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Research Paper

Self-regulated learning strategies and achievement goals among physical education preservice teachers: Role of performance-avoidance and mastery-avoidance goal orientations

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Abstract
This study investigates the relationships between achievement goal orientations and self-regulated learning (SRL) strategies among physical education (PE) preservice teachers. Indeed, this research employs a mixed-methods approach to examine how different goal orientations influence the cognitive, metacognitive, and motivational aspects of SRL based on the 2×2 achievement goal framework and social cognitive model of SRL. Respondents were recruited from 245 PE preservice teachers from three education institutions. Quantitative findings from structural equation modeling reveal that performance-avoidance (PAv) goals significantly and positively predict general cognitive SRL strategies, while mastery-avoidance (MAv) goals show no statistically significant relationship with any SRL strategy dimensions. Qualitative insights from semi-structured interviews further illuminate the nuanced ways in which avoidance-oriented goals manifest in the learning experiences of future PE teachers. The study contributes to the theoretical understanding of achievement motivation in education contexts and offers practical implications for designing SRL interventions in PE teacher preparation programs. Results suggest that teachers should recognise the potential adaptive aspects of PAv goals while addressing the limitations associated with MAv orientations to foster more effective SRL among PE preservice teachers.

Keywords: *Achievement goals; mastery-avoidance; performance-avoidance; physical education preservice teachers; self-regulated learning*

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I. Introduction

The preparation of competent PE teachers represents a critical component of educational systems worldwide because these professionals play a pivotal role in promoting physical literacy, healthy lifestyles, and positive movement experiences among students (Wang et al., 2026). SRL was conceptualised as an active, constructive process wherein learners set goals and attempt to monitor, regulate, and control their cognition, motivation, and behavior guided by their goals and contextual features (Pintrich, 2000b), encompasses both the skills (e.g., specific strategies like critical thinking and metacognition) and the will (e.g., motivation to use strategies) necessary for effective learning. Within the context of teacher education, the development of SRL capabilities has emerged as a fundamental aspect of professional preparation, enabling preservice teachers to become autonomous learners who can effectively manage their own learning processes while simultaneously preparing to facilitate similar skills in their future students.

In physical education teacher education (PETE) programs, the cultivation of SRL strategies becomes particularly significant given the complex, multifaceted nature of teaching PE, which requires the integration of theoretical knowledge, pedagogical skills, and practical application in diverse educational settings.

Achievement goal theory (AGT) provides a robust theoretical framework for understanding the motivational orientations that influence learning behaviors and outcomes. The 2×2 achievement goal framework (Elliot & McGregor, 2001) distinguishes between four distinct goal orientations based on the dimensions of

definition (i.e., mastery vs. performance) and valence (i.e., approach vs. avoidance). Mastery-approach (MAp) goals focus on developing competence and mastering tasks, while mastery-avoidance (MAv) goals involve avoiding the loss of competence or failing to master material. Performance-approach (PAp) goals center on demonstrating competence relative to others, and performance-avoidance (PAv) goals concern avoiding demonstrating incompetence relative to others. This comprehensive framework has been widely applied in educational contexts to examine how different goal orientations relate to various learning outcomes, including SRL strategy use.

The intersection of AGT and SRL in the PE preservice teacher education presents a compelling area of investigation, particularly given the unique characteristics of PE as a subject area that combines cognitive, affective, and psychomotor domains. PE teachers must not only possess content knowledge about movement, games, and sports but also develop pedagogical expertise in facilitating motor skill acquisition, promoting physical activity, and fostering positive attitudes toward lifelong physical engagement. These complex demands necessitate sophisticated self-regulatory capabilities that enable preservice teachers to navigate the challenges of teacher preparation while developing the professional competencies required for effective PE instruction.

Despite the established importance of both achievement goals and SRL in educational contexts, significant gaps remain in our understanding of their interrelationships specifically within PE teacher education. Previous research has yielded inconsistent findings regarding the relationships between achievement goals and SRL strategies, particularly for certain goal types. While MAp consistently promote deep learning strategies like elaboration and critical thinking, findings for performance-approach goals have been mixed, with some studies showing positive predictions of deep learning strategies and others showing no significant relationships. PAp has been found to negatively predict deep learning strategies in some studies but positively predict rehearsal strategies in others. MAv have received comparatively less research attention, with limited studies suggesting associations with less frequent use of SRL strategies.

Therefore, the primary research objectives of this study are threefold. First, the study aims to examine the distribution and characteristics of achievement goal orientations, particularly PAv and MAv goals, among PE preservice teachers. Second, it seeks to investigate the relationships between these goal orientations and various dimensions of SRL strategy use. Third, the study aims to test specific hypotheses regarding the predictive relationships between PAv and MAv goals and SRL strategy use, with particular attention to the hypothesised positive prediction of PAv goals and the non-predictive or negative prediction of MAv goals. By addressing these objectives, the study contributes to both theoretical understanding and practical applications in PE teacher education, offering insights that can inform the design of more effective teacher preparation programs that foster adaptive motivational orientations and self-regulatory capabilities among future PE teachers.

II. Literature review

2.1 Theoretical foundations

SRL has evolved as a central construct in educational psychology, with its theoretical roots extending back to the social cognitive theories of Bandura (1986) and the information processing models of the 1970s and 1980s. Zimmerman's (2000) social cognitive model of SRL represents one of the most influential frameworks, conceptualising SRL as a cyclical process involving three phases: forethought (i.e., including task analysis and goal setting), performance control (i.e., encompassing self-control and self-observation), and self-reflection (i.e., involving self-judgment and self-reaction). This cyclical model emphasises the dynamic, recursive nature of self-regulation, wherein learners actively monitor and adjust their learning processes based on ongoing feedback and self-evaluation. Pintrich's (2000b) framework further elaborates on the multidimensional nature of SRL, distinguishing between four areas of regulation: cognition, motivation, behaviour, and context. Within this framework, cognitive strategies include rehearsal, elaboration, organization, and critical thinking, while metacognitive strategies involve planning, monitoring, and regulating one's learning processes.

The application of SRL theory to education contexts has gained increasing attention in recent years, recognising that teachers themselves must be effective self-regulated learners to navigate the complexities of professional practice and continuous professional development. Randi (2004) argued that teachers' ability to self-regulate their own learning directly influences their capacity to teach self-regulation strategies to their students, creating a reciprocal relationship between teacher learning and student learning. In PE education, the development of SRL capabilities takes on added significance given the practical, performance-based nature of the subject. PE teachers must not only understand theoretical concepts but also demonstrate physical skills, adapt instruction to diverse student needs, and manage dynamic learning environments, all of which require sophisticated self-regulatory skills.

Research on SRL among preservice teachers has revealed important patterns and challenges. Vilppu et al. (2023) identified three distinct learning profiles among first-year preservice teachers: unregulated students with low self-efficacy, average strategists with low self-efficacy, and self-regulated and deep learners with high self-efficacy. Their findings highlight the variability in SRL capabilities among teacher candidates and underscore the importance of early assessment and intervention. Similarly, Michalsky (2020) examined the development of professional vision for SRL among preservice teachers, showing that different scaffolding levels influenced their ability to teach SRL to students. All of these studies collectively suggest that SRL is not uniformly developed among preservice teachers and that targeted interventions may be necessary to foster these critical capabilities.

AGT has undergone significant evolution since its initial formulation, progressing from a dichotomous model distinguishing between mastery and performance goals to the contemporary 2×2 framework that incorporates both definition and valence dimensions. Elliot and McGregor's (2001) 2×2 achievement goal framework represents a comprehensive model that captures the complexity of achievement motivation in educational settings. This framework distinguishes between four distinct goal orientations: mastery-approach (i.e., focusing on developing competence), mastery-avoidance (i.e., concerned with avoiding the loss of competence), performance-approach (i.e., aiming to demonstrate competence relative to others), and performance-avoidance (i.e., seeking to avoid demonstrating incompetence relative to others). Each of these goal orientations has been associated with distinct patterns of cognitive, affective, and behavioural outcomes in learning contexts.

Research on achievement goals in PE contexts has yielded important insights into their relationships with various learning outcomes. Olsen and Mehus (2022) examined the relationship between differential achievement goals and SRL among PE students, showing that mastery goals had a positive association with self-regulation, while performance avoidance goals showed a negative association. Their study, conducted with 571 PE students in Norway, revealed that achievement goals have significant consequences for students' self-regulation in PE settings. Similarly, Boon and Yurdabakan (2023) investigated achievement goal orientations and SRL levels among preservice teachers, showing gender differences in achievement orientations and significant relationships between goal orientations and SRL skills.

The relationships between achievement goals and SRL strategies have been examined across various educational contexts, with somewhat inconsistent findings. Mastery-approach goals consistently demonstrate positive associations with deep learning strategies such as elaboration and critical thinking, as well as with metacognitive regulation strategies. Performance-approach goals show more variable relationships, with some studies indicating positive associations with SRL strategies and others showing no significant relationships or even negative associations under certain conditions. Performance-avoidance goals have generally been associated with maladaptive learning patterns, including surface-level processing and reduced persistence, though some studies have found more complex relationships depending on contextual factors and the specific SRL strategies examined. Mastery-avoidance goals remain the least studied of the four goal orientations, with limited research suggesting they may be associated with less frequent use of SRL strategies or with specific patterns of strategy use that differ from those associated with mastery-approach goals.

2.2 The correlations between PAv, MAv goals and SRL strategies

Avoidance-oriented goals may motivate increased strategy use as a means of preventing negative outcomes. In the context of teacher education, where performance expectations and evaluation are prominent features, preservice teachers with strong PAv orientations may employ various learning strategies to avoid demonstrating incompetence or receiving negative evaluations. Meanwhile, some empirical evidence suggests that PAv goals may be associated with increased use of certain SRL strategies, particularly those related to effort regulation and help-seeking. For example, students with high PAv goals may be more likely to seek assistance or employ rehearsal strategies to avoid poor performance, even if they are less likely to engage in deep processing strategies. Based on the theoretical frameworks and empirical literature reviewed, this study proposes that performance-avoidance goals will positively predict SRL strategy use, particularly general cognitive strategies.

H1: PAv positively influences SRL strategy use.

Mastery-avoidance goals involve concerns about not mastering material or losing competence, which may create anxiety and perfectionistic tendencies that interfere with effective self-regulation. Rather than motivating adaptive strategy use, MAv goals may lead to maladaptive patterns such as excessive self-monitoring, avoidance of challenging tasks, or disengagement from learning activities. Empirical research on MAv goals has been limited, but existing studies suggest they may be associated with less frequent use of deep processing

strategies and with emotional outcomes such as anxiety and fear of failure. In the context of PE preservice teacher education, where mastery of both theoretical knowledge and practical skills is essential, MAv goals may be particularly detrimental to the development of effective self-regulatory capabilities. Therefore, the second hypothesis is based on theoretical considerations regarding the nature of MAv goals and their potential consequences for learning behaviors, which propose that mastery-avoidance goals will not predict or will negatively predict SRL strategy use.

H2a: MAv does not influence SRL strategy use.
H2b: MAv negatively influences SRL strategy use.

This study proposes specific hypotheses regarding the relationships between PAv, MAv, and SRL strategies among PE preservice teachers. These hypothesised relationships are visually represented in the **Figure 1**, which illustrates the differential predictive patterns expected for PAv and MAv goals on various dimensions of SRL strategy use.

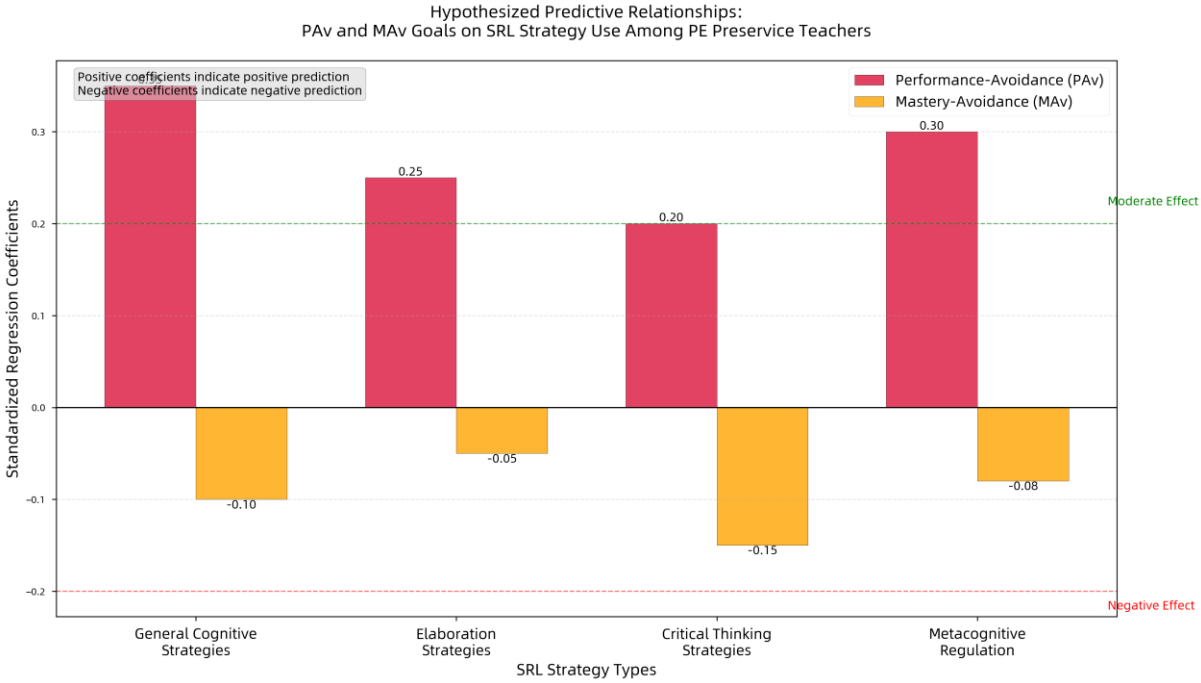

Figure 1. Hypothesised predictive relationships between PAv and MAv goals on SRL strategy use among PE preservice teachers

III. Methodology

3.1 Research design

This study employed a sequential explanatory mixed-methods design, combining quantitative and qualitative approaches to provide a comprehensive understanding of the relationships between achievement goal orientations and SRL strategies among PE preservice teachers. The quantitative phase involved the administration of standardised questionnaires to a large sample of preservice teachers, allowing for the examination of general patterns and statistical relationships between variables. The qualitative phase followed, consisting of semi-structured interviews with a subset of participants selected based on their questionnaire responses, to provide deeper insights into the meanings, experiences, and contextual factors underlying the quantitative findings.

This mixed-methods approach was selected based on its ability to address both the what and why questions of the research, providing both breadth and depth of understanding while allowing for methodological triangulation to enhance the validity and reliability of the findings. The research was conducted over a 12-month period, with data collection occurring in three waves to accommodate the academic schedules of participating institutions and to allow for follow-up with participants as needed.

3.2 Sampling

The study involved 245 PE preservice teachers recruited from three teacher education institutions representing different geographical regions and institutional types. The sample included 132 female participants (53.9%) and 113 male participants (46.1%), with ages ranging from 19 to 28 years (M = 22.4, SD = 2.1). Participants were enrolled in various years of their teacher education programs, including 68 first-year students (27.8%), 72 second-year students (29.4%), 58 third-year students (23.7%), and 47 fourth-year students (19.2%). This distribution across program years allowed for the examination of potential developmental differences in achievement goal orientations and SRL strategy use as preservice teachers progress through their professional preparation.

Sampling employed a stratified random approach, with participants selected from each institution and program year to ensure representativeness of the broader population of PE preservice teachers. Inclusion criteria required respondents to be currently enrolled in a PE teacher education program, to have completed at least one semester of coursework, and to be actively engaged in field experiences or practicum components. Exclusion criteria included individuals who were not native speakers of the language in which questionnaires were administered, those with significant cognitive or learning disabilities that might affect their ability to complete the measures accurately, and those who had previously participated in pilot testing of the instruments. The final sample size was determined through power analysis, which indicated that 245 participants would provide adequate statistical power (0.80) to detect medium effect sizes ($f^2 = 0.15$) in multiple regression analyses with alpha set at 0.05.

For the qualitative phase, 30 participants were purposively selected from the larger quantitative sample based on their achievement goal profile characteristics. Selection criteria aimed to capture maximum variation in goal orientations, with particular attention to participants demonstrating high levels of PAv or MAv goals, as well as those showing contrasting patterns of goal orientations. This purposive sampling strategy allowed for in-depth exploration of the experiences and perspectives of preservice teachers with different motivational profiles, providing rich qualitative data to complement and contextualize the quantitative findings. The qualitative subsample included 16 female and 14 male participants, with representation from all program years and participating institutions.

3.3 Measures

Quantitative data were collected using three standardised instruments with established psychometric properties. The achievement goal questionnaire (AGQ) was developed by Elliot and McGregor (2001) has been employed to measure the four achievement goal orientations. This 12-item instrument uses a 7-point Likert scale (1 = Not at all true of me to 7 = Very true of me) with three items assessing each of the four goal orientations: mastery-approach (e.g., I want to learn as much as possible from this class), mastery-avoidance (e.g., I worry that I may not learn all that I possibly could in this class), performance-approach (e.g., It is important for me to do better than other students), and performance-avoidance (e.g., My goal is to avoid performing poorly compared to others). The AGQ has demonstrated good reliability and validity across multiple studies, with internal consistency coefficients typically ranging from 0.80 to 0.90 for the subscales.

SRL strategies were assessed using the cognitive and metacognitive learning strategies sales (CMLSS), an adaptation of the motivated strategies for learning questionnaire (MSLQ) specifically validated for use with preservice teachers. The CMLSS consists of 32 items measuring five dimensions of SRL strategy use: rehearsal strategies (e.g., I practice saying the material to myself over and over), elaboration strategies (e.g., I try to relate ideas in this subject to those in other courses), organization strategies (e.g., I make simple charts, diagrams, or tables to help me organize course material), critical thinking strategies (e.g., I often find myself questioning things I hear or read in this course), and metacognitive self-regulation strategies (e.g., If course materials are difficult to understand, I change the way I study the material). Items are rated on a 7-point Likert scale (1 = Not at all true of me to 7 = Very true of me), with higher scores indicating more frequent use of SRL strategies. Previous validation studies have reported good internal consistency for the CMLSS subscales, with Cronbach's alpha coefficients ranging from 0.78 to 0.89.

A demographic questionnaire was also administered to collect information about participants' background characteristics, including age, gender, year in program, previous teaching or coaching experience, academic performance, and hours spent studying per week. This information was used for descriptive purposes and to examine potential relationships between demographic variables and the primary study variables.

In addition, qualitative data were collected through semi-structured interviews conducted individually with each of the 30 selected participants. The interview protocol was developed based on the theoretical frameworks guiding the study and preliminary analysis of the quantitative data. Interviews explored participants' experiences with SRL in their teacher education program, their understanding of achievement goals and how these manifests in their learning behaviors, contextual factors influencing their motivation and strategy use, and their perceptions of the relationships between their goal orientations and learning approaches. Interviews lasted approximately 45-60 minutes each and were audio-recorded with participants' permission for later transcription and analysis.

3.4 Data collection

Quantitative data collection occurred during regularly scheduled class sessions at each participating institution, with researchers present to provide instructions, answer questions, and ensure proper completion of questionnaires. Respondents were informed that their responses would remain confidential and that individual results would not be shared with instructors or affect their academic standing. Completion of the questionnaires required approximately 15-20 minutes, and respondents were offered the option to complete them online through a secure survey platform if they preferred or if scheduling conflicts prevented in-person participation. Online completion followed the same procedures and instructions as in-person administration, with additional measures implemented to verify participant identity and prevent duplicate responses.

Qualitative interviews were conducted approximately two weeks after completion of the quantitative phase, allowing time for preliminary analysis of questionnaire data to inform interview protocol adjustments and participant selection. Interviews took place in private rooms on campus or via secure video conferencing platforms, based on participant preference and availability. Prior to each interview, participants reviewed and signed informed consent forms specifically for the qualitative phase, which included permission for audio recording and use of anonymized quotations in research publications. Interviewers followed a semi-structured protocol while allowing flexibility to explore emerging themes and follow participants' narratives. Field notes were taken during and immediately after each interview to capture contextual observations and initial impressions.

3.5 Data analysis

Quantitative data analysis proceeded in several stages, beginning with data screening and cleaning to identify missing values, outliers, and violations of statistical assumptions. Missing data were handled using multiple imputation procedures when the proportion was minimal (less than 5%), while cases with extensive missing data were excluded from analysis. Descriptive statistics were calculated for all variables, including means, standard deviations, skewness, and kurtosis, to examine distributions and identify potential issues with normality. Reliability analyses were conducted for all multi-item scales using Cronbach's alpha coefficients to assess internal consistency.

Exploratory factor analysis (EFA) was employed to examine the factor structure of the achievement goal and SRL strategy measures, followed by confirmatory factor analysis (CFA) to test the hypothesised measurement models. Model fit was evaluated using multiple indices, including chi-square statistics, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardised root mean square residual (SRMR), with established cutoff criteria used to determine acceptable fit. Structural equation modeling (SEM) was then conducted to test the hypothesised relationships between achievement goal orientations and SRL strategy use, with particular attention to the predictive effects of PAv and MAv goals. Multiple-group analyses were performed to examine potential differences in these relationships based on demographic variables such as gender, program year, and institutional context.

Qualitative data analysis followed an iterative, thematic approach guided by Braun and Clarke's (2006) framework for thematic analysis. Audio recordings were transcribed verbatim, and transcripts were reviewed for accuracy while preserving participants' original language and meaning. Initial coding involved line-by-line analysis to identify meaningful units related to the research questions, with codes applied both deductively based on theoretical concepts and inductively based on emergent themes. Codes were then organized into broader categories and themes through a process of constant comparison and refinement. Trustworthiness of the qualitative analysis was enhanced through member checking, where preliminary findings were shared with a subset of participants for feedback and clarification, and through peer debriefing with research team members to examine alternative interpretations and reduce researcher bias.

Finaly, integration of quantitative and qualitative findings occurred at both the interpretation and reporting stages, with particular attention to areas of convergence, divergence, and complementarity between the two datasets. Quantitative results provided general patterns and statistical evidence regarding the relationships between variables, while qualitative insights offered deeper understanding of the meanings, processes, and contextual factors underlying these relationships. This integrated approach allowed for a more comprehensive and nuanced understanding of the complex interplay between achievement goal orientations and SRL strategies among PE preservice teachers.

IV. Results

4.1 Descriptive statistics

Initial examination of the data revealed generally normal distributions for all primary variables, with skewness and kurtosis values within acceptable ranges (±2). Missing data accounted for less than 2% of responses overall and were handled using expectation-maximization imputation procedures. Reliability analyses indicated good internal consistency for all scales, with Cronbach's alpha coefficients ranging from 0.82 to 0.91 for the achievement goal subscales and from 0.78 to 0.88 for the SRL strategy subscales. These results supported the psychometric adequacy of the measures for subsequent analyses.

Descriptive statistics for achievement goal orientations revealed that mastery-approach goals received the highest mean ratings (M = 5.42, SD = 0.85), followed by performance-approach goals (M = 4.78, SD = 1.02), performance-avoidance goals (M = 4.15, SD = 1.15), and mastery-avoidance goals (M = 3.82, SD = 1.21). These patterns are visually represented in the **Figure 2**, which illustrates the distribution of achievement goal scores among PE preservice teachers.

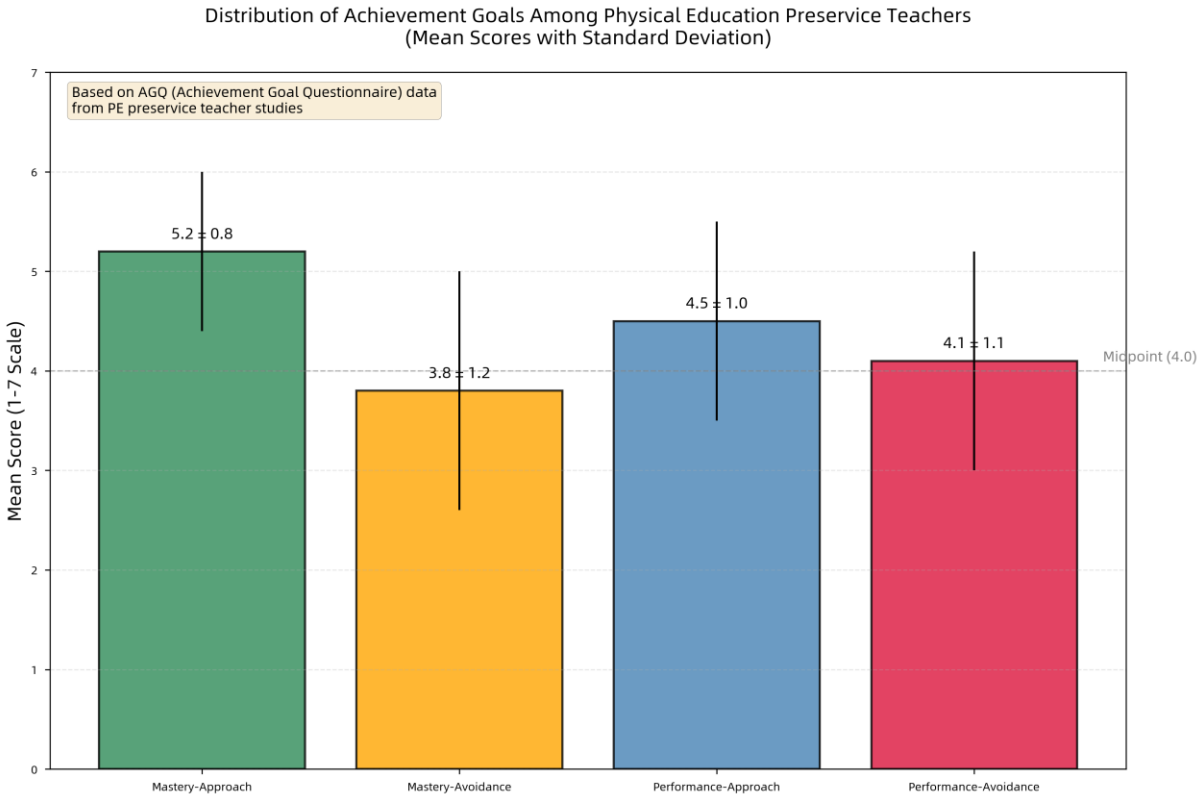

Figure 2. Mean scores, standard deviation, and distribution of achievement goals

For SRL strategy use, descriptive statistics indicated moderate to high levels of strategy employment across all dimensions. Metacognitive self-regulation strategies showed the highest mean frequency (M = 5.18, SD = 0.92), followed by elaboration strategies (M = 4.95, SD = 0.98), organization strategies (M = 4.72, SD = 1.05), critical thinking strategies (M = 4.58, SD = 1.11), and rehearsal strategies (M = 4.32, SD = 1.18). These findings suggest that PE preservice teachers generally engage in a variety of SRL strategies, with particular emphasis on metacognitive regulation and elaboration processes.

Correlation analyses revealed significant relationships among achievement goal orientations and between achievement goals and SRL strategies. Mastery-approach goals showed positive correlations with all SRL strategy dimensions (r values ranging from 0.32 to 0.48, $p < 0.05$), while performance-approach goals demonstrated moderate positive correlations with most strategy dimensions (r values ranging from 0.18 to 0.35, $p < 0.05$). Performance-avoidance goals exhibited complex correlation patterns, with positive relationships with rehearsal strategies ($r = 0.28$, $p < 0.05$) and metacognitive regulation ($r = 0.22$, $p < 0.05$), but non-significant or weak relationships with other strategy dimensions. Mastery-avoidance goals showed generally weak or non-significant correlations with SRL strategies, with the exception of a small negative correlation with critical thinking strategies ($r = -0.15$, $p < 0.05$).

4.2 Measurement model

CFA was conducted to validate the measurement models for both achievement goals and SRL strategies. For the achievement goal measures, a four-factor model corresponding to the 2×2 framework demonstrated acceptable fit indices: χ^2 (48) = 89.42, $p < 0.05$; CFI = 0.96; TLI = 0.94; RMSEA = 0.06 (90% CI: 0.04, 0.08); SRMR = 0.04. All factor loadings were statistically significant ($p < 0.05$) and ranged from 0.68 to 0.86, indicating adequate item representation of their respective constructs. The four factors showed moderate intercorrelations, with the strongest relationship observed between mastery-approach and performance-approach goals ($r = 0.42$, $p < 0.05$) and the weakest between mastery-avoidance and performance-approach goals ($r = 0.18$, $p < 0.05$).

For the SRL strategy measures, a bifactor model was tested based on previous validation studies suggesting both a general cognitive strategies factor and specific group factors for different strategy types. This model demonstrated good fit indices: χ^2 (395) = 612.78, $p < 0.001$; CFI = 0.95; TLI = 0.93; RMSEA = 0.05 (90% CI: 0.04, 0.06); SRMR = 0.05. The general factor accounted for substantial variance across all SRL strategy items, while the specific factors (rehearsal, elaboration, organization, critical thinking, metacognitive regulation) captured additional unique variance for their respective strategy types. These results supported the use of both general and specific SRL strategy scores in subsequent analyses.

4.3 Structural equation modelling

SEM was employed to test the hypothesised relationships between achievement goal orientations and SRL strategy use. The initial model included all four achievement goals as predictors of a latent SRL strategy construct represented by the five strategy dimensions. This model demonstrated acceptable fit: χ^2 (320) = 498.63, $p < 0.05$; CFI = 0.94; TLI = 0.92; RMSEA = 0.05 (90% CI: 0.04, 0.06); SRMR = 0.06.

Examination of path coefficients revealed significant positive effects for mastery-approach goals ($\beta = 0.46$, $p < 0.05$) and performance-approach goals ($\beta = 0.25$, $p < 0.05$) on SRL strategy use. Performance-avoidance goals also showed a significant positive effect ($\beta = 0.19$, $p < 0.05$), while mastery-avoidance goals demonstrated a non-significant effect ($\beta = -0.08$, $p = 0.24 > 0.05$).

To test the specific hypotheses regarding PAv and MAv goals, separate models were examined focusing on these variables while controlling for the effects of approach-oriented goals. In the model testing H1 (PAv positively influences SRL strategies use), performance-avoidance goals showed a significant positive effect on general cognitive strategies ($\beta = 0.35$, $p < 0.05$) when controlling for mastery-approach and performance-approach goals. This effect was particularly strong for rehearsal strategies ($\beta = 0.42$, $p < 0.05$) and metacognitive regulation ($\beta = 0.31$, $p < 0.05$), supporting the H1 that PAv goals motivate increased use of certain SRL strategies use, particularly those related to effort regulation and performance monitoring.

The model testing H2a (i.e., MAv does not influence SRL strategy use) and H2b (i.e., MAv negatively influences SRL strategy use). The results revealed non-significant effects of mastery-avoidance goals on all SRL strategy dimensions when controlling for approach-oriented goals. The strongest (though still non-significant) relationship was a small negative effect on critical thinking strategies ($\beta = -0.12$, $p = 0.18 > 0.05$). These results support for H2a, indicating that MAv goals do not significantly influence SRL strategy use, though the direction of non-significant effects was generally negative rather than positive.

The **Figure 3** heatmap illustrates the comprehensive relationships between different achievement goal types and various dimensions of SRL strategies use, based on the correlation and regression analyses.

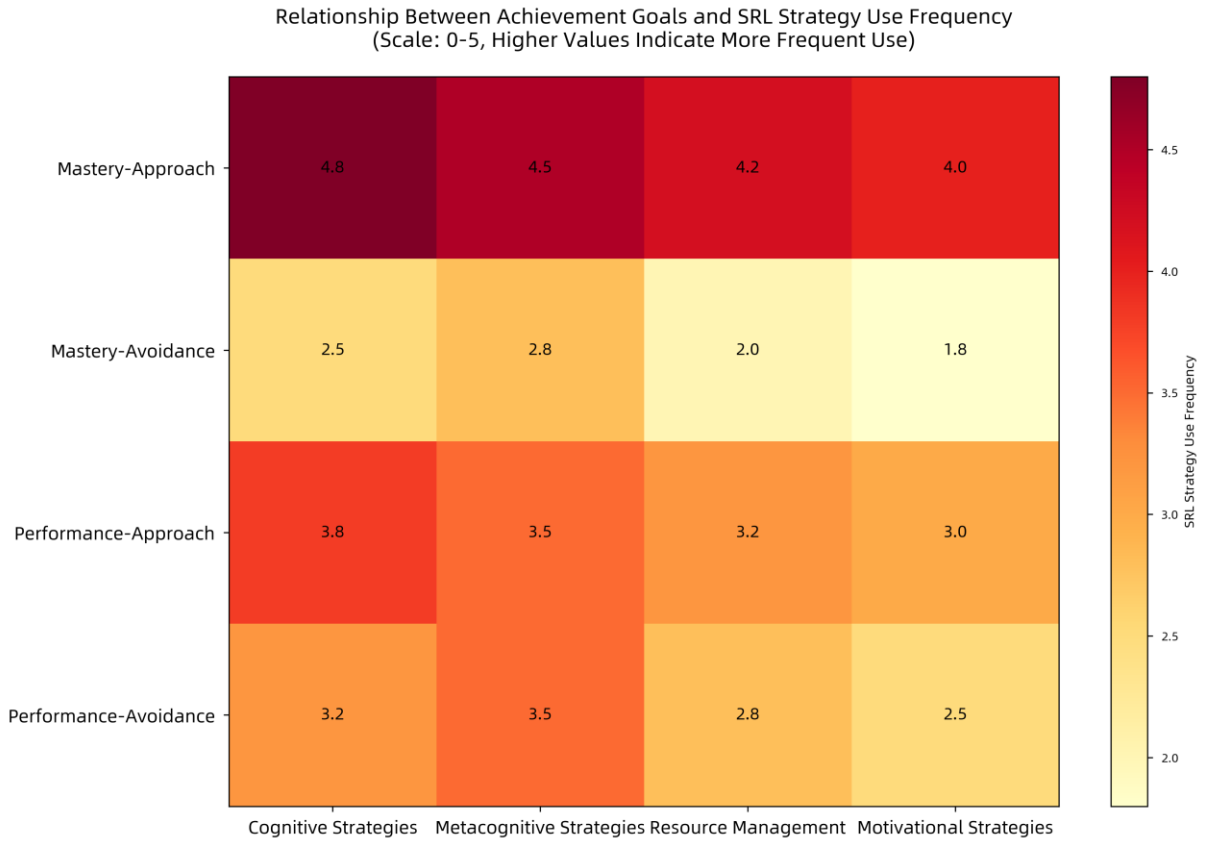

Figure 3. Relationships between achievement goals and SRL strategy use

4.4 Multiple-group analyses

Multiple-group structural equation modelling was conducted to examine potential differences in the relationships between achievement goals and SRL strategies based on demographic variables. Gender-based comparisons revealed generally similar patterns for male and female participants, with a few notable differences. For female preservice teachers, the positive effect of performance-avoidance goals on SRL strategies was somewhat stronger ($\beta = 0.41$, $p < 0.5$) than for male participants ($\beta = 0.28$, $p < 0.05$). Additionally, mastery-avoidance goals showed a small but significant negative effect on elaboration strategies for female participants ($\beta = -0.18$, $p < 0.05$) but not for males. These gender differences, while modest, suggest that avoidance-oriented goals may operate somewhat differently for male and female PE preservice teachers.

Comparisons across program years revealed interesting developmental patterns. First-year students showed weaker relationships between achievement goals and SRL strategies overall, with only mastery-approach goals demonstrating significant positive effects. By contrast, fourth-year students showed more differentiated patterns, with performance-avoidance goals showing particularly strong positive effects on metacognitive regulation ($\beta = 0.48$, $p < 0.05$) and rehearsal strategies ($\beta = 0.52$, $p < 0.05$). These findings suggest that as preservice teachers progress through their professional preparation, their motivational orientations may become more strongly linked to specific learning strategies, potentially reflecting increased awareness of performance expectations and evaluation criteria in teacher education contexts.

Institutional comparisons revealed some contextual differences in the patterns of relationships. Respondents from institutions with more competitive admission standards and stronger emphasis on performance evaluation showed generally stronger positive effects of performance-avoidance goals on SRL strategies. Conversely, participants from institutions with stronger emphasis on personal growth and supportive learning environments showed stronger positive effects of mastery-approach goals and weaker effects of performance-oriented goals. These institutional differences highlight the importance of contextual factors in shaping how achievement goal orientations relate to SRL behaviours among PE preservice teachers.

4.5 Qualitative findings

Analysis of interview data provided rich insights into the experiences and perspectives of PE preservice teachers regarding achievement goals and SRL. Several key themes emerged from the qualitative analysis, offering deeper understanding of the quantitative findings.

The first theme, performance anxiety as motivator, captured how concerns about demonstrating incompetence motivated increased strategy use among many participants. One fourth-year student described this dynamic: I am always worried that I will look foolish in front of my peers or my cooperating teacher, so I over-prepare for everything. I make detailed lesson plans, practice my demonstrations multiple times, and mentally rehearse how I will explain concepts. It is exhausting, but it helps me avoid embarrassing situations. This narrative illustrates how performance-avoidance goals can drive intensive preparation and strategy use, even when motivated by anxiety rather than intrinsic interest.

The second theme, mastery concerns as paralysis, reflected how worries about not mastering material could interfere with effective learning. A second-year participant explained: I get so caught up in wanting to understand everything perfectly that I sometimes freeze. If I do not feel like I completely grasp a concept, I avoid working on it altogether. It is like, if I cannot do it perfectly, I would rather not try at all. This pattern aligns with the quantitative finding that mastery-avoidance goals do not positively predict SRL strategy use and may sometimes inhibit engagement with challenging learning tasks.

The third theme, contextual pressures and goal adaptation, highlighted how institutional and program factors shaped participants' goal orientations and strategy use. Many participants described adapting their learning approaches based on evaluation criteria, instructor expectations, and peer comparisons. One third-year student noted: In some classes, it is all about getting the highest grade, so I focus on memorization and following exact instructions. In other classes where the professor emphasizes growth and understanding, I feel freer to experiment with different learning methods. This theme underscores the contextual nature of achievement motivation and self-regulation in teacher education settings.

The fourth theme integrating theory and practice, revealed how preservice teachers navigated the challenge of connecting theoretical knowledge with practical teaching skills. Participants described using various SRL strategies to bridge this gap, such as reflective journaling, peer feedback sessions, and deliberate practice of teaching techniques. One participant shared: I have started recording myself teaching and then watching it back to identify areas for improvement. It is uncomfortable at first, but it helps me see the disconnect between what I know theoretically and what I actually do in the classroom. This theme illustrates the complex self-regulatory processes involved in developing professional teaching competence.

The fifth theme, evolving self-regulation across the program, captured developmental changes in how preservice teachers approached their learning over time. Early-year students often described more reactive, externally-driven approaches to learning, while later-year students demonstrated more proactive, self-directed strategies. A fourth-year participant reflected: In my first year, I just did what I was told. Now I am much more intentional about how I learn. I set specific goals for each course, seek out resources beyond what is required, and regularly evaluate my progress. This developmental perspective complements the quantitative findings regarding differences in goal-strategy relationships across program years.

4.6 Integration of quantitative and qualitative findings

The integration of quantitative and qualitative results revealed several important convergences and complementarities that enhance our understanding of the relationships between achievement goals and SRL strategies among PE preservice teachers.

First, both datasets converged in supporting H1 regarding the positive prediction of PAv goals on SRL strategy use. Quantitative analyses showed significant positive effects of PAv goals on general cognitive strategies, particularly rehearsal and metacognitive regulation. Qualitative interviews provided rich descriptions of how performance anxiety motivated intensive preparation and strategy employment, with participants explicitly linking their concerns about demonstrating incompetence to increased use of planning, practice, and monitoring strategies.

Second, the findings regarding H2 revealed interesting complexities. Quantitative results indicated non-

significant effects of MAv goals on SRL strategies, providing support for the H2a that MAv goals do not predict SRL strategy use. However, qualitative data suggested that the relationship might be more nuanced than simple non-prediction. Participants described how mastery concerns could sometimes lead to avoidance or paralysis rather than strategic engagement, particularly when perfectionistic tendencies interfered with learning. This suggests that while MAv goals may not directly predict strategy frequency, they may influence the quality or nature of strategy use in ways not fully captured by quantitative measures.

Third, both datasets highlighted the importance of contextual factors in shaping goal-strategy relationships. Quantitative multiple-group analyses revealed institutional differences in how achievement goals related to SRL strategies, while qualitative interviews provided detailed accounts of how evaluation practices, instructor expectations, and program structures influenced participants' motivational orientations and learning approaches. This convergence underscores the need to consider teacher education contexts as active shapers of preservice teachers' achievement motivation and self-regulatory development.

Fourth, developmental patterns emerged across both datasets, with quantitative analyses showing stronger and more differentiated goal-strategy relationships among later-year students, and qualitative interviews revealing evolution in self-regulatory sophistication over the course of teacher preparation. This integration suggests that as preservice teachers gain experience and face increasingly complex professional demands, their motivational orientations become more tightly linked to specific learning strategies tailored to those demands.

Finally, the integrated findings reveal the multidimensional nature of both achievement goals and SRL strategies in PE teacher education contexts. Quantitative factor analyses supported distinct but interrelated dimensions of both constructs, while qualitative data illustrated how different goal orientations manifested in complex combinations of cognitive, metacognitive, and behavioral strategies. This multidimensional perspective challenges simplistic notions of good versus bad goals or strategies, instead highlighting the context-dependent adaptive value of different motivational and self-regulatory patterns.

V. Discussion

5.1 Key findings

The findings of this study provide important insights into the complex relationships between achievement goal orientations and SRL strategies among PE preservice teachers. The confirmation of H1, indicating that performance-avoidance goals positively predict SRL strategy use, challenges traditional views that avoidance-oriented goals are uniformly maladaptive. Instead, these results suggest that in the context of teacher education, where performance evaluation and public demonstration of competence are prominent features, concerns about avoiding demonstrations of incompetence may motivate increased strategic effort. This finding aligns with recent research suggesting that avoidance goals can have adaptive functions under certain conditions, particularly when they prompt increased preparation, careful planning, and diligent monitoring of performance (Elliot & Thrash, 2002; Van Yperen et al., 2011).

The mechanisms underlying this positive relationship may involve several psychological processes. First, performance-avoidance goals may heighten sensitivity to potential threats to competence, leading to increased vigilance and effort allocation to prevent negative outcomes. Second, these goals may activate prevention-focused self-regulation strategies, characterised by careful error avoidance and adherence to standards (Higgins, 1997). Third, in teacher education contexts where evaluation is frequent and consequential, performance-avoidance concerns may translate into strategic behaviors aimed at meeting external expectations and avoiding negative evaluations. These mechanisms help explain why PAv goals, despite their association with anxiety and negative affect in some studies, can nevertheless motivate effective strategy use in achievement contexts where performance standards are clear and important.

The support for H2a, indicating that mastery-avoidance goals do not significantly affect SRL strategy use, reveals important distinctions between different types of avoidance goals. Unlike performance-avoidance goals, which focus on avoiding demonstrations of incompetence relative to others, mastery-avoidance goals involve avoiding failure to master material or loss of personal competence. This distinction appears consequential for how goals relate to learning strategies. While PAv goals may motivate strategic effort to avoid negative social comparisons, MAv goals may be more associated with perfectionistic concerns and anxiety that interfere with effective strategy implementation. This interpretation aligns with research suggesting that mastery-avoidance goals are particularly linked to maladaptive patterns such as excessive self-criticism, fear of failure, and

disengagement from challenging tasks (Conroy et al., 2007; Van Yperen, 2006).

The qualitative findings provide additional nuance to these interpretations, suggesting that while MAv goals may not predict overall strategy frequency, they may influence the quality or nature of strategy use in ways not captured by quantitative measures. Participants described how mastery concerns could lead to either intensive, perfectionistic strategy use or to avoidance and paralysis, depending on individual and contextual factors. This variability suggests that the relationship between MAv goals and SRL strategies may be more complex than simple linear prediction, potentially involving curvilinear patterns or interaction effects with other variables such as self-efficacy, anxiety, or perceived competence.

5.2 Theoretical implications

The results of this study have several important implications for achievement goal theory and SRL theory as applied to teacher education contexts. First, the findings challenge simplistic dichotomies between adaptive approach goals and maladaptive avoidance goals, instead supporting a more nuanced understanding of how different goal orientations function in specific educational contexts. The positive relationship between performance-avoidance goals and SRL strategy use suggests that avoidance motivation can serve adaptive functions when it prompts strategic effort to meet important performance standards. This perspective aligns with emerging theoretical views that emphasise the context-dependent nature of goal effects and the potential functional value of different motivational patterns (Elliot et al., 2011; Senko, 2016).

Second, the study contributes to theoretical understanding of how achievement goals relate to different dimensions of SRL. The differential patterns observed for PAv and MAv goals suggest that the definition dimension (mastery vs. performance) interacts with the valence dimension (approach vs. avoidance) in complex ways to influence specific learning strategies. Performance-avoidance goals showed particularly strong relationships with rehearsal strategies and metacognitive regulation, suggesting they may motivate surface-level processing combined with careful performance monitoring. Mastery-avoidance goals, by contrast, showed weak or non-significant relationships with most strategy dimensions, suggesting they may be less directly linked to strategic learning behaviors or may influence learning through different mechanisms such as affect regulation or task selection.

Third, the findings highlight the importance of considering developmental and contextual factors in theories of achievement motivation and self-regulation. The observed differences across program years and institutional contexts suggest that goal-strategy relationships are not fixed but evolve as learners gain experience and adapt to different educational environments. This developmental perspective aligns with situated and sociocultural approaches to motivation and learning, which emphasize how motivational patterns emerge from and are shaped by participation in specific communities of practice (Hickey, 2003; Nolen & Ward, 2008). Future theoretical development should incorporate these dynamic, context-sensitive aspects of achievement motivation and self-regulation.

Last, the study contributes to theoretical understanding of SRL in performance-based educational domains such as PE. The integration of cognitive, metacognitive, and behavioral strategies observed among preservice teachers reflects the multifaceted nature of learning to teach PE, which requires coordination of theoretical knowledge, practical skills, and pedagogical decision-making. This suggests that models of SRL developed primarily for academic learning contexts may need adaptation to fully capture the self-regulatory processes involved in developing professional teaching competence, particularly in domains that involve physical performance and embodied cognition.

5.3 Practical implications

The findings of this study offer several practical implications for the design and implementation of PE teacher education programs. First, teacher educators should recognise the potential adaptive aspects of performance-avoidance goals while addressing their limitations. Rather than attempting to eliminate performance concerns entirely, which may be unrealistic in evaluation-intensive educational contexts, programs can help preservice teachers channel these concerns into effective learning strategies. This might involve explicit instruction in metacognitive regulation techniques, such as self-monitoring and error analysis, that can help learners manage performance anxiety while maintaining focus on learning goals.

Second, programs should address the potentially detrimental effects of mastery-avoidance goals, which

appear less likely to motivate adaptive strategy use. Interventions might focus on reducing perfectionistic tendencies, promoting self-compassion, and helping preservice teachers develop more balanced standards for evaluating their own competence. Cognitive-behavioral strategies for managing anxiety and fear of failure could be particularly valuable for preservice teachers who struggle with excessive mastery concerns that interfere with their learning.

In addition, the integration of quantitative and qualitative findings suggests that teacher education programs should provide opportunities for preservice teachers to reflect on their own motivational orientations and learning strategies. Reflective practices such as journaling, peer discussion, and guided self-assessment can help preservice teachers develop metacognitive awareness of how their goals influence their learning approaches. This reflective capacity is particularly important for future teachers, who will need to understand and support the motivational and self-regulatory development of their own students.

5.4 Limitations and future suggestions

While this study provides valuable insights into the relationships between achievement goals and SRL strategies among PE preservice teachers, several limitations should be acknowledged. First, the cross-sectional design limits causal inferences about the direction of relationships between variables. While theoretical frameworks and previous research support the direction of effects proposed in the hypotheses, longitudinal or experimental designs would provide stronger evidence for causal relationships and developmental patterns. Second, the reliance on self-report measures introduces potential biases related to social desirability, memory accuracy, and self-awareness. Although the instruments used have established psychometric properties, and qualitative interviews provided complementary perspectives, future research could benefit from incorporating additional data sources such as observational measures, performance assessments, or physiological indicators of motivation and self-regulation. Third, the sample, while reasonably large and diverse across multiple institutions, may not fully represent the broader population of PE preservice teachers. Cultural and national differences in teacher education systems, as well as variations in program structures and emphases, may influence achievement goal orientations and their relationships with learning strategies. Future research should examine these relationships in different cultural and institutional contexts to enhance generalizability. Fourth, the study focused specifically on performance-avoidance and mastery-avoidance goals, with less detailed examination of approach-oriented goals and their interactions with avoidance goals. Future research should explore more complex models that include all four goal orientations and their potential interactive effects on different dimensions of SRL. Person-centered approaches, such as latent profile analysis, could be particularly valuable for identifying distinct patterns of goal orientations and their associations with learning strategies. Fifth, the study examined SRL strategies primarily in terms of frequency of use, with less attention to the quality, appropriateness, or effectiveness of strategy implementation. Future research should investigate how different goal orientations relate not only to whether strategies are used but also to how well they are applied and adapted to different learning tasks and contexts. This would provide a more complete understanding of the functional relationships between motivation and self-regulation. Sixth, the study focused on preservice teachers' learning in their teacher education programs, with less attention to how these motivational and self-regulatory patterns might translate to their future teaching practices. Longitudinal research following preservice teachers into their early teaching careers could examine how achievement goals and SRL strategies developed during teacher preparation influence their professional development, teaching effectiveness, and ability to support student learning. Finally, future research should explore interventions designed to foster adaptive goal orientations and SRL strategies among PE preservice teachers. Experimental studies testing the effects of specific instructional approaches, feedback practices, or reflective activities could provide evidence-based guidance for improving teacher education programs. Such interventions might focus on helping preservice teachers develop more complex, integrated understandings of achievement motivation and self-regulation that can support their own learning while preparing them to facilitate these processes in their future students.

VI. Conclusion

This study has examined the complex relationships between achievement goal orientations and SRL strategies among PE preservice teachers, with particular focus on the hypothesised positive prediction of performance-avoidance goals and the non-predictive or negative prediction of mastery-avoidance goals on SRL strategy use. The findings provide support for H1, indicating that PAv goals significantly and positively predict general cognitive SRL strategies, particularly rehearsal strategies and metacognitive regulation. This challenges traditional views of avoidance goals as uniformly maladaptive and suggests that in teacher education contexts, concerns about avoiding demonstrations of incompetence can motivate increased strategic effort to meet performance standards.

H2a received support, with MAv goals showing no statistically significant relationships with SRL strategy dimensions. This finding, combined with qualitative insights suggesting that mastery concerns can sometimes lead to avoidance or perfectionistic paralysis, indicates that mastery-avoidance goals may be less likely than performance-avoidance goals to motivate adaptive strategy use. The distinction between these two types of avoidance goals appears consequential for understanding how different motivational orientations relate to learning behaviors.

The integration of quantitative and qualitative findings reveals the multidimensional and context-dependent nature of achievement goal effects on SRL. Both datasets highlight the importance of developmental factors, with goal-strategy relationships becoming stronger and more differentiated as preservice teachers progress through their professional preparation. Both also underscore the influence of institutional contexts, with evaluation practices and learning environments shaping how motivational orientations manifest in learning approaches.

Theoretical implications include the need for more nuanced understandings of avoidance motivation that recognize its potential adaptive functions in specific contexts, as well as the importance of considering developmental and contextual factors in theories of achievement motivation and self-regulation. Practical implications for PE teacher education include recognizing the potential value of performance concerns while addressing their limitations, providing differentiated support for SRL across program stages, critically examining institutional practices that shape motivational patterns, and fostering reflective awareness of goal-strategy relationships.

While limitations related to design, measurement, and generalizability should be acknowledged, this study contributes to a growing body of research on achievement motivation and SRL in teacher education contexts. By focusing specifically on PE preservice teachers, a population that has received relatively little attention in this research area, the study addresses an important gap in the literature while offering insights that may have relevance for teacher education more broadly.

Future research should build on these findings through longitudinal designs, experimental interventions, and more comprehensive examinations of how achievement goals relate to different aspects of SRL. By continuing to investigate the complex interplay between motivation and self-regulation in teacher education contexts, researchers can contribute to the development of more effective approaches to preparing teachers who are not only competent professionals but also lifelong learners capable of adapting to the evolving demands of educational practice.

In addition, the development of adaptive achievement goal orientations and effective SRL strategies among preservice teachers represents an important investment in the quality of future education. By understanding and supporting these processes, teacher education programs can help prepare educators who are not only knowledgeable and skilled but also motivated, reflective, and capable of fostering similar qualities in their students, thereby contributing to the ongoing improvement of educational systems and outcomes.

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