A Study of the Association between Learning Strategies and Academic Performance in Physiotherapy Students

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ABSTRACT

Introduction: Learning strategies consist of a student's implicit and explicit actions, beliefs and habits that influence how they comprehend and learn. The current study intended to assess this parameter in physiotherapy students and to explore whether an association exists between learning strategies and academic performance.

Materials and Methods: A descriptive, cross-sectional survey was carried out over a period of 6 months in five Physiotherapy colleges. 343 students participated after giving informed consent. The learning strategies section of the Motivational Strategies of Learning Questionnaire (MSLQ) was used to assess learning strategies. Overall percentage score in the previous year's final University exam was considered as a measure of academic performance. A correlation matrix was used to investigate the relationship between the two parameters, and a multivariate regression analysis was carried out to create a model to predict academic performance based on their learning strategies. Data were entered in MsExcel (© Microsoft, USA) and converted to Stata Version 15.1 © StataCorp, College Station for analysis.

Results: Physiotherapy students reported lowest mean scores on critical thinking (mean=3.78+1.13), metacognitive self-regulation (mean=3.76+1.01) and effort regulation (mean=3.76+ 0.99) and moderate scores on time/study environmental management (mean=4.10+ 0.80).

Conclusion: Essential learning strategies such as critical thinking and metacognitive self-regulation, as well as resource management strategies such as effort regulation and time management, were deficient in physiotherapy students. A curriculum that emphasizes and teaches learning strategies along with professional skills seems to be the need of the hour of physiotherapy students.

Key Words: Learning, Physiotherapy, Time management, Academic success, Metacognition, Critical thinking

INTRODUCTION

Wittrock (1977)¹ defined learning as practices that lead to transforming through experience. It is the process of gaining a fairly permanent change in comprehension, information, knowledge, outlook, skill and aptitude through experience.

It is widely accepted that the process of learning requires the participation of the learner on a conscious or unconscious, implicit or explicit level to receive and process sensory input and incorporate it in some form into memory.²

Each educational field provides different learning settings and tasks. For instance, physiotherapy programs provide different course objectives which provide the framework and

overview for practising physical therapy. Within this framework, students have similar learning experiences including lectures as well as practical training in evaluation, diagnosis, the use of therapeutic modalities, manual therapy, and overall rehabilitation for a range of impairments.³

The role of universities in the modern era, and scientific research to gain an insight into how people learn is of utmost importance.⁴ The main goal for higher education is to train, enable, and inspire students to learn.⁵ To accomplish these goals, factors associated with student learning should be explored and evaluated in-depth.

These factors can be divided into two broad categories: a) those related to students' characteristics, such as learning

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strategies and motivation, and b) those related to the academic environment, such as teaching style and satisfaction with the academic atmosphere.⁶

As stated by Strale (2001)⁷, learning strategies consist of a student's implicit and explicit actions, beliefs, and habits that influence how they comprehend and learn.^{8,9,10} Such strategies may impact the process whereby a motivated student becomes an active participant in acquiring knowledge¹¹, finishes a specific academic task¹² and can fulfil the demands of higher education.⁸

To learn efficiently, certain learning tactics and techniques should be used by students. Three subcategories of these strategies have been identified by experts in the domain of post-secondary student learning- cognitive, affective and metacognitive regulation.

Cognitive processing strategies are tactics that students use to process learning materials that directly lead to results such as the acquisition of knowledge or a new skill, gaining an in-depth understanding etc. These include looking for associations among various aspects of the subject (relating), finding ways to remember newly learnt information (memorizing), thinking of illustrations (concretizing), distinguishing major and minor points (selecting), and looking for practical relevance (applying).¹³

Affective learning strategies are directed at dealing with the emotions which may arise during learning, and lead to an emotional state that may hasten or halt the progression of learning. Examples are **motivating** oneself, attaching individual evaluations to learning tasks, attributing learning outcomes to contributing factors, paying attention to and controlling blocking emotions.¹³

Metacognitive regulation strategies are directed at controlling the emotional and cognitive learning behaviours and therefore indirectly lead to positive learning outcomes. Examples are: familiarizing oneself with a learning task, monitoring the progress of a planned learning activity, identifying the reason for difficulties and modifying the learning practices according to varying demands as required.¹³ Enhanced insight into the utilization of these strategies by university students, their interaction with each other and their influence on academic performance may augment our capacity to potentially intervene and rectify them.¹³ This may also positively the student's overall academic learning.

Need for the study:

Physiotherapists are an important part of the rehabilitation team. They help the patients regain function after an injury/insult to the various structures of the body. To achieve this, they need to identify exactly what a patient can't do, analyze why he can't do it and how to best retrain the function in question.

Thus, a physiotherapist needs to be versatile in terms of learning strategies—

1. Analytical skills are required for linking impairment to function.
2. Synthetic thinking is required to gain a holistic view of the patient's rehabilitation.
3. Management of the available resources to integrate the individual into society and to maximize function.

Thus, a physiotherapist needs to consider factors ranging from joint biomechanics to possible facilitators and barriers to function in society. To do this, effective learning strategies, styles and approaches are essential, and the lack of these essential skills may adversely affect their academic performance.

A review of the literature has revealed that learning strategies have been studied in students from various educational streams. However, very few authors have evaluated this parameter in physiotherapy students, and its relationship with their academic performance hasn't been explored in depth. These issues reiterate the need to study learning strategies in physiotherapy students in detail and study their relationship with academic performance. A model to predict academic performance of physiotherapy students on the basis of their learning strategies will provide an insight into these skills, and provide additional assistance where necessary.

MATERIALS AND METHODS

Ethical Moral Code and Consideration

The Institutional Ethics and Research Committee of our University approved the research (IEC Ref No. DYP/IEC/01-005/2019). The participants willingly gave written informed consent before agreeing to participate in the study, and the researchers made sure that their confidentiality was maintained.

Study design

This descriptive, cross-sectional research was carried out over a 6 months duration.

The study used a total sampling method: all the undergraduate and postgraduate physiotherapy students from five institutions of Mumbai and Navi Mumbai, who fulfilled the inclusion criteria were included.

Inclusion Criteria: Undergraduate and postgraduate physiotherapy students from five public and private university institutions from Mumbai and Navi Mumbai who agreed to contribute to the research were incorporated into the study.

Exclusion criteria: Students who were reluctant to be a part of the research and students with an established diagnosis of musculoskeletal, neurological, learning or mental health impairments which had the potential to impede their educational

achievements or learning were not permitted to participate in the study.

Outcome measures

Learning strategies were evaluated using the Motivational Strategies of Learning Questionnaire (MSLQ). This outcome measure was chosen as it showed an acceptable level of factor validity¹⁴, reasonably good internal reliability¹⁵ and the subscales appeared to show sound predictive validity.¹⁴

The MSLQ consists of 81, self-report items divided into two distinct sections:

(1) a motivation category and (2) a learning strategies category.

The learning strategies section comprises of two components:

1. A cognitive and metacognitive strategies section consisting of sub-scales for organization, rehearsal, elaboration, metacognitive self-regulation, and critical thinking;
2. A resource management strategies section consisting of sub-scales for effort regulation, time and study environment, peer learning, and help to seek.^{14,16}

Overall, the MSLQ consists of fifteen subscales: six in the motivation category and nine in the learning strategies category. The instrument is designed in such a way that it allows a researcher to use the scales collectively or independently, depending on their particular requirements and research objectives.¹⁷

Scoring of the questionnaire

Students grade their responses using a 7-point Likert scale, ranging from 1 (not at all true of me) to 7 (very true of me). Scores for each of the subscales are calculated by taking the mean of their components. Some items in the MSLQ are negatively phrased and should be reversed before a student's score is calculated.¹⁷ Finally, the overall score for a given subscale denotes the positive wording of all items within that scale, therefore higher scores signify greater amounts of the parameter being measured.¹⁸

The MSLQ was intended to be used by researchers, teachers and students as an instrument to investigate and evaluate the nature of student motivation and their use of learning strategies within a given course. The instrument takes approximately 20-30 minutes to complete. Normal scores have not been defined for the instrument, although they can be generated for different institutions, teachers, or courses if needed for comparative purposes.¹⁸

Academic performance was evaluated using the percentage obtained in the last University exam undertaken by the stu-

dents. These scores were considered to be a reliable measure of the student's academic performance since they included some marks for internal assessment (taking into account their performance throughout the year) and were also the benchmark used to decide whether to promote students to the next academic year.

Statistical Analysis

Data were first recorded in MS Excel (© Microsoft, USA) and analyzed further by transferring it to Stata Version 15.1 © StataCorp, College Station. We tested the normality of continuous data using the Shapiro Wilk test. We estimated the means and standard deviations (SDs) for continuous variables. We estimated the Pearson correlation coefficient r between two continuous variables. We used linear regression models to conduct multivariate analysis for each item in the questionnaire. Initially, we build univariate models. After these, we build multivariate models. The additional variables in the multivariate models were age, gender, type of course and type of university. A p-value of < 0.05 was considered statistically significant.

RESULTS

343 students from five institutions across Mumbai and Navi Mumbai participated in the study. Among the participants, 6% were male and 94% were female. The age of the respondents ranged between 21 years and 26 years. 56.9% of students were from public universities, while 43.1% were from private universities. 59.5% of students were undergraduates (final year BPT), while 40.5% were postgraduates.

Graph 1: Mean scores of learning strategy subscales of MSLQ in physiotherapy students.

Interpretation: Physiotherapy students reported lowest mean scores in the domains of critical thinking (mean=3.78±1.13), metacognitive self-regulation (mean=3.76±1.01), effort regulation (mean=3.76±0.99) and time/study environmental management (mean=4.10±0.80).

Graph 2: Comparison of mean scores of learning strategy subscales of MSLQ in BPT and MPT students.

Interpretation: Undergraduate students had statistically significantly lesser mean effort regulation ($p=0.0001$) and help-seeking behaviour ($p=0.0001$) as compared to postgraduate students.

Interpretation: There was a positive and statistically significant correlation between percentage scores and learning strategies such as elaboration, organisation, critical thinking, metacognitive self-regulation, time/study environmental management, effort regulation, peer learning, help to seek.

A multivariate regression analysis was used to create a model to predict the academic performance of physiotherapy students based on their learning strategies. This model showed a stronger association between academic performance (indicated by per cent scores) and complex learning strategies such as critical thinking, as compared to simple learning

strategies such as rehearsal.

Interpretation: After adjusting for age, gender, type of university, and type of student, we found that each unit increase in critical thinking score was associated with an average of 3.95-point increase in the Percent scores (95%: 3.60, 4.29; $p<0.001$). This association (increase) was statistically significant.

Interpretation: After adjusting for age, gender, type of university, and type of student, we found that each unit increase in metacognitive self-regulation score was associated with an average of 4.93-point increase in the Percent scores (95%: 4.63, 5.23; $p<0.001$). This association (increase) was statistically significant.

Interpretation: After adjusting for age, gender, type of university, and type of student, we found that each unit increase in Time/study environmental management score was associated with an average of 4.23-point increase in the Percent scores (95%: 3.62, 4.85; $p<0.001$). This association (increase) was statistically significant.

Interpretation: After adjusting for age, gender, type of university, and type of student, we found that each unit increase in Effort regulation score was associated with an average of 3.52-point increase in the Percent scores (95%: 3.01, 4.03; $p<0.001$). This association (increase) was statistically significant.

Table 1: Correlation between learning strategies and Academic performance.

	Percent- age score	Rehears- al	Elabora- tion	Organi- zation	Critical thinking	Metacogni- tive self-regula- tion	Time Man- agement	Effort regula- tion	Peer Learning	Help seeking
Percentage Score	1.000									
Rehearsal	0.042	1.000								
Elaboration	0.175**	0.649***	1.000							
Organization	0.167**	0.685***	0.774***	1.000						
Critical Thinking	0.774***	0.201***	0.398***	0.364***	1.000					
Metacognitive self-regulation	0.862***	0.190***	0.332***	0.327***	0.851***	1.000				
Time Manage- ment	0.599***	0.255***	0.325***	0.401***	0.630***	0.700***	1.000			
Effort regulation	0.597***	0.068	0.178***	0.206***	0.562***	0.657***	0.656***	1.000		
Peer Learning	0.139*	0.478***	0.605***	0.518***	0.332***	0.277***	0.229***	0.140**	1.000	
Help seeking	0.375***	0.203***	0.345***	0.329***	0.393***	0.435***	0.420***	0.459***	0.444***	1.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Multivariate regression model: Percentage scores and critical thinking scores.

Percentage Score	Coefficient	[95% Confidence Interval]		t	p-value
Critical thinking	3.95	3.60	4.29	22.66	<0.001
Age	-0.41	-0.78	-0.03	-2.15	0.033
Gender					
Female					
Male	-1.38	-2.99	0.23	-1.68	0.093
University					
Deemed					
MUHS	1.44	0.66	2.22	3.65	<0.001
Type of student					
BPT					
MPT	1.84	0.64	3.05	3.01	0.003
Constant	57.29	48.85	65.73	13.35	<0.001

Table 3: Multivariate regression model: Percentage scores and Metacognitive self-regulation scores.

Percentage Score	Coefficient	[95% Confidence Interval]		t	p value
Metacognitive self-regulation	4.931	4.632	5.230	32.450	<0.001
Age	-0.047	-0.340	0.246	-0.310	0.754
Gender					
Female					
Male	-1.506	-2.766	-0.246	-2.350	0.019
University					
Deemed					
MUHS	1.684	1.078	2.290	5.460	<0.001
Type of student					
BPT					
MPT	0.842	-0.104	1.788	1.750	0.081
Constant	45.680	38.928	52.433	13.310	<0.001

Table 4: Multivariate regression model: Percentage score and Time/study environmental management scores

PercentageScore	Coefficient	[95% Confidence Interval]		t	p value
Time/study environmental management	4.23	3.62	4.85	13.59	<0.001
Age	-0.55	-1.03	-0.08	-2.30	0.022
Gender					
Female					
Male	-0.41	-2.46	1.65	-0.39	0.698
University					
Deemed					
MUHS	1.85	0.86	2.84	3.68	<0.001
Type of student					
BPT					
MPT	1.09	-0.46	2.64	1.39	0.166
Constant	58.26	47.30	69.23	10.45	<0.001

Table 5: Multivariate regression model: Percentage score and Effort regulation scores.

PercentageScore	Coefficient	[95% Confidence Interval]		t	p value
Effort regulation	3.52	3.01	4.03	13.61	<0.001
Age	-0.31	-0.79	0.17	-1.27	0.206
Gender					
Female					
Male	0.35	-1.70	2.40	0.34	0.736
University					
Deemed					
MUHS	1.63	0.64	2.62	3.24	0.001
Type of student					
BPT					
MPT	-0.78	-2.37	0.81	-0.97	0.335
Constant	57.57	46.57	68.56	10.30	<0.001

DISCUSSION

The first objective of the study was to evaluate the learning strategies of physiotherapy students using the learning strategies section of the MSLQ.

According to the findings of the present study, students reported fairly consistent use of learning strategies such as rehearsal, elaboration and organization.

Higher levels of both academic accomplishment and cognitive engagement have been found in students using a range of cognitive tactics such as elaboration, rehearsal, and organization.¹⁹ Therefore, the effective use of these strategies in physiotherapy students is a positive sign.

However, physiotherapy students in our study reported low mean scores in the domains of critical thinking, metacognitive self-regulation, effort regulation and time/study environmental management. A strong positive correlation was also seen between academic performance and these learning strategies.

Physiotherapists are involved in patient management at various stages of rehabilitation, every stage of which involves clinical decision making and evidence-based practice.²⁰

Clinical decision making is a dynamic and multifaceted process of reasoning and critical thinking which includes making reliable decisions concerning patient care.²¹ Evidence-based practice is “the explicit, diligent, and prudent use of existing evidence in making choices regarding the treatment

of a specific patient.”²² This process enables a therapist to select and understand the findings from their evaluation to implement effective treatment strategies that are rooted in sound theory and scientific evidence to facilitate the best possible outcomes for a patient.²⁰

Critical thinking indicates the extent to which students report applying previously learnt information and experiences to new situations for solving problems, making choices, or conducting essential assessments about standards of excellence.¹⁶ It is considered to be a prerequisite for skilled clinical decision making as well as an important step in evidence-based practice.²⁰

Metacognition refers to the knowledge and self-regulation of cognition.¹⁶ Studies on academic performance and student learning have found self-regulation of both cognition and behaviour to be an important aspect in this regard.²³⁻²⁵ Self-regulated learning consists of three components- students’ organization and control of their effort on theoretical as well as practical academic tasks,²³ students’ metacognitive tactics for formulating, monitoring, and altering their cognition²⁶⁻²⁹, and the actual intellectual strategies used by students use to learn, memorize, and comprehend the academic material.^{24,28,29} Furthermore, the capacity to choose the preferable alternatives and make tactical plans, and using introspection and self-monitoring approaches are necessary for proficient clinical decision making during rehabilitation.²⁰

Effort regulation indicates the students’ capacity to control

their concentration and effort when confronted with diversions and monotonous assignments. Effort management is self-management and shows a student's dedication to accomplishing their study goals, even when they face problems or interferences. It is important for academic success because it not only signifies commitment but also regulates the persistent use of effective learning tactics.¹⁶

Students who persist at a task even if it seems to be challenging or monotonous, or those who deal with distractions succeed in maintaining their cognitive engagement in the task, facilitating a better overall performance.^{25,27} Strongman and Burt (2000)³⁰ propose that there is a relationship between academic success and the ability to stay on task for a prolonged duration. They also concluded that students with higher academic ranking took fewer and shorter breaks while completing a task.

While physiotherapy students from our study successfully managed their study environments, most struggled with time management.

Study environment refers to the surroundings where the students usually complete their classwork. Ideally, the learner's study environment should be organized and reasonably free of distractions and interruptions.¹⁶

In an academic context, time management involves organizing, planning and utilizing one's study time with maximum efficiency. This includes setting achievable goals, allocating adequate time for studying and effectively using them.¹⁶ Time management is said to have a buffering influence on stress³¹ and is a key marker of better academic performance and lesser nervousness and stress amongst college students.³² Efficient time management is usually linked to greater academic success.^{33,34} Poor time management may lead to poor planning, and students may feel anxious towards the end of a course, which is usually when their performance is likely to be evaluated through exams.³⁵

Ling, Heffernan, and Muncer (2003)³⁶ found an association between students' academic performance and effective time management.

Kelly (2002)³⁷ proposes that analyzing the efficiency and appropriateness of the utilization of time involves three fundamental assumptions: an understanding of time, a knowledge of the components that fill time, and constructive working behaviours. Generally, such awareness is developed through self-regulation, setting goals and having a concrete plan of action. These strategies have been found to lower anxiety amongst students.³⁸ In addition to being a desirable trait in students, time management is also an asset for physiotherapists as healthcare professionals.

A regression analysis revealed that a unit increase in the use of strategies such as organization and elaboration lead to a

corresponding increase of approximately 1% in the overall academic performance of the participants. However, a similar increase in the use of strategies such as critical thinking, metacognitive self-regulation, effort regulation and time management leads to a corresponding increase of 3.50% to 5% in academic performance. This indicates a greater association between academic performance and these four strategies, as compared to elaboration and organization. Consequently, it appears that problem-solving by correlating previous knowledge with the newly presented information, analytical and reflective thinking, self-regulation along effective management of resources such as time seem to have a greater impact on academic performance as compared to other learning strategies. Therefore, awareness regarding the effective use of these strategies amongst teachers and students should be promoted.

CONCLUSION

Essential learning strategies such as critical thinking and metacognitive self-regulation, as well as resource management strategies such as effort regulation and time management, were deficient in physiotherapy students. The strategies are essential for academic success as well as professional growth, and therefore need to be taught and promoted during student life. A curriculum that emphasizes and teaches learning strategies along with professional skills and student evaluations which assess the use of these strategies seem to be the need of the hour of physiotherapy students.

Limitations

The study contained more undergraduate students as compared to postgraduates. Equal distribution of students (across the years and between undergraduate and postgraduate students) would have been ideal. Students from a specific geographical location were chosen for the study. A larger size, spread over a wider geographical area may improve the generalizability of the results.

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Authors' Contribution:

Dr. Manasi N. Desai (PT)¹: The author is involved in planning, implementation and analysis of the research study, and its presentation in the form of the manuscript. The author is also responsible for the technical information communicated.

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