Relationships Matter: The Role of Teacher-Student Relationships in Predicting

Engagement, Achievement, and High School Dropout

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Purpose

Learning is an interactive process where both students and teachers are involved (Pianta et al., 2012). Much research has documented that positive teacher-student relationships (TSRs) significantly predict student engagement and academic achievement (Roorda et al., 2011). Specifically, during adolescence where students face more academic and emotional challenges (Eccles et al., 1993), students may need more support and help from teachers. Indeed, the role of TSRs has been reported to be particularly critical for secondary students' engagement and achievement (Roorda et al., 2011).

Despite the strong evidence of TSRs in predicting engagement and achievement with general populations, little is known about how strong these associations would be for high school bilinguals, who tend to be at greater risk of lower achievement compared to their native English-speaking peers (Sheng et al., 2011). Besides, even fewer studies have examined distal outcomes such as high school dropout in relation to TSRs, which leaves us with an unanswered question about the long-term educational effect of TSRs. The purpose of this research is to fill this gap by using a path analysis (see Figure 1 for a conceptual model).

Prior Literature

TSRs, which refer to students' perceptions of trust, support, and identification with their teachers (Davis, 2001; Ryan et al., 1994), has been well-documented as a significant predictor of engagement and achievement (Roorda et al., 2011). In a meta-analytic review analyzing 99

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studies, Roorda et al. (2011) found that as students perceived interest and care from their teachers, their engagement in class and achievement increased. Furthermore, TSRs had a stronger impact on achievement for students with a lower SES and ethnically minoritized students. However, in the TSRs literature, little research has been done with bilingual students, which may be another critical potential moderator considering that these populations have been reported to need additional support in academic settings (Jimerson et al., 2016). Also, prior research has often overlooked the multidimensionality of engagement such as behavioral and emotional engagement (Fredricks et al., 2014) in relation to TSRs (Roorda et al., 2011).

Lastly, despite the importance of high school dropout as an indicator of students' academic success, only a handful of studies have examined the impact of TSRs on high school dropout (e.g., Noble et al., 2021). Considering that bilingual students are often reported to be at greater risk of dropping out of high school (Abedi, 2004), this proposed research will contribute to providing evidence of TSRs as a promising predictor of bilingual students' high school completion.

Bringing both evidence and limitations from prior literature together, my research questions are as follows: (1) To what extent do TSRs predict engagement, achievement, and high school dropout? (2) To what extent the impact of TSRs on engagement, achievement, and high school dropout differ depending on students' bilingual status?

Method

I will use High School Longitudinal Study of 2009 data (Ingels et al., 2011). This is nationally representative data of approximately 23,000 9th graders. Items that will be used in this proposed research are presented in Table 1. I will design a structural equation modeling (SEM), which is useful for both analyzing a path analysis and a confirmatory factor analysis.

Research Plan and Deliverables

I will conduct data cleaning between March and April 2022 so that I can focus on analyzing data during next Summer. Then, I will write a proposal for the annual meeting of the American Educational Research Association in July 2022. I will submit a manuscript for publication to the

Journal of Adolescence by October 2022 (see Table 2).

Prior Research Skill Development

I am well-positioned at this point to complete the proposed research. I have built strong knowledge in the TSRs literature through CEP 904 (Social-Emotional Development). Also, I participated in SEM workshop in May 2020 taught by Dr. Amy Nuttall, which equipped me with a good knowledge of SEM methods including CFA and moderation within a path-analysis framework.

Conclusion

The use of nationally representative data will help provide more generalizable evidence for the critical role of TSRs in supporting bilingual students' educational outcomes. Furthermore, this research will provide practical implications for designing high school dropout preventions by emphasizing a need to build positive TSRs as an important component of high school dropout preventions.

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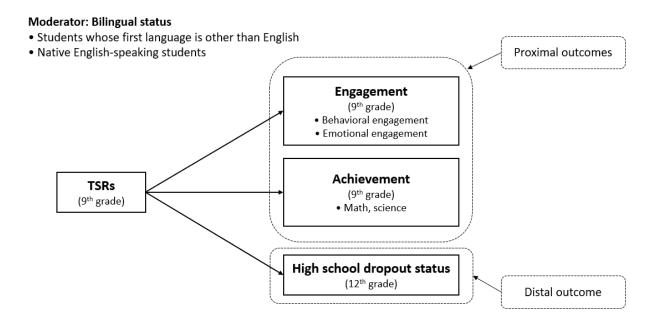
Appendix

Figure 1. *Conceptual model*

Table 1.

Variables and Items from HSLS:09 data

Variables	Items	Descriptions
Teacher-Student Relationships	S1MTCHVALUES	Your math teacher values and listens to students' ideas.
	S1MTCHRESPCT	Your math teacher treats students with respect.
	S1MTCHFAIR	Your math teacher treats every student fairly.
	S1MTCHCONF	Your math teacher thinks every student can be successful.
	S1MTCHMISTKE	Your math teacher thinks mistakes are okay as long as all students learn.
	S1MTCHTREAT	Your math teacher treats some kids better than other kids. *(Reverse item)*
	S1MTCHMFDIFF	Your math teacher treats males and females differently. *(Reverse item)*
	S1STCHVALUES	Your science teacher values and listens to students' ideas.
	S1STCHRESPCT	Your science teacher treats students with respect.
	S1STCHFAIR	Your science teacher treats every student fairly.
	S1STCHCONF	Your science teacher thinks every student can be successful.
	S1STCHMISTKE	Your science teacher thinks mistakes are okay as long as all students learn.
	S1STCHTREAT	Your science teacher treats some kids better than other kids. *(Reverse item)*
	S1STCHMFDIFF	Your science teacher teats males and females differently. *(Reverse item)*
	• *NOTE.* The items were asked to respond on a 4-sclae Likert scale (1 = Strongly agree, 2 = Agree, 3 = Disagree, and 4 = Strongly disagree) • *NOTE.* Final items will be determined based on a CFA.	
Student Engagement		
Behavioral Engagement	S1NOHWDN	How often do you go to class without your homework done?
	S1NOPAPER	How often do you go to class without pencil or paper?
	S1NOBOOKS	How often do you go to class without books?
	S1LATE	How often do you go to class late?
	• *NOTE.* The items were asked to respond on a 4-sclae Likert scale (1 = Never, 2 = Rarely, 3 = Sometimes, and 4 = Often)	
Emotional Engagement	S1MENJOYING	You are enjoying your math course very much.
	S1MWASTE	You think your math course is a waste of your time.
	S1MBORING	You think your math course is boring.
	S1SENJOYING	You are enjoying your science course very much.
	S1SWASTE	You think your science course is a waste of your time.
	S1SBORING	You think your science course is boring.
	• *NOTE.* The items were asked to respond on a 4-sclae Likert scale (1 = Strongly agree, 2 = Agree, 3 = Disagree, and 4 = Strongly disagree)	
Academic Achievement	Student math and science grade at base year, when students were 9th grade.	
High School Dropout	X2DROPSTAT	Student dropout status in 2013 (when students were 12th grade)
Moderator:	S1LANG1ST	What was the first language you learned to speak when you

Variables	Items	Descriptions
Bilingual Status		were a child? 1 = English 2 = Spanish 3 = Another language 4 = English and Spanish equally or 5 = English and another language equally
Covariate: prior achievement	S1M8GRADE	What was your final grade in math course you took in the 8th grade? 1 = A (90 to 100), 2 = B (80 to 89), 3 = C (70 to 79), 4 = D (60 to 69), 5 = Below D, 6 = Your class was not graded.
	S1S8GRADE	What was your final grade in science course you took in the 8th grade? 1 = A (90 to 100), 2 = B (80 to 89), 3 = C (70 to 79), 4 = D (60 to 69), 5 = Below D, 6 = Your class was not graded.
Covariate: SES	X1SES	Parent/guardian education, parent/guardian occupation, and family income.
Covariate: Ethnicity	S1HISPANIC	Are you Hispanic or [Latino/Latina]? 1 = Yes, 0 = No
		Which of the following choices describe your race? You may choose more than one.
	S1WHITE	0 = No, 1 = Yes
	S1BLACK	0 = No, 1 = Yes
	S1ASIAN	0 = No, 1 = Yes
	S1PACISLE	0 = No, 1 = Yes
	S1AMINDIAN	0 = No, 1 = Yes

NOTE. All the items were collected at the base year of 2009, when students were 9th grade, except high school dropout status and prior achievement.

Table 2.

Timeline for actions and deliverables

Processes	Time	Specific Tasks
Elaborate on literature review	Jan.-Feb. 2022	• Elaborate more on prior literature review on TSRs in relation to engagement and achievement • Elaborate more on prior literature review on TSRs with bilingual students and their high school dropout • Examine potential covariates other than SES and ethnicity
Data cleaning	Mar.-Apr. 2022	• Data cleaning of HSLS:09 dataset: Data for public use are available through NCES website: https://nces.ed.gov/onlinecodebook
Data analysis	May-Jun. 2022	• Handling missing data • Confirmatory factor analysis • Path analysis - Predictors: TSRs - Outcomes: engagement, achievement, high school dropout - Moderator: bilingual status - Covariates: SES, ethnicity • Software programs: SPSS, Mplus
Write a proposal and submit it to AERA	Jun.-Jul. 2022	• Word limit: 2,000 words (literature review, purpose, method, results, and discussion)
Write a publishable manuscript and submit it for publication	Aug.-Oct. 2021	• Introduction, Methods, Results, Discussion
Deliverables	**Time**	**Target Conference & Journal**
Submit the proposal	Jul. 2022	• Target conference: AERA
Write-up the manuscript	Aug.-Sep. 2022	• Target journal: Journal of Adolescence
Submit for publication	Oct. 2022	

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Research Proposal for Summer Research Fellowship (SRF) 2022

Receiving a 2022 SRF will advance my current research and the development of my dissertation proposal after completing EAD 995 in Spring 2022. SRF 2020 focused on the experiences of mid-level administrators[1] working in Student Affairs (SA) within the U.S. and Canada. Through semi-structured interviews (Coe et al., 2017), I conducted an exploratory study investigating this group's ability to persist towards personal and career success, and how post-secondary education (PSE) institutions can support and retain this population. Using a self-concept of everyday resilience—*buoyancy* (Martin & March, 2008)—as my theoretical framework, I interviewed 51 individuals[2] who self-identify as SA mid-level administrators (Appendix 1). Analysis commenced fall 2021 as an independent study, and the final product will be a manuscript submitted in December to the Journal of SA Research and Practice (JSARP). This will introduce and distinguish *career buoyancy* to the profession (Appendix 2).

SRF 2022 Objectives

My goal is to conduct in-depth interviews (Mears, 2017) with a purposive selection (Cresswell, 2015) of participants from SRF 2021 considering self-identified characteristics. My intention is to seek theoretical saturation around career buoyancy as a concept. This approach will focus my research and enhance the connection to theory. Specifically, by engaging

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[1] The population of administrators I research will be referred to as "mid-level". There is discourse in how mid-career, or mid-level, administrators are described. The most consistent definition describes someone with: (i) Minimum of five years as a full-time professional, (ii) Responsibility for the budget, direction, control, or supervision of one or more units, and (iii) Supervising one or more professional staff members.

[2] I aimed for 15 interviews through open-access registration. Nearly 70 completed the registration form and I continued to schedule and interview people as I made progress throughout the summer.

participants in a different way from my "tightly scripted" (Mears, 2017, p. 184) 2021 interviews, in-depth methods can lead to deeper analysis to build on my SRF 2021 research. Accordingly, I will: (1) Explore similarities and/or differences from their responses related to the concept of career buoyancy, (2) Identify relationships and patterns of association (e.g., relationship between the 'buoyant' professional and the profession).

Significance Focusing Research on the Mid-level SA Administrator Population

While there is comprehensive focus on SA administrators and their departure from the profession, this study aims to understand success factors (e.g., behaviours, structures). Mid-level success, broadly, is mutually beneficial to the individual and the organization, as the population is: (1) Among the largest number of administrators within most PSE institutions (Rosser, 2006; Say, 2019; Schuh, 2005), and (2) An essential component to the organizational structure of a campus due to the size of this population, their vast responsibilities, and knowledge base (Harris et al., 2016; Tull et al., 2009). Further importance relates to their consistent characteristics, as they: (A) Have the opportunity to influence all levels of leadership, (B) Have direction over systems, work, budget, and personnel, and (C) Likely hold capital through their knowledge base and engagement with their professional field (Porath et al., 2012; Say, 2019).

However, general satisfaction of this group is inconsistent. While this population is known to have a strong professional identity, there are expressed challenges regarding opportunities for advancement, lack of mentorship, and feelings of minimal recognition and morale. Having gathered insights from my 2020 interviews about *how* and *why* they persist, in-depth interviews will ground a greater understanding of the concept of buoyancy. Other literature focuses on concepts of *thriving* and *resilience* of this population, whereas buoyancy concentrates on necessary, everyday coping strategies.

Contributions to the Field of Higher Education and the SA Profession

Prior to the pandemic, this was a relevant topic to understand this population's development and needs. This research can result in individuals' inherent abilities to self-improve, regulate, and "achieve fulfillment" (Brown et al., 2017, p.169). However, current media is focusing on how PSE staff and administrators, broadly, are leaving their careers as a result of the pandemic (Tomac, 2021), with some calling it "the great resignation" (Schroeder, 2021). In-depth interviews will bolster my earlier findings, resulting in conference proposals and a second JSARP manuscript focused on organizational and leadership implications for practice. As a result, while this project is focused specifically on mid-level SA administrators, it could offer perspective to different campus populations or other education sectors. For example, findings may describe what leadership needs to do to foster generative environments and influence self-directed success strategies for other employee groups.

Scholarly Development & SRF Deliverables

My goal is to continue applying my qualitative methods, advanced analysis training, and writing skills to advance my doctoral candidacy. Prior to MSU, I worked in progressive administrative and leadership roles in SA. Therefore, I will deliver accessible implications for practice that are translatable to faculty and administration. I am committed to demonstrating my critical voice through evaluation of current literature, data, and integration of my own experiences. See Appendix 3 for a detailed timeline for this research project.

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Appendices

Appendix 1

Overview of Self-identification of Mid-level Student Affairs Participants (n=51), Summer 2021

Pseudonym	Racial Identity(-ies)	Ethnic Identity(-ies)	Country	Gender Identity	Highest Credential	Years in the Profession
Adam	-	-	U.S.	Male	Ph.D–Higher Education	15
Adriana	Black	Black	U.S.	Female	Masters–Education	12
Alysha	-	-	Canada	Female	-	9
Andy	White	White	Canada	Male-ish	Masters–Education	13
Angela	White	-	Canada	Woman	Masters–Business	14
Annie	White	White	U.S.	Female	Masters–Education	9
Becca	Caucasian	Canadian	Canada	Cis-Female	Bachelors	12
Brian	Masters	-	U.S.	Male	Masters–Education	13
Deanna	Black	Black	U.S.	Female	Masters–Education	13
Deanna	Caucasian	Settler; Indigenous ancestry	Canada	Female	Bachelors	13
Eliisa	White	Canadian	Canada	Female	Bachelors	14
Elisabeth	-	-	Canada	Female	Ed.D.	15
Eliza	White	Latino	Canada	Woman	Masters–Education	15
Elsie	-	-	Canada	Female	Masters–Education	7
Franca	White	Canadian	Canada	Female	Masters–Education	14
George	White	British	Canada	Male	Masters–Arts	15
Ian	-	-	U.S.	Male	Ph.D–Higher Education	14
Jacquie	Person of Colour	Latina	U.S.	Female	Masters–Teaching	8
Jared	White	-	U.S.	Male	Masters	11
Jasmine	Caucasian	Caucasian	Canada	Woman	Masters–Public Health	11
Jason	-	-	Canada	Male	-	12
Jennifer	Black	Black	U.S.	Female	Masters–Education	9
Jessica	White	Canadian Settler	Canada	Cis-gender woman	Masters–Education	13

Pseudonym	Racial Identity(-ies)	Ethnic Identity(-ies)	Country	Gender Identity	Highest Credential	Years in the Field
John	-	-	U.S.	Male	Masters–Education	12
Kelly	White	European	Canada	Female	Bachelors	13
Kira	-	-	Canada	Male	Ed.D.	13
Kristen	-	-	U.S.	Female	Masters	13
Laura	White	Portuguese-Canadian	Canada	Female	Ph.D–Higher Education	15
Lauren	-	-	Canada	Female	Diploma	9
Leo	-	-	U.S.	Male	Bachelors	12
Lidia	White	-	Canada	Male	Ed.D.	16
Lisa	Caucasian	-	Canada	Female	Masters–Education	12
Marc	South Asian	Goan, Indian	Canada	Cisgender Male	Masters–Education	12
Maria	White	Italian	Canada	Female	Ed.D.	14
Mark	White	Caucasian	Canada	Male	Masters–Education	19
Mark	-	-	U.S.	Male	Bachelors	14
Nancy	-	-	Canada	Female	-	14
Olivia	-	-	U.S.	Female	Masters–Education	9
Paul	-	-	U.S.	Male	Masters–Education	9
Paula	White	-	Canada	Female	Masters–Education	11
Rebecca	White	European	Canada	Female	Bachelors	9
Rhonda	Black	Black	U.S.	Female	Ed.D.	14
Sara	White	Anglo	Canada	Male	Masters–Education	13
Sharon	-	-	U.S.	Female	Masters–Education	15
Steven	-	-	U.S.	Male	-	11
Susan	White	Irish	Canada	Female	Masters–Sciences	9
Sussie	-	-	Canada	Female	-	14
Taylor	Caucasian	Canadian	Canada	Female	Masters–Education	11
Valerie	White	White	U.S.	Female	Masters–Education	13
William	-	-	U.S.	Male	Bachelors	15

Appendix 2

Table Summarizing Differences and Key Ideas Related to Different Career Development Frameworks Developed By Researcher

CONTEXT	**THRIVING**	**BUOYANCY**	**RESILIENCE**
DEFINITION	"When people are thriving, they feel progress and momentum, marked both by a sense of learning and a sense of vitality." (Spreitzer et al., 2005)	"...resilience research has been extended to consider more 'everyday' resilience that is typical of the ordinary course of life. This 'everyday resilience' has been referred to as buoyancy." (Parker & Martin, 2009)	"The process of negotiating, managing, and adapting to significant sources of stress or trauma. Assets and resources within the individual, their life and environment facilitate the capacity for adaptation in the face of adversity." (Winwood et al., 2013)
Smith, BRG: *Buoyancy* is distinguished from *thriving* and *resilience* because it focuses on an individual's fluid, everyday experiences. Thriving is a psychological state and feeling, while resilience is a behavioural response resulting from some sort of pressure. Buoyancy is resilience in daily practice—how an employee responds to the ebbs and flows of the changing demands of the workplace. Buoyancy is not necessarily a process responding to a period of stressors. Rather, buoyancy is the daily example of how resilience 'shows up' in an employee, and enables them to work towards thriving or bouncing back when necessary.			
KEY AUTHORS	Schreiner Spreitzer, et al., 2005 <-at work Nieto, 2009 <- 'survive to thrive' Carver, 1998 Spreitzer & Sutcliffe, 2007<-orgs	Parker & Martin, 2009 Martin & March, 2006:2019 Martin & Burns (academic buoyancy) Calhoun et al., 2019 (athletics)	Caza, 2021...Spreitzer Carver, 1998...Powley et al., 2020 Sutcliffe & Vogus, 2003 Masten & Reed, 2002 Caza & Milton, 2012
KEY IDEAS	-socially embedded; varies by employee gr. -self-adaptation" "goal-oriented activities" -'practical' link to health (broadly) -learning=contribution at work -important because some people want to spend more time at work -occurs with/without adversity -focuses on the positive <u>psychological</u> experience of increased learning and vitality to develop/grow at work -distinct from subjective well-being	-individuals' <u>self-perception</u> of their ability to successfully deal with setbacks and challenges that are typical of the ordinary course of life (e.g., poor performance, competing deadlines, pressure, difficult tasks) - necessary coping -traditional conceptions of resilience are relevant to a relatively small (but important) proportion of the population while buoyancy is more relevant to understanding the challenges -4-scale: setback, challenge, adversity, pressure	-similar to thriving by which an individual's capacity for adaptability and positive adjustment -focuses on rebounding in the face of particularly extreme and extenuating circumstances that pose a threat to outcomes -<u>behavioral</u> capacities that allow one to bounce-back from untoward events -a response to some sort of challenge/overcoming… "homeostatic return"

Appendix 3

Proposed Timeline for Study

TIMELINE	OBJECTIVES
SPRING TERM	*Prior to indication of any funding of this project*: • arrange/order purposive sample based on criteria (e.g., years in field, self-ID's, location) • review/refine RQs • draft interview protocol which considers SRDF 2020[3] outcomes and SRF 2021 results *Once signaled to receive funding:* • submit revision to existing IRB so project is ready to launch • update participants status of project and invitation to participate
Weeks 1–2	• begin interviews *In tandem:* • organize and update data management and platforms (e.g., Dedoose).
Weeks 3–4	• continue data collection *In tandem* • meet with peer-reviewer (colleague; academic and experienced administrator in PSE) to overview project for support in bias check.
Weeks 6–10*	• theme, categorize, complete thematic analysis; compare with 2020 findings • draft findings and ensure critical analysis *In tandem* • begin member check process to establish credibility/trustworthiness • present draft to peer-reviewer (see above) • draft discussion and implications; submit to Dr. Renn for review • identify and apply for opportunities to present literature for conferences (i.e. ASHE, NASPA) and/or journal publication

**Note:* From my previous SRDF and SRF experiences, I learned that this phase of research requires adaptability. IRB approval prior to my SRF beginning was key to my success, therefore I plan to submit my revisions (e.g., IRB, invitation prose, consent documents) in the Spring term again. I feel the objectives in weeks 1–2 and 3–4 are pertinent to the success and organization of the project, and while the objectives noted in weeks 6–10 are as important, I will likely need to adapt to what is needing attention and focus in this broader timeframe. As a result, I have indicated objectives that require confirmed schedules (i.e. membership) with those that allow for flexibility (i.e. writing, conference application preparation) to ensure productivity.

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[3] The 2021 SRF stemmed from my 2020 Summer Research Development Fellowship which resulted in a narrative literature review and research questions for the 2021 SRF study. The literature review focused on: (1) Who mid-level professionals are and their responsibilities (Rosser, 2000; Tull et al., 2009), (2) Synthesis of their capitol and knowledge base (Harris et al., 2016; Johnsrud, 1996; Rosser, 2003; Say, 2019; Schuh, 2005), (3) Analysis of historic burnout literature specifically on the SA population (Rosser, 2000; Say, 2019; Tull et al., 2009), and (4) Conversation about what may influence this population to thrive and advance in their careers (Brown et al., 2017; Porath et al., 2012).

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Identifying Deficits in Visual and Sensorimotor Skills Following Sport-Related Concussion in High School and Collegiate Athletes

Background.

Sport-related concussion (SRC), defined as a traumatic brain injury induced by biomechanical forces,[1] is a challenging issue facing the sport and medical community. One emerging area of SRC research is the assessment of visual and sensorimotor skills following SRC. In athletes, the sensory system plays a crucial role in performance and return to sport from injury. Vision and the vestibular system contribute substantially to an individual's balance and coordination, and deficits in these areas have been shown following SRC.[2,3] Current evidence has also demonstrated deficits in depth perception, reaction time, and eye-hand coordination in individuals with a history of SRC.[4-6] **These processing deficits, among others, following return to play could lead to serious consequences, including a subsequent SRC or lower extremity musculoskeletal injury**.[7,8]

Common SRC assessments used to test eye movement are the King-Devick (KD) and Vestibular-Ocular Motor Screening (VOMS) tests, which have demonstrated usefulness in the evaluation of SRC.[2,9-13] Assessments of sensorimotor skills, such as reaction time, have been measured using computer programs or clinic-friendly adaptations (e.g., stick drop for reaction time).[14,15] **The critical barrier is that these assessments only measure visual and sensorimotor ability in isolation and may not adequately test the wide range of skills used when athletes return to sport**. Assessment tools that measure a battery of visual and sensorimotor skills, such as the Senaptec Sensory

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Station (Senaptec),[16] should be evaluated to determine reliability and usefulness following SRC.

Senaptec is comprised of interactive touch screen devices and a remote utilized to test 10 visual and sensorimotor skills (Table 1). Extant literature has used Senaptec to examine the effect of sensorimotor performance on head impact biomechanics and to compare performance in combat soldiers with and without concussion history.[17,18] However, there is no evidence in the high school and collegiate population following SRC. Therefore, the primary aim for the proposed fellowship is to support the data collection, analysis, and dissemination of findings pertaining to the examination of Senaptec following SRC.

Summer Research Fellowship Proposal.

During the 2022 Spring and Summer semesters, I will build on my 2021 _Summer Research Fellowship_ (SRF), which I used for data collection, analysis, and abstract development. The purpose of my study remains threefold: Arm 1 aims to determine the reliability of Senaptec; Arm 2 aims to examine the influence of SRC history on visual and sensorimotor ability; and Arm 3 aims to examine visual and sensorimotor ability throughout recovery following SRC. To date, I have enrolled 72 participants in Arm 1 and 2, and 20 participants in Arm 3. Preliminary findings from Arm 1 have demonstrated good reliability for sensorimotor skills, but poor reliability for most visual skills (Table 1). Preliminary findings from Arm 2 demonstrated no persistent deficits in visual and sensorimotor skills between college students with a concussion history compared to those without a concussion history. These findings have been submitted as abstracts for presentation at the American College of Sports Medicine (ACSM) and the National Athletic Trainers' Association.

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Proposed Goals.

Table 2 includes my proposed timeline for the summer.

1. **Goal 1:** *Data collection and analysis.*

   a. Data will be collected in the BRAIN Laboratory in the MSU Department of Kinesiology. I plan to enroll 28 additional participants to complete Arm 1 and 2, according to my *a priori* power analysis. My main focus will be on data collection for Arm 3, including healthy, age-matched controls for my concussed participants. Accounting for attrition, 43 participants for my concussion and control group will be required to identify significant between-group differences.

2. **Goal 2:** *Dissemination of findings.*

   a. Combined with data I collect throughout this academic year, findings from Arm 3 will be developed into abstracts and submitted to academic conferences (e.g., ACSM). Additionally, with my mentor, I will develop my findings from Arm 1 and 2 into manuscripts for submission to *The American Journal of Sports Medicine*.

Significance and Future Directions.

This fellowship will support my original work, improve my research skills in data collection/analysis and abstract/manuscript development, and allow me to provide important contributions to the SRC literature where more research is needed.[19] Findings from this study will aid healthcare professionals in better understanding visual and sensorimotor deficits and how they may influence the recovery process following SRC.

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Appendix.

Table 1. Senaptec Sensory Station test domains and preliminary reliability results.

Domain	Description	Procedures	Units	ICC (95% CI)*
Visual Clarity	How well can participant see distant details	Swipe in the direction of the opening in the C-shaped ring	LogMAR (lower is better)	0.49 (0.17-0.69)
Contrast Sensitivity	How well can participant judge contrast differences	Swipe in the direction of the circle containing a pattern of rings	LogCS (higher is better)	0.30 (-0.13-0.57)
Depth Perception	How well can participant judge depth and distance	With 3D glasses on, swipe in the direction of the ring that appears closest	Arcsec (lower is better)	0.84 (0.74-0.90)
Near-Far Quickness	How rapidly and accurately participant can shift their gaze between near and far	Swipe in the direction of the opening in the C-shaped ring as it alternates between tablet and remote display	# correct (higher is better)	0.28 (0.12-0.55)
Perception Span	Tests scope of participant's visual field and how well visual information is acquired	Replicate the pattern of dots flashed in the circles within the grid	Total score (higher is better)	0.67 (0.46-0.79)
Multiple-Object Tracking	How well participant can divide attention between moving objects and track them at various speeds	Select the dots that flashed red at the beginning of the tests once they are done rotating	Composite score (higher is better)	0.86 (0.77-0.91)
Reaction Time	How rapidly participant can react in response to a visual stimulus	Remove the required index finger when the pattern turns red as quickly as possible	Msec (lower is better)	0.79 (0.63-0.88)
Target Capture	How quickly participant can shift their gaze and recognize a target in their periphery	Track the C-shaped ring as it appears in different corners of the screen and swipe in the direction of the opening	Msec (lower is better)	0.48 (0.16-0.68)
Eye-Hand Coordination	How rapidly and accurately participant can respond to changing target	Touch the green dots that appear within the grid as quickly as possible	Msec (lower is better)	0.60 (0.29-0.77)
Go/No-Go	How rapidly and accurately participant can decide about a target and respond to changes	Touch the green dots that appear within the grid as quickly as possible while not touching the red dots	Total score (higher is better)	0.87 (0.75-0.93)

Abbreviations: ICC = Intraclass Correlation Coefficient, *Unpublished data of N=72 healthy participants (mean age=21.1±2.3; 56 F) from Arm 1. ICCs were interpreted as poor (<0.50), moderate (0.50–0.75), good (0.75–0.90), and excellent (>0.90).

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Table 2. *Summer Research Fellowship* plan of proposed goals and expected timeline of completion.

Proposed Goal	Expected Timeline
Data Collection (Goal 1)	May-July 2022
Data Analysis (Goal 1)	June/July 2022
Abstract Development and Submission (Goal 2)	June/July 2022
Manuscript Development and Submission (Goal 2)	July/August 2022