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## Learning Strategies and Academic Difficulty in Occupational and Physical Therapy Online Education

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# Learning Strategies and Academic Difficulty in Occupational and Physical Therapy Online Education

## Abstract

As occupational therapy (OT) and physical therapy (PT) programs expand across the United States to address a shortage in the health workforce there is a limited understanding of the relationship between learning strategies and academic success in these professions. The purpose of this study was to explore the Learning and Study Strategies Inventory (LASSI) in relation to hybrid-online clinical neuroscience course outcomes in OT and PT students. Thirty-four students (n=14 OT; n=20 PT) self-administered the LASSI during the spring of 2019. The scales of Information Processing ( $r = -0.43$ ;  $p < 0.01$ ), Self-Testing ( $r = -0.36$ ;  $p < 0.05$ ), and Test Strategies ( $r = 0.32$ ;  $p < 0.05$ ) displayed modest statistically significant relationships to final neuroscience grade and cumulative professional grade point average ( $r = -0.43$ ;  $p < 0.01$ ), ( $r = -0.30$ ;  $p < 0.05$ ), ( $r = 0.29$ ;  $p < 0.05$ ), respectively. Some scales of the LASSI appeared to be modestly related to academic difficulty in this sample, however scales were not significantly related to academic achievement. Students who scored highly on the LASSI scale of Test Strategies tended to have higher course performance compared to their peers. Students who rely on certain learning strategies may be at risk for academic difficulty in hybrid-online coursework. Those who scored highly on the LASSI scales of Information Processing and Self-testing tended to have lower course performance compared to their peers. The LASSI may provide OT and PT students a better understanding of learning and study strategies that are related to academic difficulty in online learning.

## Keywords

Academic difficulty, learning strategies, study strategies, academic performance, LASSI

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### ABSTRACT

As occupational therapy (OT) and physical therapy (PT) programs expand across the United States to address a shortage in the health workforce there is a limited understanding of the relationship between learning strategies and academic success in these professions. The purpose of this study was to explore the Learning and Study Strategies Inventory (LASSI) in relation to hybrid-online clinical neuroscience course outcomes in OT and PT students. Thirty-four students (n=14 OT; n=20 PT) self-administered the LASSI during the spring of 2019. The scales of Information Processing ( $r = -0.43$ ;  $p < 0.01$ ), Self-Testing ( $r = -0.36$ ;  $p < 0.05$ ), and Test Strategies ( $r = 0.32$ ;  $p < 0.05$ ) displayed modest statistically significant relationships to final neuroscience grade and cumulative professional grade point average ( $r = -0.43$ ;  $p < 0.01$ ), ( $r = -0.30$ ;  $p < 0.05$ ), ( $r = 0.29$ ;  $p < 0.05$ ), respectively. Some scales of the LASSI appeared to be modestly related to academic difficulty in this sample, however scales were not significantly related to academic achievement. Students who scored highly on the LASSI scale of Test Strategies tended to have higher course performance compared to their peers. Students who rely on certain learning strategies may be at risk for academic difficulty in hybrid-online coursework. Those who scored highly on the LASSI scales of Information Processing and Self-testing tended to have lower course performance compared to their peers. The LASSI may provide OT and PT students a better understanding of learning and study strategies that are related to academic difficulty in online learning.

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## **INTRODUCTION**

Entry-level occupational therapy (OT) and physical therapy (PT) education programs are witnessing explosive growth rates as the demand for qualified health care providers increases (Landry et al., 2016). To address this growing need, the number of accredited OT and PT education programs has increased by 24% and 21%, respectively, in the last decade (Commission on Accreditation in Physical Therapy Education [CAPTE], 2019; Harvison, 2018). Concomitantly, there has been a shift in the curricular models of many health professions education programs. The American Occupational Therapy Association (AOTA) reported that nearly 90% of OT programs are offered with at least half of their curriculum delivered online (Harvison, 2018). According to aggregate program data from CAPTE (2019) and AOTA (Harvison, 2018), curricula have moved from mostly traditional face-to-face to online and hybrid-online instruction. Additionally, across the United States (U.S.), entry-level PT curricula now include up to 75% hybrid-online instruction (CAPTE, 2019). As such, OT and PT educational programs appear to be increasingly turning to online instruction to help meet the growing needs of expanding professional education.

As online and hybrid-online education become more widely integrated into these professions, there exists a need to better understand the learning and study strategies associated with academic outcomes for this mode of instruction (Griffin, MacKewn, Moser, & VanVuren, 2012; Liu et al., 2016; Zhou, Graham, & West, 2016). A deeper understanding of learning strategies in OT and PT education can be beneficial for many reasons (Kuo, 2015; Lee, 2018; Waite, Farkas, Topp, Smoot, & Harmon, 2019). For example, strategies related to outcomes can be advantageous in making programmatic decisions or diagnosing and prognosticating student success to mitigate academic difficulty (Slaybaugh, 2012; West & Sadoski, 2011). A sound knowledge of learning strategies may help educators promote specific strategies most closely associated with success (Griffin, et al., 2012; West & Sadoski, 2011; Zhou et al., 2016). As such, learning and study strategies may be used to promote academic progression and retention and help struggling students avoid increased financial burden from added tuition costs (Crede & Kuncel, 2008). Therefore, a better understanding of the learning and study strategies linked to academic outcomes may provide educators with many areas to target for student support (Alkhateeb & Nasser, 2014; Villareal & Martinez, 2018).

The Learning and Study Strategies Inventory (LASSI) is a valid and reliable tool that has been shown to identify scales of learning and study strategies associated with positive learning outcomes (Cano, 2006; Flowers, 2003; Melancon, Sanders, & Smith, 2002; Moak, 2002; Weinstein, Palmer, & Acee, 2016). The LASSI measures ten scales of learning and study strategies, including Anxiety, Attitude, Concentration, Information Processing, Motivation, Selecting Main Ideas, Self-testing, Test Strategies, Time Management, and Using Academic Resources (Weinstein et al., 2016). The LASSI is normative referenced, has demonstrated sound psychometric properties across many educational levels, and has been widely adopted at thousands of universities across the U.S. (Cano, 2006; Melancon et al., 2002; Weinstein et al., 2016). For these reasons,

the LASSI has become a trusted tool that generates actionable data from which to drive educational support for students (Norouzinia, Seidabadi, Mohammadi, Ghadimi, & Aghabarari, 2016; Villarreal, & Martinez, 2018).

A review of the literature revealed a vast array of studies that have investigated learning and study strategies using the LASSI measurement. These studies have uncovered some important relationships. For example, in prior investigations of a select few health professions the LASSI scales of Motivation, Concentration, Time Management, and Self-testing Strategies have been positively and significantly associated with academic performance; whereas, Anxiety has shown a significant negative association (Zhou et al., 2016). More broadly, prior investigations have led to an improved understanding of the important relationship between learning strategies and academic success for college students (Broadbent & Poon, 2015; Ning & Downing, 2010; Orsini, Binnie, & Wilson, 2016; Simons, Dewitte, & Lens, 2004; Skinner et al., 2015). There is a growing body of evidence highlighting the link between the scales measured by the LASSI and academic performance. Currently, however, an understanding of the LASSI in OT and PT education is severely lacking (Kuo, 2015; Lee, 2018, Waite et al., 2019), especially when considering online or hybrid-online education. Therefore, it is possible that the LASSI may have practical utility in this population.

To date, there is a dearth of published investigations examining the relationships between the LASSI and learning outcomes in OT and PT students (Kuo, 2015; Lee, 2018; Waite et al., 2019). As a result, a knowledge of the learning and study strategies associated with academic outcomes in online education for this population remains largely unknown. Therefore, the purpose of this study was to characterize a sample of entry-level OT and PT students, and to identify and describe any relationships that may exist between the scales of the LASSI and measures of academic performance within an online neuroscience course. It was hypothesized that the LASSI scales of Time Management, Motivation, and Self-testing scales would be positively associated with academic performance, while Anxiety would be positively associated with academic difficulty.

## **MATERIALS AND METHODS**

A cross-sectional and correlational study design was utilized. A convenience sample of OT and PT students was solicited for participation in this study. The study was approved by an Institutional Review Board (IRB) and conducted during the spring term of 2019. All participants completed a written informed consent. Participants were included in this study if they were actively enrolled in an interprofessional Clinical Neuroscience for master of occupational therapy (MOT), doctor of occupational therapy (OTD), and doctor of physical therapy (DPT) programs, had not previously failed or withdrew from the course, or had a history of remediating the course. Participants were excluded from this study if they declined participation on the written informed consent procedure or had not completed the LASSI prior to the first course examination. No financial incentives were provided for participants.

The LASSI third edition (LASSI-3) measurement was self-administered online by each participant using an individual access code according to the test procedures (Weinstein et al., 2016). The LASSI-3 contains a total of 60-items, six question items for each of the ten scales of strategic learning. The ten scales measured include Anxiety, Attitude, Concentration, Information Processing, Motivation, Selecting Main Ideas, Self-testing, Test Strategies, Time Management, and Using Academic Resources (Weinstein et al., 2016). There is no time limit associated with the test; however, it is typically completed in under 15 minutes.

The LASSI measures three main components of Skill, Will, and Self-regulation (Weinstein et al., 2016). Skill is comprised of Information Processing, Selecting Main Ideas, and Test Strategies scales. The skill component quantifies how one “prepares for and demonstrates new knowledge on tests” (Bernier, 2009, p. 30). Will is comprised of Anxiety, Attitude, and Motivation scales. The Will component quantifies “students’ receptivity to learning new information and the willingness to exert the effort necessary to successfully complete academic requirements” (Bernier, 2009, p. 30). Self-regulation is comprised of Concentration, Self-testing, Time Management, and Using Academic Resources scales. The self-regulation component quantifies how students “manage the whole learning process” and has been highly studied in adult learners (Bernier, 2009, p. 30).

The LASSI was self-administered within the first three weeks of the Spring 2019 term, and prior to the first written examination of the course to avoid a confounding influence on results. At the conclusion of the term, academic performance was collected for the outcome variables of cumulative professional grade point average (GPA), final neuroscience grade, and averages across four written course examinations. Undergraduate GPA and undergraduate core science GPA were collected for each participant from record of admission to the university.

## **DATA ANALYSIS**

Data was analyzed using IBM SPSS version 25 for Windows (IBM Corp, Armonk, NY, 2018). Descriptive, comparative, and inferential statistics were performed in accordance with Green and Salkind (2014) and Warner (2008), and assumptions tests were performed across all variables of interest (Portney & Watkins, 2015). All levels of statistical significance were set at 0.05. The data set met the assumptions of homogeneity of variance; however, the sample was not normally distributed. As such, non-parametric Spearman’s rho was chosen to test for all correlation analyses. Independent samples t-tests were performed to compare differences across means scores for scales of the LASSI and academic outcomes by profession and gender, as it is robust to violations in assumptions of normality (Portney & Watkins, 2016). A post-hoc analysis was performed to determine the power of this sample.

## **RESULTS**

A total of 34 students met the inclusion criteria and completed this study [N=9 (26.5%) male; N=25 (73.5%) female]. This number represented 40% of the total number of students enrolled in this cohort. Of this sample, 14(41%) were OT students and

20(59%) were PT students and were equally proportionate to the OT/PT class size. According to a post-hoc power analysis for a two-tailed correlation, this sample size was significantly underpowered at 59% instead of the desired 80%. A description of the participants, demographic information, and academic outcomes can be found in Table 1. Significant differences were found between examination averages for OT and PT students ( $p < 0.01$ ), but not between final course grade, or professional GPA.

Table 1

<i>Participant Demographics</i>				
<b>Category</b>	<b>OT</b>	<b>PT</b>	<b>OT/PT Combined</b>	<b>P value</b>
<b>Total N (%)</b>	14 (41%)	20 (59%)	34 (100%)	n/a
<b>Gender N (%)</b>	3 (21%) Male 11 (79%) Female	6 (30%) Male 14 (70%) Female	9 (26%) Male 25 (74%) Female	n/a
<b>Final Course Grade Mean (SD)</b>	83.1(5.9)	83.1(4.7)	83.1(5.1)	$p=0.975$
<b>Exam Average Mean (SD)</b>	67.6(6.2)	79.7(5.4)	74.7(8.3)	$p < 0.01$
<b>Professional GPA* Mean (SD)</b>	3.40 (.33)	3.28 (.28)	3.33 (.30)	$p=0.91$

\*GPA reported on a 4.0 scale.

Descriptive statistics were performed for the LASSI scale scores as an aggregate and by professional affiliation (OT/PT) and can be found in Table 2. Results on the performance of the LASSI measurement by profession and gender can also be found in Table 2. The highest mean (SD) percentile scores on the scales of the LASSI for this sample were noted in Attitude 62.9(23.1) and Information Processing 58.8(23.3) scales. The lowest LASSI scale scores for this sample were noted in Selecting Main Ideas 36.2(23.6) and Concentration 39.7(23.1) scales. A comparison of the mean percentile scores by profession and gender for the LASSI can be found in Table 2. Females scored significantly lower on the scale of Anxiety when compared to males ( $p < 0.01$ ), indicating decreased ability to manage levels of anxiety. Males scored significantly higher on the LASSI scales of Attitude, Concentration, Motivation, Time Management, and Using Academic Resources. Significant differences were noted between the professions across the LASSI scales of Concentration and Selecting Main Ideas.

Table 2

*Descriptive Statistics for LASSI Scale Scores by Gender and Profession*

LASSI scales	OT	PT	OT/PT p value	Male	Female	M/F p value	Combined
<b>Skill component</b>							
INP	56.4(22.4)	60.5(24.3)	p=0.62	67.8(20.6)	55.6(23.7)	p<0.05	58.8(23.3)
SMI	32.6(22.8)	38.8(24.4)	p<0.05	34.6(30.5)	36.8(21.4)	p=0.75	36.2(23.6)
TST	52.1(17.3)	55.0(16.8)	p=0.63	47.2(16.2)	56.2(16.7)	p=0.19	53.8(16.8)
<b>Will component</b>							
ANX	50.7(27.4)	55.7(30.5)	p=0.63	69.9(24.1)	47.8(28.8)	p<0.01	53.7(28.9)
ATT	60.4(24.8)	64.8(22.3)	p=0.59	52.2(17.5)	66.8(23.9)	p<0.05	62.9(23.1)
MOT	51.4(23.8)	51.0(23.7)	p=0.97	35.0(21.1)	56.9(21.7)	p<0.01	51.2(23.4)
<b>Self-regulation component</b>							
CON	43.6(26.3)	37.0(22.6)	p<0.05	31.1(19.3)	42.8(25.1)	p<0.05	39.7(23.1)
SFT	44.0(23.7)	45.8(25.5)	p=0.84	41.7(27.5)	46.2(23.7)	p=0.49	45.0(24.4)
TMT	46.1(29.6)	47.8(26.1)	p=0.86	27.2(20.6)	54.2(25.9)	p<0.01	47.1(27.2)
UAR	49.6(26.2)	50.0(27.3)	p=0.97	34.4(26.9)	55.4(24.5)	p<0.05	49.9(26.4)

*Key. ANX – anxiety; ATT – attitude; CON – concentration; INP – information processing; MOT – motivation; SMI – selecting main ideas; SFT – self-testing; TST – test strategies; TMT – time management; UAR – using academic resources*

Relationships were identified between LASSI scale scores and academic performance using Spearman's rho and can be found in Table 3. Significant relationships were detected between academic performance and the LASSI scales of Information Processing ( $r = -0.43$ ;  $p < 0.01$ ), Self-Testing ( $r = -0.36$ ;  $p < 0.05$ ), and Test Strategies ( $r = 0.32$ ;  $p < 0.05$ ). The LASSI scale of Test Strategies was the only scale to show a significant positive relationship to final grade. Significant relationships were identified between undergraduate science GPA and final grade ( $r = 0.36$ ;  $p < 0.05$ ), and undergraduate cumulative GPA and final grade ( $r = 0.33$ ;  $p < 0.05$ ). Interestingly, the scales of Information Processing and Selecting Main Ideas were significantly and negatively correlated to undergraduate science ( $r = -0.36$ ;  $r = -0.30$ ) and undergraduate cumulative GPA ( $r = -0.29$ ;  $r = -0.54$ ). The results of the correlation analysis between the scale of Information Processing and final grade, and cumulative professional GPA can be found in Figure 1.



Table 3

## Spearman Correlations of LASSI Scale Scores and Academic Performance

LASSI Scales	Final course grade	Exam average	profGPA	uGPAcum	uGPAsci
<b>Skill component</b>					
INP	-0.43**	-0.14	-0.43**	-0.29*	-0.36*
SMI	-0.07	0.08	-0.10	-0.54**	-0.30*
TST	0.32*	0.21	0.29*	-0.06	0.05
<b>Will component</b>					
ANX	-0.03	0.09	0.09	-0.11	0.02
ATT	0.06	0.09	0.02	0.08	0.04
MOT	0.29	0.13	0.25	0.08	-0.18
<b>Self-regulation component</b>					
CON	0.05	-0.11	0.05	-0.18	-0.13
SFT	-0.36*	-0.21	-0.30*	-0.28	-0.31
TMT	0.14	0.02	0.05	-0.15	-0.16*
UAR	-0.25	-0.26	-0.21	-0.02	-0.11

\* $p < 0.05$ ; \*\* $p < 0.01$

Key. ANX – anxiety; ATT – attitude; CON – concentration; INP – information processing; MOT – motivation; SMI – selecting main ideas; SFT – self-testing; TST – test strategies; TMT – time management; UAR – using academic resources; profGPA = professional cumulative GPA; uGPAcum = undergraduate cumulative GPA; uGPAsci = undergraduate science GPA

Figure 2 represents the relationship between the LASSI scale of Self-testing and final grade, and cumulative professional GPA. The results in Figure 3 demonstrate the relationship that was detected between undergraduate admissions variables and academic performance in this interdisciplinary cohort of OT and PT students. Figure 3 illustrates the historical relationship that exists between performance in undergraduate core science coursework and success in future sciences.

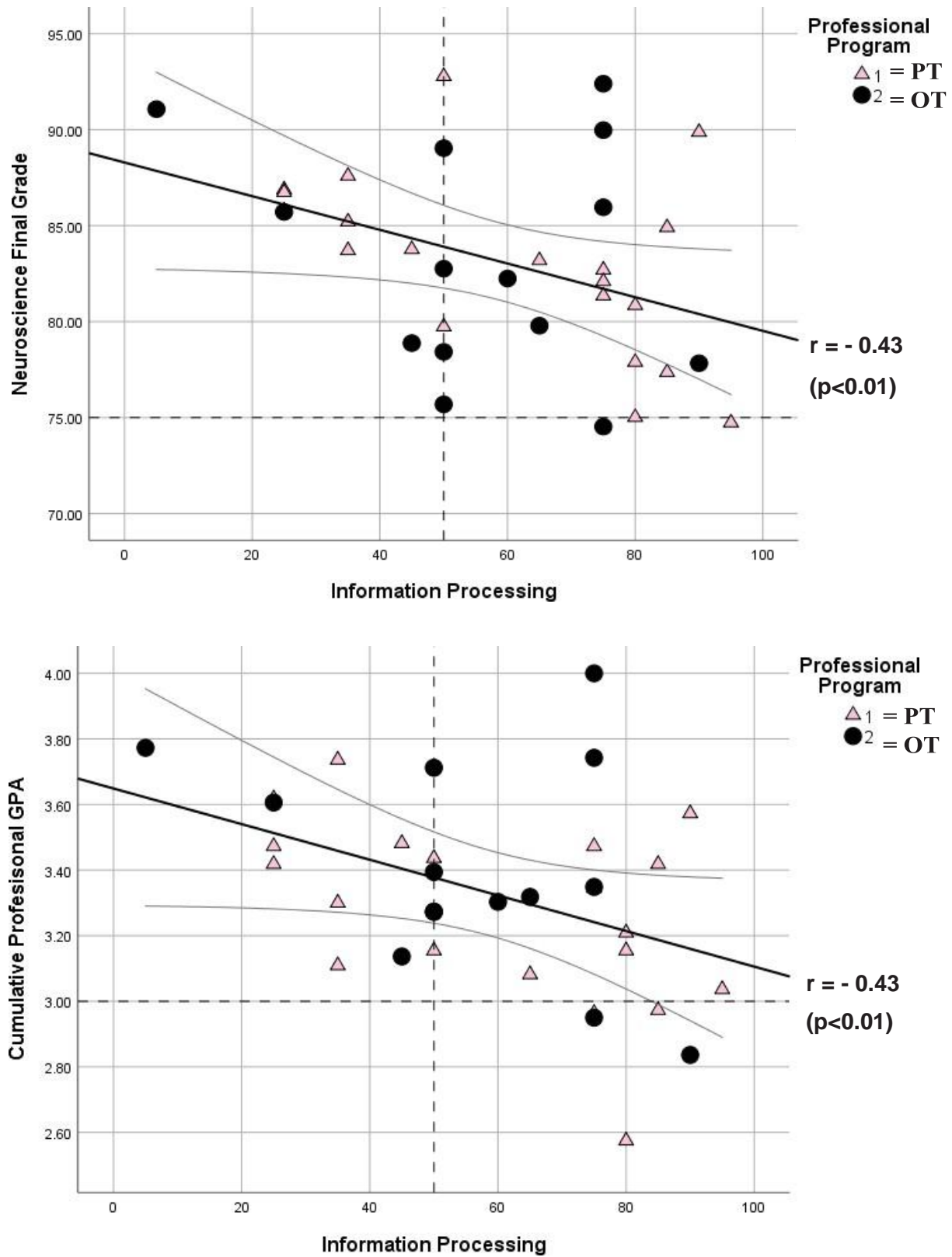


Figure 1. Relationships to the LASSI Scale of Information Processing.

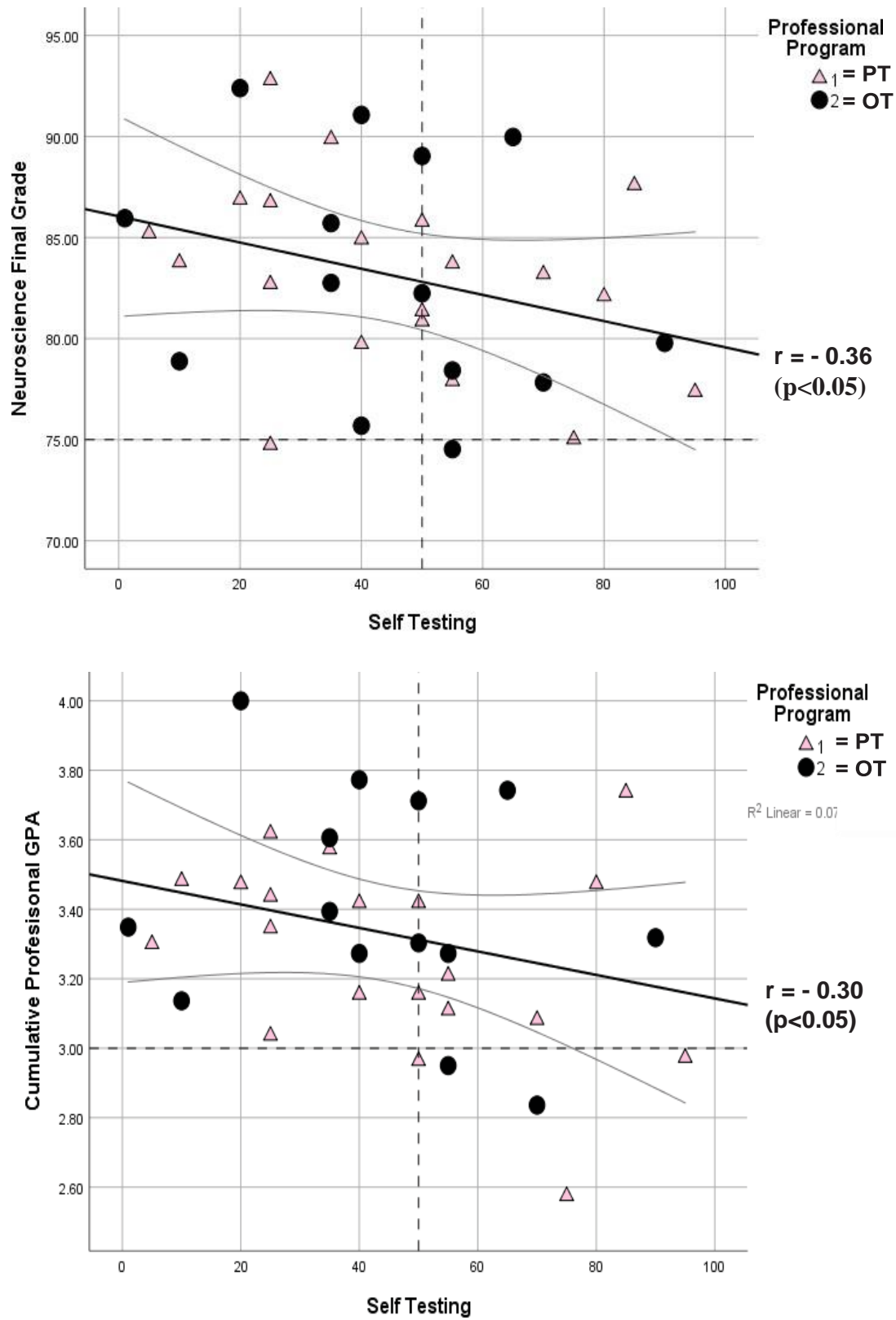


Figure 2. Relationships to the LASSI Scale of Self-Testing.

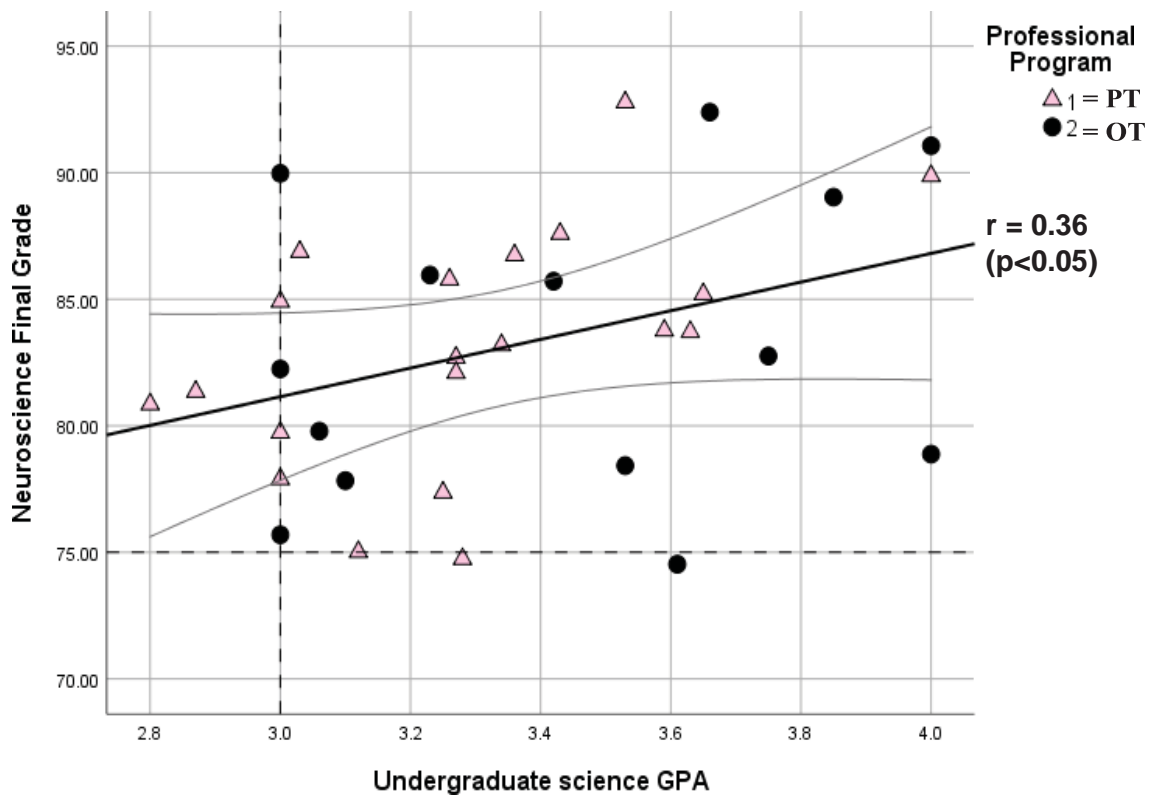
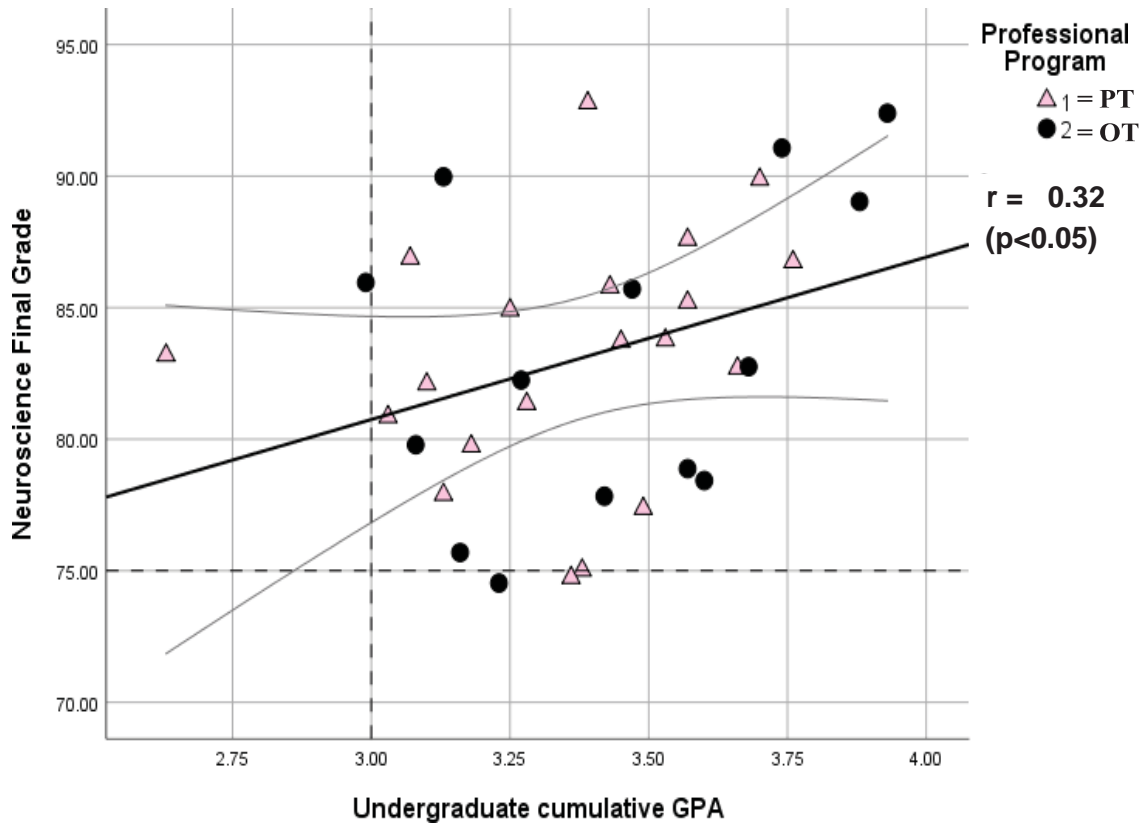


Figure 3. Relationship to undergraduate academic performance.

## DISCUSSION

Prior investigations in health professions education have demonstrated positive relationships between the LASSI and student outcomes, chiefly the scales of Time Management, Motivation, Concentration, and Self-testing Strategies (Haghani & Sadeghizadeh, 2011; Jouhari, Haghani, & Changiz, 2016; Khalil, Williams, & Hawkins, 2018; Zhou et al., 2016). It was originally hypothesized that the LASSI scales of Motivation, Time Management, and Self-testing would be positively related to academic performance in this course, while Anxiety would be negatively related. However, the hypotheses were not supported in the findings. Interestingly, males and females differed significantly across several scales of the LASSI, particularly Anxiety, Motivation, and Time Management. This may indicate that gender played a role in influencing outcomes, however, lay outside the scope of this study. Although no significant positive findings were identified for the hypothesized outcomes, valuable results were uncovered. In this study, only one of the ten LASSI scales were positively related to academic performance, Test Strategies. The Test Strategies scale measures a student's actions and behaviors that influence performance and execution on examinations (Hicks, 2010; Weinstein et al., 2016). However, the relationship of Test Strategies to academic performance was found to be modest, at best, and should be interpreted cautiously. In large part, results from this study conflict with prior findings from many studies using the LASSI with similar designs across fields of education (Crede & Kuncel, 2008).

Overall, the findings from this study demonstrate that a modest negative relationship exists between some scales of the LASSI and academic performance in a hybrid-online neuroscience course for OT and PT students. This study found that the scales of Information Processing and Self-testing were modestly and negatively related to academic success. Interestingly, significant findings were detected in the Skill component of the LASSI, although the Skill component itself was not found to be significantly related to academic outcomes. This suggests that these scales may be more valuable in measuring academic difficulty, and those who may struggle, instead of success. The scale of Information Processing measures how a student chooses to absorb, make meaning of, and accommodate new information into existing structures and evaluates one's cognitive skill (Hicks, 2010; Weinstein et al., 2016). On the other hand, the scale of Self-testing measures how a student continually evaluates their understanding as they learn new information and the ability to perform progressive self-assessment. In this sample, it appears that these strategies were more highly utilized by less successful students, and perhaps should have been avoided for OT and PT students in online coursework. As such, Information Processing and Self-testing may be inferior sets of learning and study strategies that are more indicative of struggling students in graduate health professions. Unfortunately, the exact mechanisms by which these strategies impact academic performance are not fully understood and lay outside the scope of this investigation. However, this information can be helpful to both students and educators as there is equal value in understanding which strategies to encourage, and those to evade.

Not surprisingly, prior academic performance in undergraduate science and undergraduate cumulative GPA were significantly related to academic outcomes in this graduate clinical neuroscience course. This was an important component of the study as it anchored the results of each participant to their historical academic performance. The results from this study indicate that undergraduate admissions variables are related to future performance in a graduate-level science course and is well supported by prior literature (Riddle et al., 2009; Utzman, Riddle, & Jewell, 2007). One may expect students with a history of academic difficulty in undergraduate core sciences to have a greater propensity to struggle in more challenging graduate-level sciences. However, it appears that this was not the case for the subjects included in this study, suggesting performance may have been linked to other factors such as learning strategies. As a result, these findings establish consistency in performance for science coursework, thereby lending credibility to the data collected from participants.

This study has limitations, and the results should be interpreted with caution when considering its external validity. This sample consisted of second-term OT and third-term PT students enrolled in a hybrid-online clinical neuroscience course and may not be representative of the broader population of these learners. Therefore, these results may not be applicable to other institutions that harbor more traditional instructional methods. Given the results of this study, it may be more beneficial to examine the LASSI in relation to measures of academic difficulty instead of success. This study was also limited by a small sample size and larger than expected variation in LASSI scores. Future studies should seek to enroll larger samples of students and prospectively examine the prognostic and diagnostic utility of the LASSI across a curriculum. Furthermore, although psychometric properties for the LASSI have been well-established, studies should interrogate the reliability and validity of the LASSI measurement in this population of learners and educational setting. Lastly, future studies should consider examining the use of the LASSI in relation to other measures of future performance, such as cumulative professional GPA at graduation or national licensure examination passing rates.

### **CONCLUSION AND IMPLICATIONS FOR OCCUPATIONAL THERAPY EDUCATION**

Although relationships appear to be modest as best, some scales of the LASSI are significantly related to academic difficulty in this sample of OT and PT students. OT students who rely on certain learning strategies may be at risk for academic difficulty in hybrid-online coursework. For example, students who prefer to endorse the elements measured in the LASSI scales of information processing, self-testing, and test strategies compared to other learning strategies may result in lower academic performance in online or hybrid-online learning. OT educators should consider utilizing the LASSI measurement in programs with online coursework to screen for learning strategies that may support learning outcomes.

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