 studies, only 32 of these were finally included in the meta-analysis. Of the studies excluded, two followed a qualitative methodology (Abdulghani et al., 2014; Jouhari et al., 2015), while the other four did not provide the necessary information (Pearson's correlation) for inclusion in the analysis (Cheung & Pomerantz, 2011; Choe, 2020a; Hafzan et al., 2015; Schauber et al., 2015). On the other hand, one report (Soenens & Vansteenkiste, 2005) included two independent studies, and two correlation coefficients were therefore extracted.

Statistical analysis, funnel plots and forest plots were constructed with the R package METAFOR (Viechtbauer, 2010). The procedures proposed by Hedges and Olkin (1985) were used to analyze the sample of effect size values: Q test for homogeneity, Q_b for categorical moderators and Q_R for continuous moderators.

Pearson's product moment correlation, transformed to Fisher's Z value, was used as the effect size. The degree of heterogeneity (tau^2) was calculated using a restricted maximum-likelihood estimator. The meta-analysis was performed assuming a random-effects model, as this allows for generalization of the results beyond the specific set of studies included and is considered more conservative than fixed effects models in regard to statistical inference (Botella & Gambara, 2006; Quintana, 2015).

As an estimate of the risk of publication bias, deviations from symmetry in the funnel plot were analyzed (Light & Pillemer, 1984), and Egger's regression and Rank correlation tests (Quintana, 2015) were applied. Visual inspection of the funnel plot (Fig. 2) and the tests applied (Egger's test p=.457; Rank's test p=.919) suggest that symmetry can be assumed, and therefore no publication bias was observed.

Sex (47.05 % of males across all samples) and educational level

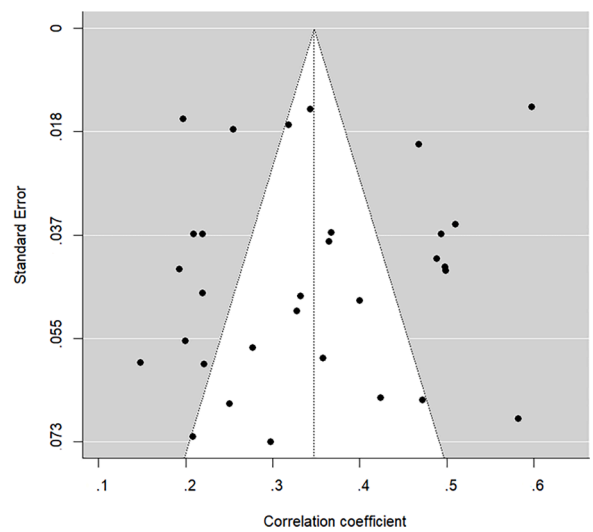

Fig. 2. Funnel plot of the meta-analysis of PSS on SRL.

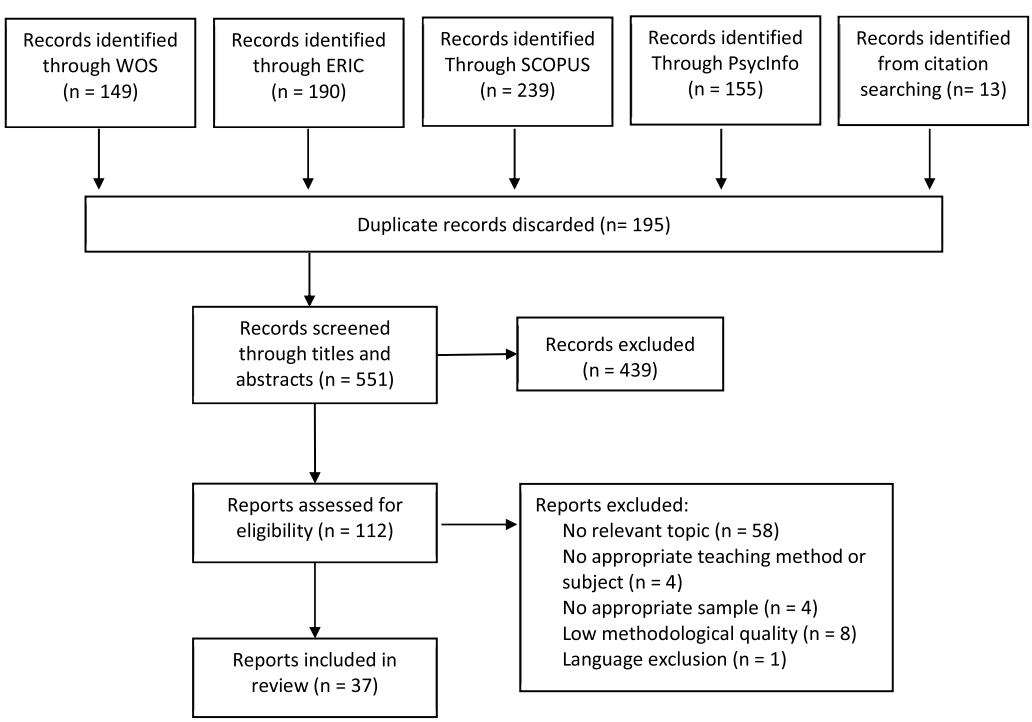

Fig. 1. Flowchart of the literature search process and selection of documents.

(elementary, secondary, and university), as well as different sources (i.e., teachers, family, and peers) and provisions (i.e., reassurance of worth, guidance, attachment, and social integration) of support were considered potential moderators. Owing to the small number of studies reporting attachment and social integration, both provisions were merged into a single category entitled "emotional support".

The complete protocol for this systematic review was registered on PROSPERO (ID number CRD42018115461; http://www.crd.york.ac.uk/prospero/).

3. Results

The main characteristics (authors, year published, country where the study was conducted, sample size, dimensions, and SRL and PSS measures) and the results of the selected studies were extracted and summarized in Table 3.

3.1. Study characteristics

Three of the papers reviewed were published in the 1990s and another four in the 2000s. The remaining 30 reports were published in the last 15 years. This indicates that the relationship between SRL and PSS has been receiving increasing attention from researchers and that the body of empirical research has increased gradually.

The study samples were quite heterogeneous. The sample size, excluding those from qualitative studies, varied between 93 (Hafzan et al., 2015) and 6370 (Choe, 2020) participants (mean=1.179). The educational level of participants ranged from elementary school to university (6 studies included elementary school students, 25 included secondary school students, and 8 included university students), showing that adolescence has attracted most attention, probably because reasoning capacity and decision-making skills develop greatly during this life stage (Keating, 2014), while a high level of disengagement from school is also observed at this stage (Chouinard et al., 2017).

Regarding the origin of the participants, 14 samples were from Europe, 10 from Asia, 14 from USA, 1 from Australia, and 1 from Ghana. One of the transcultural studies identified (Lam et al., 2014) involved 12 countries (see Table 3 for details). This diversity of origins manifests the generalized interest attracted at an international level by the theme of the present review.

The Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991) was the instrument most commonly used to evaluate SRL, specifically in 13 studies. The MSLQ is composed of two sections: one involves cognitive, metacognitive, and resource management strategies, and the other involves motivation. The MSLQ does not assess the self-regulation of motivation, but rather dimensions that account for the motivation itself, such as anxiety and self-efficacy (Wolters, 2003). The second most commonly used measure to assess SRL was the Self-Regulation Questionnaire (SRQ; Ryan & Connell, 1989) (in 7 of the 37 selected reports). This questionnaire focuses on the degree of academic motivational self-regulation and consists of four subscales designed to assess motivational autonomous and controlled types delimited in the context of the self-determination theory (Ryan & Deci, 2000). The remaining instruments used to assess SRL also consisted of self-report questionnaires (see details in Table 3); only 2 studies used different methods to evaluate SRL. Abdulghani et al. (2014) carried out focus group discussions in which students were encouraged to reflect on their learning strategies and activities during learning and exam preparation. In the other study of this type, Jouhari et al. (2015) used semi-structured in-depth interviews, introducing the factors that affect self-regulation of learning as a major question.

Regarding the instruments used to assess PSS, a high degree of heterogeneity was noted. The most frequent assessment strategies in this case were the selection of items from more generic self-report measures and the combination of items from other questionnaires (see Table 3 for details). In general, these instruments are composed of statements about the availability of and satisfaction with social support from significant others. The individual must indicate the extent to which they agree/disagree with the statements. In relation to the sources of social support, 22 studies evaluated perceived support from teachers. Perceived social support from the family was evaluated in 16 studies, and perceived support from peers in 7 studies. As regards specific provisions of support and using Weiss's taxonomy as a framework, 14 studies focused on reassurance of worth, 6 studies assessed attachment, another 5 considered guidance, and 2 studies explored social integration.

3.2. Summary of results

The findings of the studies are presented below. First, the findings referring to the relationship between PSS and SRL were organized considering sources and provisions of support. The results on the moderating and mediating factors of the relationship between PSS and SRL were then summarized.

All of the studies included in this systematic review examined specific sources of support, except that by Schauber et al. (2015), in which global PSS in university students was found to indirectly predict the use of metacognitive strategies, specifically planning and monitoring activities. Social support was related to students' appraisals, namely self-efficacy and perception of the learning environment. In turn, both dimensions predicted a study-related affect which encompassed effort and metacognitive strategies.

Social support from teachers was consistently positively associated with SRL. Thus, global support from teachers has been shown to be a positive predictor of the use of metacognitive and cognitive strategies in secondary and university education (see, e.g., Ginns et al., 2014). The effect of different support provisions provided by the teacher has also been explored; specifically, autonomy support (reassurance of worth in Weiss's taxonomy) has received special attention, showing a predictive effect on metacognitive, cognitive, and help-seeking learning strategies in high school and university students, and on motivational self-regulation in elementary and high school students (see, e.g., Trigueros & Navarro, 2019). Teachers' provision of attachment has been shown to have a predictive effect for metacognitive strategies in elementary and high school students (Patrick et al., 2007; Schuitema et al., 2016) and for help-seeking in middle-school students (Schenke et al., 2015). Guidance has been found to predict metacognitive strategies in elementary school students (Patrick et al., 2007), as well as SRL globally in high school and university students (Karabenick & Sharma, 1994; Yildirim, 2012). Integration has also been shown to be predictive of metacognitive strategies in high-school students and help-seeking among elementary and middle school students (Danielsen et al., 2011; Marchand & Skinner, 2007).

Regarding family support, two qualitative studies with university students were included in the present review (Abdulghani et al., 2014; Jouhari et al., 2015). The perception of the participants regarding factors affecting academic learning was analyzed, and in both studies students referred to family support as an important aid. Global parental support has also been found to predict the use of cognitive strategies in middle school (Rubel, 2008), high school (Jelas et al., 2016), and university students (Roman et al., 2008), as well as the use of metacognitive strategies and learning strategies jointly considered in middle school students (Rubel, 2008). On the other hand, parental support for autonomy has been shown to predict motivational self-regulation in elementary (Grolnick et al., 1991) and high school students (see e.g. Soenens & Vansteenkiste, 2005), as well as cognitive strategies in high school and university students (McEown & Sugita-McEown, 2018; Mih, 2013) and metacognitive strategies in secondary school students (Won & Yu, 2018) and university students (McEown & Sugita-McEown, 2018). Guidance and attachment support from family have also been shown to be predictors of cognitive and resource management strategies in elementary and high school students, as well as of metacognitive strategies in high school students (Bong, 2008; Choe, 2020).

Table 3
Summary of the main characteristics and findings of the studies included in the review.

Author(s) and Publication Year	Sample characteristics	Dimensions and measures of PSS and AAR	Findings
Grolnick et al. (1991)	456 ESS from USA	Perceived support from father and mother (reassurance of worth)[a] Motivational self-regulation (relative autonomy index)[b]	Autonomous motivation was positively correlated with and predicted by perceived support from mother (β=0.17*) and father (β=0.12*).
Stiller and Ryan (1992)	755 HSS (53 % males) from USA	Perceived teacher and parental support (reassurance of worth)[a] Motivational self-regulation (relative autonomy index)[b]	Autonomous motivation was positively correlated with and predicted by perceived teacher support (β=0.09***) and perceived parental support (β=0.77***).
Karabenick and Sharma (1994)	288 US (36 % males) from USA	Perceived teacher support (guidance)[c] Metacognitive (planning, monitoring, and regulating), cognitive (rehearsal, elaboration, and organization) and resource management (time and effort) strategies[d]	Perceived teacher support for classroom questioning was positively correlated with learning strategies.
Ryan and Patrick (2001)	233 MSS (43 % males) from USA	Perceived teacher support[e] Metacognitive (planning, monitoring, and regulating) strategies[d]	Perceived teacher support was positively correlated with and predicted metacognitive strategies (β=0.21**).
Soenens and Vansteenkiste (2005)	Study 1 328 HSS (74 % males) from Belgium	Perceived support from father, mother and teachers (reassurance of worth)[e] Motivational self-regulation (relative autonomy index)[b]	Autonomous motivation was positively correlated with and predicted by support from mother (β=0.24**) and teachers (β=0.35**).
	Study 2 285 HSS (46 % males) from Belgium		Autonomous motivation was positively correlated with and predicted by support from mother (β=0.27**) and teachers (β=0.35**).
Marchand and Skinner (2007)	765 ESS and MSS (51 % males) from USA	Perceived teacher support (social integration)[a] Motivational self-regulation (relative autonomy index)[b] Resource management strategies: help-seeking[a]	Support from teachers was positively correlated with help-seeking and autonomous motivation and predicted help-seeking (β=0.24***). Motivational self-regulation partially mediated the relationship between teacher support and help-seeking.
Patrick et al. (2007)	602 ESS (49 % male) from USA	Perceived teacher and classmate support (attachment and guidance)[e] Metacognitive (planning, monitoring, and regulating) strategies[a]	Metacognitive strategies were positively correlated with and predicted by teacher attachment (β=0.18*) and classmates' guidance (β=0.22*). Motivational beliefs mediated both associations.
Bong (2008)	753 HSS (60 % males) from South Korea	Perceived parental support (attachment)[c] Metacognitive (planning, monitoring, and regulating) and cognitive (rehearsal, elaboration, and organization) strategies[d] Resource management strategies: help-seeking avoidance[c]	Support from parents was positively correlated with learning strategies and indirectly predicted (through achievement goals and self-efficacy) help seeking avoidance.
Roman et al. (2008)	553 US (19–45 years, 40 % males) from Spain	Perceived family support[f] Surface (rehearsal) and deep processing (elaboration and organization) learning strategies[c]	Family support was positively correlated with and predicted deep processing (β=0.10*), but not surface learning. Deep processing strategies mediated the relationship between perceived support and academic achievement.
Rubel (2008)	296 MSS (mean age of 12.7 years, 47 % males) from USA	Perceived support from teachers, parents, and classmates[g] Metacognitive (planning, monitoring, and regulating) and cognitive (rehearsal, elaboration, and organization) strategies[d]	Learning strategies were positively correlated with and predicted by support from parents (β=0.24**) and classmates (β=0.17**).
Cheung and Pomerantz (2011)	825 HSS (52 % males) from China and USA	Perceived parental support (reassurance of worth)[c] Metacognitive (planning, monitoring, and regulating) and cognitive (rehearsal and elaboration) strategies[e]	Support from parents predicted learning strategies globally considered, both in China (β=0.27***) and USA (β=0.22***).
Danielsen et al. (2011)	3125 MSS (1591 aged 13 years, 1534 aged 15 years, 52 % males) from Norway	Perceived support from teachers and classmates (social integration)[c] Metacognitive strategies[a]	Support from teachers predicted metacognitive strategies in 13-year-old boys (β=0.15*), 13-year-old-girls (β=0.22***), 15-year-old boys (β=0.16***), and 15-year-old-girls (β=0.14***). The association was partially mediated by school satisfaction and academic competence. Support from classmates only predicted metacognitive strategies in 13-year-old boys (β=0.25***).
Yildirim (2012)	4855 HSS (57 % males) from Turkey	Perceived teacher support (guidance)[e] Metacognitive (planning, monitoring, and regulating) and cognitive (elaboration) strategies)[a]	Support from teachers was positively correlated with and directly predicted learning strategies globally considered (β=0.14**) and indirectly through motivational beliefs and anxiety.
Mih (2013)	189 HSS (51.3 % males) from Romania	Perceived parental support (reassurance of worth)[e] Motivational self-regulation (relative autonomy index)[h]	Support from parents positively correlated with and directly predicted autonomous motivation

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Table 3 (*continued*)

Author(s) and Publication Year	Sample characteristics	Dimensions and measures of PSS and AAR	Findings
		Surface (rehearsal) and deep (elaboration, organization, critical thinking, and metacognition) processing learning strategies[e]	(β=0.37*) and indirectly predicted deep learning (through autonomous motivation, and effort).
Abdulghani et al. (2014)	19 university high achieving students (52.6 % males) from Saudi Arabia	Students' perceptions of factors contributing to academic achievement: focus groups of discussion on learning strategies and activities during their learning and exam preparation.	Family support was considered to contribute to effective time management.
Ginns et al. (2014)	5198 HSS (11–19 years, 56.5 % males) from Australia	Perceived teacher support[e] Cognitive (memorization and elaboration) strategies[e]	Support from teachers was positively correlated with and predicted memorization (β=0.09*) and elaboration (β=0.30*). Learning strategies mediated the relationship between perceived support and academic achievement.
Lam et al. (2014)	3420 HSS from 12 countries (Austria, Canada, China, Cyprus, Estonia, Greece, Malta, Portugal, Romania, South Korea, United Kingdom, and USA)	Perceived support from teachers, parents, and peers[e] Cognitive (meaningful information processing) strategies[c]	Support from teachers, parents, and peers was correlated with cognitive strategies.
Shim and Finch (2014)	446 MSS (46 % males) from USA	Perceived peer support (guidance and attachment)[a] Resource management strategies: expedient help-seeking, adaptative help-seeking and help-seeking avoidance[c]	Support from peers was positively correlated with adaptative help-seeking and negatively correlated with expedient help-seeking.
Hafzan et al. (2015)	93 US (67.4 % males) from Malaysia	Perceived peer support[f] Surface (work avoidance and rehearsal) and deep processing learning strategies (elaboration and organization)[i] Cognitive (imagery, verbal elaboration, organization strategies, and reasoning skills) strategies[j]	Support from peers was positively correlated with and predicted deep processing (β=0.30**) and cognitive learning strategies (β=0.31**).
Jouhari et al. (2015)	19 university medical students (52.6 % males) from Iran	Factors affecting self-regulated learning: semi-structured in-depth interviews.	Students expressed that family could play a supportive role in self-regulation.
Schauber et al. (2015)	1646 US from Germany	Perceived social support[e] Metacognitive (planning, monitoring, and regulating) and resource management (effort) strategies[d]	Social support indirectly predicted (through self-efficacy, study affect, and effort) metacognitive strategies.
Schenke et al. (2015)	3897 MSS (48 % males) from USA	Perceived teacher support (attachment)[e] Resource management strategies: instrumental and expedient help-seeking[e]	Support from teachers was positively correlated with and predicted help seeking (β=0.36**).
Schuitema et al. (2016)	701 HSS (52 % males) from The Netherlands Evaluated five times for two years	Perceived teacher support (reassurance of worth and attachment)[c] Metacognitive (planning and comprehension monitoring) strategies[d]	Support from teachers was positively correlated with and predicted metacognitive strategies at the five times of measurement (path coefficients ranging from β = 0.05*** to β = 0.06***).
Jelas et al. (2016)	2359 HSS (49.6 % males) from Malaysia	Perceived support from teachers, parents and peers[e] Cognitive strategies[e]	Support from teachers, peers and parents was positively correlated with cognitive strategies. Cognitive strategies were predicted by support from teachers (β=0.23***), peers (β=0.10**), and parents (β=0.32**). Cognitive strategies mediated the relationship between perceived support and academic achievement.
Martinek (2016)	432 ESS and HSS from Austria	Perceived teacher support (reassurance of worth)[e] Motivational self-regulation (intrinsic, identified, and controlled)[b]	Support from teachers was positively correlated with and predicted intrinsic (β=0.27**) and identified (β=0.31**) motivation. Support from teachers mediated the relationship between age and self-regulation of motivation.
Tas (2016)	315 MSS (42 % males) from Turkey	Perceived teacher support[e] Metacognitive (planning, monitoring, and regulating) and cognitive (rehearsal and elaboration) strategies[c]	Support from teachers was positively correlated with and predicted global strategic learning (β=0.13*).
McEown and Sugita-McEown (2018)	212 US from Japan	Perceived support from teachers and parents (reassurance of worth)[e] Metacognitive (planning, monitoring, and regulating) and cognitive (rehearsal, elaboration, and organization) strategies[d] Task intrinsic value	Support from teachers and parents was correlated positively and predicted (through intrinsic value) metacognitive and cognitive strategies.
Perry et al. (2018)	229 HSS (13–19 years, 41 % males) from USA	Perceived teacher support[e k] Metacognitive (planning, monitoring, and regulating) and effort management strategies[d]	Support from teachers was positively correlated with and predicted global strategic learning (β=0.02*).
Ulstad et al. (2018)	461 HSS (14 years) from Norway	Perceived teacher support (reassurance of worth)[e] Motivational self-regulation (autonomous type)[b] Resource management strategies (help-seeking)[d]	Support from teachers directly predicted autonomous motivation (β=0.34*) and indirectly predicted (through autonomous motivation) help-seeking.

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Table 3 (*continued*)

Author(s) and Publication Year	Sample characteristics	Dimensions and measures of PSS and AAR	Findings
Won and Yu (2018)	194 MSS (mean age = 14 years, 52.1 % male) from USA	Perceived parental support (reassurance of worth)[l] Resource management learning strategies (planning and monitoring time)[m]	Parental support was positively correlated with and predicted planning time (β=0.25***) and monitoring time (β=0.19***).
Liu et al. (2019)	832 ESS (53.2 % males) from China	Perceived parental support (reassurance of worth)[e] Emotional self-regulation (cognitive reappraisal and expressive suppression)[l]	Support from parents was positively correlated with and predicted emotional self-regulation (β=0.25***).
Marbell-Pierre et al. (2019)	401 HSS (39 % males) from Ghana	Perceived parents' support (reassurance of worth)[c] Motivational self-regulation (controlled and autonomous types)[b]	Parental support was positively correlated with autonomous motivation, but not with controlled motivation.
Monroy et al. (2019)	327 MSS (mean age = 12.7, 40.6 % males) from USA and 235 (mean age = 12.6, 60.8 % males) from China	Perceived parental support (reassurance of worth)[c] Cognitive (rehearsal and elaboration) and metacognitive (monitoring and planning) learning strategies[d]	Support from parents was positively correlated with and predicted learning strategies globally considered in the USA (β=0.39***) and in China (β=0.49***). Positive emotions partially mediated the association in both cases.
Schweder and Raufelder (2019)	754 HSS (50.6 % males) from Germany	Perceived teacher support[e] Cognitive (elaboration) and metacognitive (monitoring) strategies[e]	Support from teachers positively predicted elaboration (β=0.24**) and monitoring (β=0.32***).
Trigueros and Navarro (2019)	545 HSS (13–19 years, 52.8 % males) from Spain	Perceived teacher support (reassurance of worth)[o] Metacognitive (planning, monitoring, and regulating) and cognitive (rehearsal, elaboration, and organization) strategies[d] Motivational self-regulation (relative autonomy index)[p]	Support from teachers was positively correlated with and indirectly predicted learning strategies (through satisfaction of needs and autonomous motivation) and autonomous motivation (through satisfaction of needs).
Choe (2020)	6370 ESS (41.1 % males) from South Korea	Perceived parental support (guidance and attachment)[e] Cognitive[e] and resource management[d] strategies	Learning strategies were predicted by parental guidance (β=0.35***) and attachment (β=0.22***).
Sava et al. (2020)	236 US (19–53 years, 24.6 % males) from Romania	Perceived teacher support[e] Metacognitive (planning, monitoring, and regulating) and cognitive (rehearsal, elaboration, and organization) strategies[d]	Support from teachers was positively correlated with and predicted learning strategies (β=0.39**).

Note. Dimensions of PSS and AAR are specified in brackets.
ESS= elementary school students; HSS= high school students; MSS= middle school students; SS= Secondary students; US= university students; [a]Self-reported measure with items ad hoc, [b]Self-Regulation Scale (SRQ; Ryan & Connell, 1989), [c]Self-reported measure with items gathered from other questionnaires, [d]Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991; Pintrich & DeGroot, 1990), [e]Items from a validated more generic self-report measure with good psychometric properties, [f]Multidimensional Social Perceived Support Scale (MSPSS; Zimmet et al., 1988), [g]Child and Adolescent Social Support Scale (CASSS; Malecki & Demaray, 2002), [h]Academic Motivation Scale (AMS; Vallerand et al., 1992), [i]Study Process Questionnaire (R-SPQ-2F; Biggs et al., 2001), [j]Learning and Study Strategies Inventory (LASSI; Weinstein & Palmer, 2002), [k]Teacher Support Scale (TSS; Metheny et al., 2008), [l]Perceived Parental Autonomy Support Scale (P-PASS; Mageau et al., 2015), [m]Academic Time Management Scale (Won & Yu, 2018), [n]Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), [o]Perceived Autonomy Support Scale for Exercise Settings (Hagger et al., 2007), [p]Perceived Locus of Causality Revised (PLOC-R; Vlachopoulos et al., 2011), [q]Online Self-regulated Learning Questionnaire (OSLQ; Lan et al., 2004; Barnard et al., 2008).

The research collected for this review regarding global support from peers indicates a positive effect of this dimension on cognitive strategies in middle school, high school, and university students (see e.g. Hafzan et al., 2015) and on metacognitive strategies in middle school and university students (Rubel, 2008). Guidance and emotional support (attachment in Weiss's taxonomy) from peers have also been associated with metacognitive strategies in elementary school students (Patrick et al., 2007), while integration has been associated with metacognitive strategies in middle school students (Danielsen et al., 2011).

A forest plot of effect sizes for the correlations between the total score for social support and students' SRL was constructed (Fig. 3). The data correspond to 31 effects and 34,216 participants. The combined effect size was $r = 0.33$, CI 95 % [.29, 0.37] confirming the existence of a moderate positive correlation between social support and SRL.

Finally, some of the studies included in the present review explored possible mediating effects in the relationship between PSS from teachers and parents and learning strategies. In particular, several motivational dimensions (i.e., achievement goals, self-efficacy, school satisfaction, task value, and academic emotions) have been found to have a significant mediational role (Bong, 2008; Danielsen et al., 2011; McEown & Sugita-McEown, 2018; Monroy et al., 2019; Patrick et al., 2007; Schauber et al., 2015; Yildirim, 2012). Likewise, a mediational effect has also been found for autonomous motivational self-regulation (Marchand & Skinner, 2007; Mih, 2013; Trigueros & Navarro, 2019; Ulstad et al., 2018). However, none of the potential moderators were statistically significant in the meta-analysis (Table 4).

4. Discussion

The aim of this systematic review and meta-analysis was to explore the available evidence and theoretical contributions regarding the relationship between PSS and SRL. Studies that adopted a global approach to these dimensions and also studies with a more specific focus were considered. Thus, we collected findings regarding different learning strategies and various support provisions (namely reassurance of worth, guidance, integration, and attachment) and also three social sources of support (i.e., teachers, family, and peers) (Cutrona & Russell, 1987; Wills & Shinar, 2000).

One of the reviewed studies (Schauber et al., 2015) examined global PSS, reporting that this variable positively predicted the use of learning strategies in university students. The findings summarized in the present review regarding the overall PSS from the primary agents of socialization (teachers, family, and peers) also show consistent positive effect of support on SRL (see, e.g., Rubel, 2008).

Indeed, the results of the meta-analysis show a consistent positive moderate relationship between social support and SRL. The lack of significance of the moderation analysis considering the total score of support suggests that all provisions and sources examined have a similar

overall weight in the manifestation of SRL. Moreover, in the metanalysis, neither sex nor educational level were found to moderate this relationship. This is consistent with the results reported in the studies reviewed. Although the possible confounding influences of sex and age were statistically controlled, 3 of the studies explored sex differences in the relationship between perceived social support and self-regulated learning and did not find any moderation effect (see e.g., Danielsen et al., 2011; Rubel, 2008). Nevertheless, this effect should be analysed further, since it can occur under some circumstances, as suggested by the findings of Yu and Zhou (2022) in a study involving university students who took courses online during the COVID-19 pandemic. The association between perceived support and online self-regulated learning was significantly stronger for male participants than for their female classmates. Future studies should also further explore the moderating effect of specific sources and provisions of support.

As assumed in the SSMMD and demonstrated by Schauber et al. (2015), the relationship between PSS and SRL was mediated by motivational dimensions (i.e., students' appraisals of self and the academic tasks) and motivational self-regulation (see, e.g., Ulstad et al., 2018) that are thought to denote the degree of satisfaction of basic psychological needs. As also suggested by the study results, the relationship between support and SRL may be at least partly explained by self-regulation of effort, which is consistent with the widely ascertained role of PSS on the academic adjustment (Martínez-López et al., 2019; Rodríguez et al., 2017) and achievement (Tinajero et al., 2020). In fact, some of the studies selected for the present review showed a mediating effect of SRL in the relationships between social support and academic engagement (Ginns et al., 2014) and achievement (Jelas et al., 2016; Roman et al., 2008). Taken together, the available data suggest that social support enhances self-regulated learning through academic motivation and its self-regulation, which would, in turn, favor academic effort and achievement.

Nonetheless, analysis at a finer level is required prior to disentangling the possible mechanisms underlying the relationship between support and SRL. The theoretical background of social support and the data collected in the present review regarding different provisions of support could serve as the basis for new suggestions. In fact, we can establish a similarity between some of the provisions (reassurance of worth, guidance, attachment and social integration), in the taxonomy of Weiss (1974) and the contextual variables considered in the SSMMD. The similarity, along with the interconnections between provisions of support and the different facets of AAR are illustrated in Fig. 4, which is based on a graphic representation of the SSMMD model (Marchand & Skinner, 2007). We did not find any studies on the possible relationships between SRL and either provision of reliable alliance or opportunity for nurturance. In our opinion, such relationships would not be expected from a theoretical point of view, at least on the basis of the SSMMD model.

According to the findings of this review, the most frequently investigated provision of support in relation to SRL is autonomy support. In the context of the SSMMD, autonomy support is defined as the provision of choice, relevance, and respect (Skinner et al., 2008), and it is thus clearly related to Weiss's notion of the reassurance of worth provision. Providing support for learners' autonomy entails valuing their interests and perspectives and recognizing them as volitional subjects, and it is assumed to be the primary basis for satisfying the need for autonomy (Connell & Wellborn, 1991) and promoting self-regulation. In fact, in the present review, autonomy support from teachers and family was shown to be related to SRL (see, e.g., Ginns et al., 2014; Rubel, 2008).

To our knowledge, no research has yet aimed to disentangle the mechanisms underlying the relationship between autonomy support and SRL. However, the conceptualization of self-determination as a motivational resource has been tentatively suggested as a possible explanation for the relationship (Soenens & Vansteenkiste, 2005). Autonomy support would increase feelings of agency, which in turn would enhance the autonomous motivation of students, a key component of the affective dimension of SRL (Hu & Zhang, 2017). Thus, when students become confident, their motivation to self-regulate seems to develop (Sierens et al., 2009). Considering diverse theoretical contributions (see, e.g., Boekaerts & Corno, 2005; Miele & Scholer, 2018), motivational beliefs also appear to be the processes underlying other forms of SRL, such as the use of cognitive and metacognitive and resource management.

The provision of autonomy support from teachers and family has attracted particular interest. Teachers are the adults most directly involved in the academic domain and personify its goals and demands; thus, when teachers promote learning environments in which students are encouraged to make choices and follow their interests, SRL is expected to increase (Stiller & Ryan, 1992). Indeed, the findings of the research reviewed show a consistent relationship between teachers' autonomy support and the use of different learning strategies (metacognitive, cognitive, resource management, and volitional control strategies). Moreover, the relationship has been reported to be bidirectional (Marchand & Skinner, 2007; Schuitema et al., 2016), indicating that SRL in students affects provisions of autonomy support, through feedback loops. As suggested by Marchand and Skinner (2007), the behavioral engagement manifested by students may elicit more involvement by teachers. By contrast, lack of (or at least concealment of) self-regulation may exert an impact on support by feeding behavioral and emotional disaffection and leading teachers to generally withdraw their support over time. Parental autonomy support, on the other hand, probably has a more distal influence on SRL in students. Indeed, parents are assumed to exert an influence by tailoring a suitable environment in which their children can feel responsible for their own actions, fostering autonomous self-regulation in general (Grolnick et al., 1999).

Guidance is another support provision that has attracted researchers' attention. Defined by Weiss (1974) as the supply of advice or information, it has been conceptualized within the framework of the SSMMD as a structured environment, in which means of achieving desired outcomes are clarified (Skinner & Belmont, 1993). This provision is expected to fulfill students' needs for competence through the improvement of metacognitive knowledge regarding learning strategies and oneself as learner (Connell & Wellborn, 1991; Marchand & Skinner, 2007), thus enhancing positive self-assessments and perceptions regarding the capacity of students to perform successfully (Schunk & Ertmer, 2000). Along this line, the findings of a study by Patrick et al. (2007) with elementary school students showed that perceived guidance support from teachers was found to predict metacognitive strategies through academic efficacy and mastery goals. Further investigation is needed to clarify processes mediating the relationship between guidance support and SRL.

The prominent role of teachers in guidance support has been considered, as they are expected to explicitly instruct, scaffold and act as models from which students can learn how to better regulate academic tasks (Ginns et al., 2014; Liu et al., 2019). The findings of the reviewed studies are consistent with a positive effect of guidance from teachers on SRL in elementary, high-school, and university students (Karabenick & Sharma, 1994; Patrick et al., 2007; Yildirim, 2012). On the other hand, at least two studies reported a positive correlation between guidance from peers and learning strategies (Patrick et al., 2007; Shim & Finch, 2014). As indicated by Patrick et al. (2007), classmates frequently interact in academic tasks (Jelas et al., 2016) and may therefore act as models providing suitable options for self-regulating and enhancing focus on mastery and feelings of efficacy. Teachers can also promote these interactions by creating collaborative/cooperative learning environments and favoring peer mentoring. Only one recent study regarding the provision of guidance by family has been identified in the present review, even though parental modeling, reinforcement and instruction about student homework is consistently recognized (Hoover-Dempsey et al., 2001; Walker et al., 2004). In accordance with this assumption, Choe (2020) reported a positive effect of parental guidance on cognitive and resource management strategies used by elementary students.

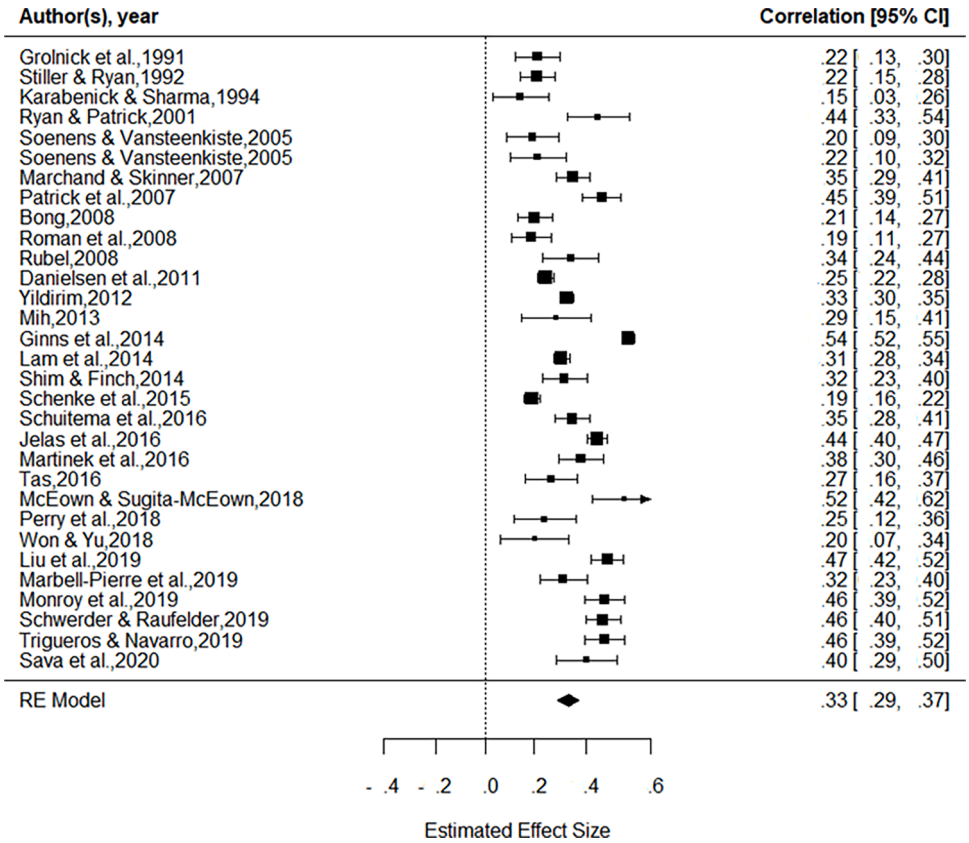

Fig. 3. Forest plot of the meta-analysis performed on the relationship between PSS and SRL.

Table 4
Random effects model and effects of moderating variables.

Heterogeneity	Tau^2	.015 (se=0.004)	
	I^2	93.77 % (95 % CI [89.78 %−93.77 %])	
	Q (df=30)	635.785***	
Summary effect size	.347 (se=0.023)***		
Pearson's correlation	.33		
Quantitative moderator			
Moderating variable		k	$Q_M(1)$
Sex		27	0.032 (p=.858)
Categorical moderators			
Moderating variable		k	Q_B
Educational level	Elementary	4	0.010 (p=.921)
	Secondary	23	
	University	4	
Source	Teachers	13	0.595 (p=.440)
	Family	6	
	Peers	1	
	Various	9	
Provision	Reassurance of worth	12	0.076 (p=.782)
	Guidance	4	
	Emotional	5	

*p> .1 **p> .05 ***p>.01.

Finally, offering warmth is expected to fulfill students' needs for relatedness by fostering feelings of emotional security and closeness (Connell & Wellborn, 1991). In the context of the SSMMD, it is defined as a degree of interest and emotional connectedness, thus covering provisions of attachment and social integration of Weiss's (1974) taxonomy. The present review has revealed a consistent and positive association between provision attachment from teachers, family, and peers and learning strategies in elementary and secondary school students. This relationship has been interpreted in terms of perceptions generated in close relationships, of being accepted and cared for; this feeling would lessen school concerns and increase self-esteem (Patrick et al., 2007). Social integration, on the other hand, is thought to manifest in the perception of psychosocial inclusion and belonging, which is assumed to favor internalization of educational goals and values (Danielsen et al., 2011; Perry et al., 2018). At the same time, as suggested by the findings of Schuitema et al. (2016), self-regulated learners might prompt a higher level of emotional support.

4.1. Research implications, limitations, and future directions

In summary, the present review highlights the existence of a consistent positive relationship between PSS and SRL. Moreover, it enabled interpretation of the relative relevance of different sources of support (teachers, family, and peers), as well as of different types of provisions (reassurance of worth, guidance, attachment, and social integration). Current findings suggest that perceived social support may serve as a marker of vulnerability/protection regarding the academic difficulties faced by students and may lay the foundations for outlining guidelines and intervention programs aimed at favoring adjustment of adolescents in the educational system. Based on the study findings, the

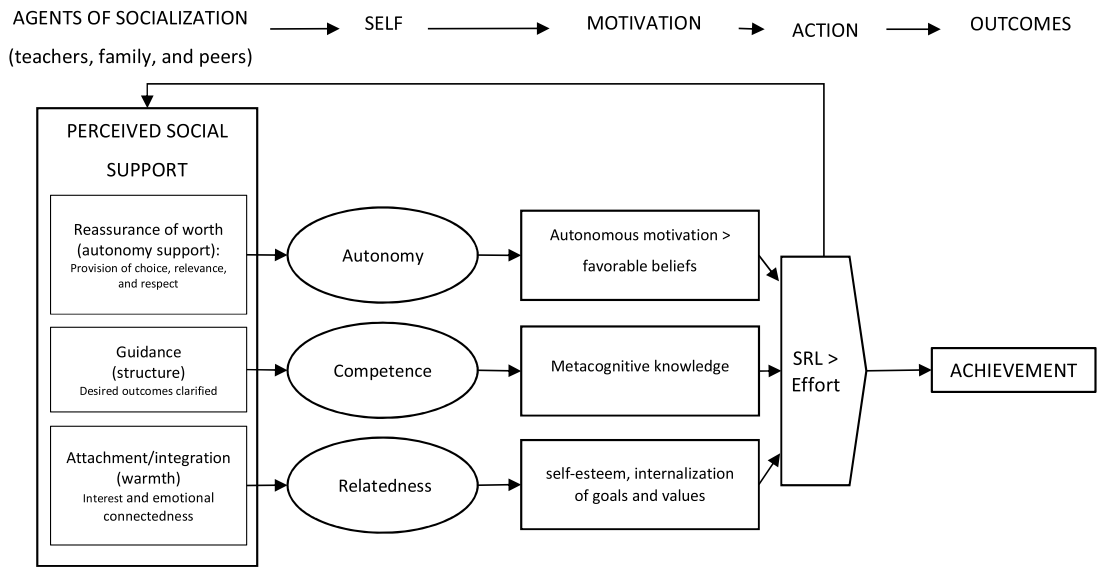

Fig. 4. Theoretical model based on data obtained in the systematic review.

inclusion of social support as a dimension of programs aimed at training learning skills is expected to enhance the effectiveness of such programs. Improvement of perceived social support and self-regulation skills is contemplated a priori as an adequate strategy favoring academic progress.

Some limitations of the studies conducted to date should be noted. First, most of the studies involved cross-sectional designs, which do not enable causal relationships or the direction of these to be established. Aspects regarding measurement should also be considered, as self-report measures are predominant; although reliable, this type of instrument may be subject to response bias. Finally, provisions of reliable alliance and opportunity for nurturance and declarative metacognition were identified as major investigation gaps in the present review and remain to be explored. Future studies should further explore the role of moderating and mediating factors in the relationships between PSP and AAR, considering specific sources and provisions of support. Tentative interpretations suggested throughout the Discussion should also be explored in future investigations.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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