

KINESIOLOGY

Undergraduate Student Perspectives of Somatic Learning in Kinesiology: The Mind-Body Connection

Emily Noton and Kristi Skebo

Abstract

In Physical Education and Kinesiology faculties in North America, undergraduate students study theoretical knowledge from various sub-disciplines (e.g., physiology, psychology, biomechanics and motor learning) and practice applied knowledge (coaching, playing sports and dance, program design, etc.). However, theory and practice are rarely combined in a single course where students are able to generate somatic knowledge. Subsequently, our faculty and the authors recently re-designed and taught several undergraduate “activity core” courses that combine anatomy, biomechanics and mind-body integration (use of breath, imagery and proprioception) through a somatic learning approach based on somatic practice. The purpose of this study is to understand if/how this somatic approach to learning enabled students to understand more fully the overlap between theory and practice in kinesiology. Likert scale questionnaires were sent to two cohorts of students having completed the first year course, KIN 156 (Introduction to Movement Fundamentals in Fitness). Forty-one of forty-three respondents indicated that the somatic learning approach of the course enabled them to better retain and apply knowledge. Our results indicate strongly that this somatic approach to kinesiology learning, the “doing” of mind-body components while executing movement fundamentals, was of significant value for undergraduate students.

Emily Noton, Faculty of Kinesiology, Sport, and Recreation, University of Alberta, Canada. **Kristi Skebo**, Faculty of Kinesiology, Sport, and Recreation, University of Alberta, Canada. Please send author correspondence to Emily Noton, enoton@ualberta.ca

Introduction

As kinesiology researcher-instructors, we intrinsically know the value that applied and somatic knowledges have in real-life settings for our students, many of whom go on to become physiotherapists, massage therapists, personal trainers, and coaches (Kluijtmans et al., 2017). Yet, the bifurcation of theoretical and applied knowledge has become common in kinesiology faculties across North America, with quantitative research and theoretical learning often dominating the landscape (Anderson, 2020; Andrews, 2008; Kretchmar, 2008 & 2014; Newell, 2007; Vertinsky, 2009). Rather than prioritizing one type of learning/knowledge over the other, or embracing popular dichotomies in kinesiology (theoretical vs. applied, quantitative vs. qualitative) we have chosen to consider how these dualisms can be challenged by approaching teaching with the integration of various types of knowledge.

In our faculty (Kinesiology, Sport and Recreation), a new set of physical activity-based courses was recently designed, marrying quantitative sub-disciplines (anatomy and biomechanics) with qualitative, practical components (mind-body integration driven by breath, imagery and proprioception) through a somatic learning approach (the “doing” of the former components). The learning outcomes of these undergraduate courses include having students generate a holistic and comprehensive understanding of the moving body by experiencing and connecting to the feeling of their own moving bodies. Experienced movement practitioners may recognize that this description has strong ties to somatic practices, which are studied and used more extensively in dance training and research than in the subdisciplines of kinesiology. In the spirit of complementarity, as described by Kretchmar (2014), we taught a redesigned undergraduate kinesiology course with a somatic approach that draws from the first author’s experience as a dancer. We noted that theory and practice were rarely combined in a single undergraduate course where students are able to generate somatic knowledge, and hence this paper’s purpose is to explore student perspectives of somatic learning.

In this course, the first author was the primary instructor and the second author was a teaching assistant; both authors fully participated in movement labs by demonstrating exercises and mov-

ing with the students. While teaching this course, we were privy to overwhelmingly positive feedback from the undergraduate students during class discussions and individual conversations after class. Notable comments included “feeling the movement of the femur helps me understand the hip joint,” “the double-s curve of the spine makes more sense now that I can feel it,” “I actually understand where my iliac crests are,” and “I had never been taught how to breathe properly.” We also noted that our approach in the lab seemed to be enjoyable for the students. As we were unable to find any literature directly addressing this aspect of (somatic) movement learning in kinesiology, we began to realize that our approach was unique. Based on student feedback and our experiences in the labs, we sensed that this approach might be a “missing piece” for kinesiology students, enabling them to operationalize sub-disciplinary theoretical knowledge (such as anatomy and biomechanics). Therefore, our primary aim in this study was to dig deeper into the students’ perspectives of this somatic learning approach and understand if/how this helped students bridge the gap between theory and practice. Understanding students’ perspectives could have wide reaching implications for the structure of our course in the future, kinesiology curriculum/degree requirements, advising practices, and overall student success (e.g., enhancing the skills of our graduates). To do this, we used a 5-point likert scale questionnaire with questions that align with our study objectives:

- a) To understand which topics in the course content were novel.
- b) To understand whether the somatic learning approach was effective in helping students understand, retain, and apply knowledge.
- c) To determine whether the course created overall value for students.

In the next section we briefly review the literature about somatic practice and learning, and student perspectives in kinesiology faculties.

Literature Review

At its core, this study is about demonstrating the effectiveness of a somatic pedagogical approach in undergraduate kinesiology by examining student perspectives of our approach to somatic learning.

Although common in dance settings, integrating first-person somatic learning is not typically done in kinesiology (Bennett, 2020); thus, we feel it's important to spend some time defining somatic practice/learning and its origins. In addition, we briefly discuss the literature about student perspectives of learning in kinesiology. Threaded throughout this section are differences between somatic practices used in a physical education context (dance, movement learning, sport) and those explored by scholars from a socio-cultural perspective (used, for example, in an emancipatory way). Our aim in doing so is to clarify and contextualize the physical education somatic approach we adopted for teaching the kinesiology course highlighted in this study. Rather than using the term somatic pedagogy in this paper, we use somatic learning as we focus primarily on student perspectives. These terms can be interchangeable and simply refer to the perspective being considered: that of the teacher or that of the learner.

Somatic Practice and Learning

Somatic practice and learning is the study of the soma (the living body) as experienced through the inner first-person perspective, rather than the body as an objective entity observed from a third-person viewpoint (Bresler, 2004; George, 2020; Green, 2003; Evans et al., 2009; Hanna, 1988). An early pioneer and teacher of somatic practice in the 1970s, Thomas Hanna (1988) explained that somatics was a matter of looking at oneself from the “inside out,” where one is aware of feelings, movements, and intentions rather than looking objectively from the outside in (Fortin, 2017; George, 2020). Early in the development of his practice, Hanna (1983:1) defined somatics as “the art and science of the interrelational process between awareness, biological function and environment, all three factors understood as a synergistic whole.” This type of training allows the mover to access essential truths of the body directly, rather than relying on authoritative feedback and judgment from an instructor (Fortin, 2017; George, 2020; Green, 1999). Thus, somatic learning entails engagement with subject matter via the body's senses, as described by Stuckey (2009). Other descriptions from Franklin (2012) and Hackney (2002) include the internal physical perceptions that the mover experiences, the body as perceived and physically felt by the

mover, and the simple act of being aware of what we are feeling and sensing while we move.

Historically, somatics, as an (American) approach to movement training, developed as a part of modern dance training practices (Eddy, 2009; Fortin et al., 2002; George, 2020) rather than from a pure sports science (for example, motor skill learning) perspective, which perhaps explains its absence from kinesiology departments despite being well integrated with movement learning in dance. In the second half of the 20th century, notable originators such as F.M. Alexander, Thomas Hanna, Margaret H'Doubler, and Mabel Elsworth Todd spread the practice via their teachings as dancers (George, 2020). Accordingly, dancers, teachers, and choreographers believed in the effectiveness of somatic practice for training the body in a fundamental way; somatic practice was believed to uncover a “natural” way of moving that did not conform to aesthetic ideals, but rather promoted natural anatomical functioning (George, 2020). In a more artistic sense, it was also popularized as an effective approach for generating original and novel movement by helping dancers derive “new” movement patterns directly from their own first-person bodily experiences, thus, in some contexts, somatic practice became a choreographic tool. As a result of its effectiveness in both scenarios (movement training/learning and movement generation) the use of somatic practices, such as body awareness and imagery, have permeated dance training, conservatories and professional companies (Eddy, 2009; Fortin et al, 2002; Green, 1999, 2002; Kirk, 2014). Although this development is seen as originating in America, hubs of somatic training also developed in Australia, Canada, England, Holland, Germany, and elsewhere throughout Europe (George, 2020). Today, the use of somatic practice is ubiquitous in many forms of dance, both in and beyond university dance settings, while still remaining underused in kinesiology (Bennett, 2020).

Returning to Hanna’s seminal (1983/1988) work, there is a distinctly American perspective articulated that connects somatic practice/learning to freedom. We include this perspective because it relates to pedagogical approaches, which can either tilt toward authoritarian and teacher-led or dialogic and student-centred methods (Rimmer-Piekarczyk, 2018). Hanna’s (1988) opinion was that one cannot truly be free if you don’t have the ability to sense and affect

your own physiology (we note that this matches well with the discipline of kinesiology). It follows naturally that somatic training resists “outdated” authoritarian ways of teaching/learning, resulting in a more personally authentic experience for the mover, who is transferred some responsibility for their learning (Fortin, 2017; George, 2020; Green, 1999; Rimmer-Piekarczyk, 2018). Fortin (2017) has likewise discussed how somatic practice can be undertaken as a way to empower and generate individual agency for a learner/mover. Teaching from a somatic perspective, by focusing on inner sensory awareness and proprioceptive sensing, can bring students into the learning process, allowing them to experience how they can generate knowledge about and through their own bodies. This approach aligns directly with the learning outcomes in our kinesiology course as well as activities done in movement labs. We often encouraged students to make their own decisions about modifying movements according to physical sensations they may experience on any given day, giving them the freedom to guide their own bodies. For example, if they sense stiffness in their hip flexors during femoral flexion (see Calais-Germain, 2004, p. 140) they may choose to alter the squatting position we use in labs, thus incorporating the feedback they receive from their bodies. In researching the proprioceptive sensing aspect of our somatic approach, we saw significant overlap in the literature between descriptions of somatic learning and proprioceptive learning. For example, Tsakiris et al’s (2006) study describes proprioceptive learning as the conscious experience of the location of a targeted body part in space, for example, an arm moving over the head in a lateral side stretch. Rather than using visual feedback from a mirror, we typically encourage students to become aware of proprioceptive sensing, such as the position of the feet aligning with (or not) the knees on a jump landing (see Calais-Germain, 2004, p. 190).

Empowering students to learn using their own bodies is a prevailing theme in several scholars’ somatic research. Green’s (1999) influential study explaining how power relations in the dance studio can produce “docile” bodies draws on the writings of earlier somatic theorists such as Don Johnson (1992) and Elizabeth Behnke (1990). These three scholars have addressed the deficit of bodily authority that can be common in dance and high-performance movement training contexts commonly studied in kinesiology. These scholars

have further demonstrated how our bodies are shaped by the cultures in which we live, and they at times situate their explanations of somatic learning in a socio-cultural milieu. Our approach is situated in a physical education context dominated by movement learning rather than considerations of cultural influence; however, it is relevant to our study to consider how somatic approaches can foster a sense of bodily authority and freedom in making decisions about one's bodily practices. For example, in our movement labs, we have students do an exercise to sense the alignment of the spine while holding a plank position; they are instructed to decide for themselves when to stop the exercise due to muscle fatigue.

Fortin's (2017) work outlines five pathways taken by somatic practitioners: social, ecological, spiritual, health and well-being, and educational. In our (kinesiology) setting, we have adopted somatic learning in a physical education context, as the outcomes of our course were to develop the mind-body connection through practicing optimal movement fundamentals. Thus, in our course, we do not prioritize a critical pedagogical, spiritual, or sociological approach to the moving body. Our approach aligns with what Fortin (2017) describes as educational, and health and well-being; for example, instead of relying on an app to tell us information about our bodies, we can teach students to develop their own bodily wisdom through their mind-body connection.

The opposite, a body-mind split, is addressed further in Johnson's (1992) and Green's (1999) work as they argue that Western cultures typically perpetuate the split of the body from the mind, subsequently separating us from our sensory selves. In addition to the body-mind split, Rimmer-Piekarczyk (2018) adds that our cultural tendency is to value external authority rather than internal, first-person knowledge.

Many somatic scholars, notably Clark (2008) and Shapiro (2007, 2011) reject the separability of mind and body, arguing that for a human mind to exist, it must inhabit a human body, which moves in order to receive information and, thus, psychological processes are incomplete without the body's information. As we have encouraged our students along the pathway to internal authority and mind-body integration, we have compared this somatic practice to the develop-

ment of a kinesthetic sense (generally meaning a sense of movement occurring in the body).

We feel strongly that the body offers something more than isolated physical capabilities, as the physical self can also act as a repository of knowledge. We find the specificity of Freiler's (2008) description of somatic learning particularly applicable, as it indicates learning directly experienced through bodily awareness and sensation, during intentionally bodily-centered movement practices (such as Alexander Technique, Bartenieff fundamentals, Pilates and tai chi, described by Bennett, 2020). Therefore, in our movement labs, we have included many Bartenieff and Pilates-based exercises (see Black, 2022; Calais-Germain, 2004; Franklin, 2012; Hackney, 2002). In summarizing our approach, we can say the following: it reinforces a commitment to understanding foundational aspects of the natural body (precluding sport-specific movement as well as aesthetic and cultural implications) by learning that is experienced through bodily awareness, proprioceptive sensing, imagery and bodily-centered movement practices.

Ultimately, this practice grows an individual's kinesthetic awareness, which is directly tied to our learning outcomes. This approach also broadens the understanding of the body beyond definitions provided by the natural sciences where mind/body dualism dominates (Aartun et al., 2022; Bennett, 2020; Bresler, 2004; Evans et al., 2009). Rather, we hope that students will generate a somatic practice of their own, facilitating the application of movement fundamentals to any sporting, dance, or fitness setting. Next, we provide a brief review of student perspectives and the assessment of learning in kinesiology.

Assessing Student Perspectives of Learning

Several studies seeking student perspectives on kinesiology curricula focus on experiential learning (Coetzee et al., 2011; Coker & Porter, 2015; Coker et al., 2017; de Groot et al., 2015; Schultz et al., 2022) as they target community service learning in health promotion. In this literature, experiential learning is described as enabling students to bridge their learned skills and their professional lives after university (Kolb, 1984; Schenck & Cruickshank, 2015). While our course is also classified as an experiential learning course in our university system (typically divided into classroom or experiential

learning methods), for specificity, we use and refer exclusively to somatic learning (which is a category of experiential learning). Other experiential learning studies conducted in kinesiology departments, such as Rabattu et al. (2022), assessed the efficacy of embodied learning (movement-based anatomy learning) although it was done through official assessments (early, mid, and late semester examinations) rather than by collecting student perspectives. Although different from ours, these studies indicate that an approach combining movement-based anatomy learning with classroom learning was effective in raising test scores, and suggest it should be considered in kinesiology curricula.

These are the only other studies published about the effectiveness of non-classroom embodied and somatic learning in kinesiology, which we find somewhat peculiar given that kinesiology learning is defined by the study of the moving body. However, student perspectives have been collected for somatic learning in dance classes; Berg (2017) observed 18 hours of ballet training classes where the teacher used a somatic style rich with imagery. One of the comments she recorded from a student interview was that they were able to go “deeper” into their work, as well as noting through observations and other interviews that students had an increased ability to self-correct, had better internal authority and were working towards autonomy in their training practice.

We reiterate that our study differs from experiential/embodied learning studies in kinesiology and somatic learning studies in ballet in that we are seeking student perspectives of somatic learning in kinesiology. Furthermore, we used a large movement studio setting in our course, as opposed to community service learning or functional anatomy learning in the classroom.

In this study, we focus on student perspectives of somatic learning in one of our first-year courses: KIN 156, Introduction to Movement Fundamentals and the Mind-Body Connection (described in Noton, 2023). Although a few studies discuss an embodied approach to learning in kinesiology (Cherdieu et al., 2017; Dickson & Stephens, 2017; Yohannan et al., 2022), the approaches in the courses they investigate are limited to the use of short-duration hand gestures in classrooms or controlled laboratory settings. We, in contrast, are interested in the effectiveness of full body, somatic movement prac-

tices in studio/gym settings. Alone among these studies, Rabattu et al. (2022) did test the effectiveness of using full-body movements, albeit for a relatively short duration in a classroom setting, with their results supporting the use of movement in kinesiology learning. We further note that these studies investigated courses tasked primarily with learning functional anatomy, while our course's approach takes students through fundamental movements as a vehicle for understanding the mind-body connection (components of which were breath, imagery and proprioception). Although one result of our approach is an increased understanding of functional anatomy and biomechanics, this is not our primary learning outcome. Thus, our study is novel from others in two ways: the use of long duration full-body movements (via a somatic approach) and the use of a non-classroom environment (a large studio setting).

Study Design

Participants and Educational Context

Questionnaires were sent to 96 students who completed the course in either Fall (September-December) 2022 or Fall 2023, with 43 students responding. Although demographic data was not collected, all students were full-time undergraduate students at the time of the questionnaire; in Canada this population is typically between the ages of 18-25. All students were enrolled in a bachelor's degree of kinesiology program, where students can select from different minors corresponding with the subdisciplines of kinesiology.

In our first-year course, students participated in one 50-minute classroom lecture and two 50-minute movement labs in a studio setting per week, for 14 weeks (over one semester of study). There were 40-60 students in each movement lab with ample space for full-body locomotive movements in our large studio with floor-to-ceiling windows, barres, and sprung floors. Both authors instructed and moved with the students during movement labs, with the first author being the primary instructor. Although our course is coded as a 100-level (first year course), it is not restricted to first-year students, thus students at all levels of their bachelor's degree were enrolled. Over the semester, students were taught a repertoire of movement fundamentals, which included exercises to develop balance and postural alignment, target strengthening, stretching, proprioceptive aware-

ness, plyometrics, and breath (see Black, 2022; Calais-Germain, 2004; Franklin, 2012; Hackney, 2002). Imagery and visualization were used throughout all exercises as appropriate to the movement (see Franklin, 2012). Furthermore, all exercises incorporated biomechanically accurate movement patterns and anatomically accurate descriptions. Students were instructed with the goal of achieving an optimal physical quality of movement in each exercise, while simultaneously integrating breath, proprioceptive awareness and imagery-visualization to develop students' mind-body connection. During labs we typically played music at a low volume so that tempo could be easily followed for certain exercises and, thus, students could choose to work on flowing movement patterns where possible. While students learned movement practices as a group, they executed the majority of the movement practice on an individual basis. Although the movement experience level of our undergraduate students was mixed, all students were taught the same exercises but given options for modifying the movement according to their needs.

Methods

Previous studies (Cherdieu et al., 2017; Dickson & Stephens, 2015; Rabattu et al., 2022; Yohannan et al., 2022) had participant students complete formal examinations to test the effectiveness of embodied learning approaches; however, we felt this was not the best fit for our goal of investigating student perspectives. Our course did not use written examinations as a primary method of assessment that the students would be accustomed to, instead combining a significant participation component with short quizzes (15 min) and a final summative assignment. Additionally, we were not interested in the efficacy of somatic learning for the pure retention of anatomical and biomechanical knowledge. Thus, the way students were assessed in the course partially informed our choice of methods in this study for investigating student perspectives of somatic learning (straight-forward likert-scale agree/disagree questions).

Questionnaires, using a 5-point Likert scale, were sent to two cohorts of students who had completed the course in either the Fall 2022 or Fall 2023 semesters. We created a questionnaire with an agree/disagree likert scale as we recognized that our students experience significant constraints on their free time, potentially impacting participation in our study (our questionnaire took 5-10 minutes to

complete). We designed our questions in accordance with methodological guidelines in Lee et al. (2002), Joshi et al. (2015), Jebb et al. (2021) and Croasmun and Ostrom (2011). Students were sent an email containing study information, a consent letter, and a link to the study, which could be completed online via our university's encrypted network and a web-based application. Students in the Fall 2022 cohort were, thus, contacted over one year after completing the course, whereas students in the Fall 2023 cohort were contacted weeks after finishing the course. Our hypotheses were that:

- In KIN 156, participants were exposed to novel topics that were not covered elsewhere in the kinesiology undergraduate curriculum.
- In KIN 156, participants were exposed to a new approach to learning about movement theory and practice not covered elsewhere in the kinesiology undergraduate curriculum.
- Participants valued their experience in KIN 156

Data Collection and Analysis

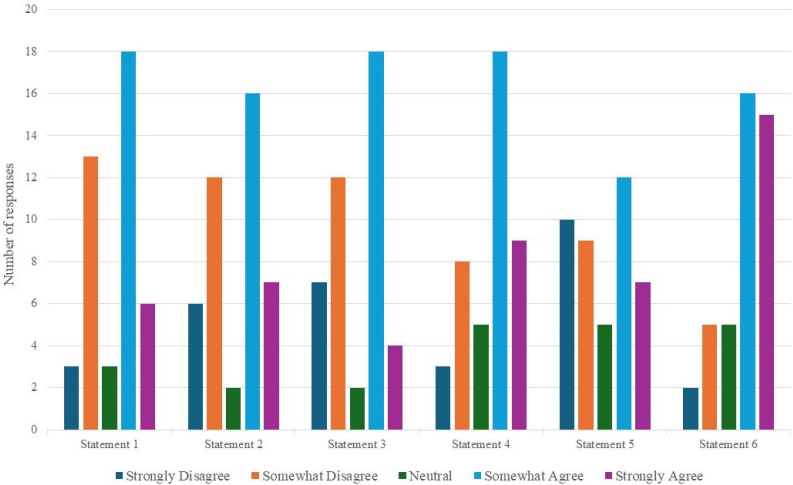
Questionnaire data was kept anonymized and no personal identifiers were collected when students submitted their responses. The questionnaire data was treated as a continuous data set, combining individual question scores to create a composite score. We used measures of central tendency and dispersion (mean + standard deviation) as well as an analysis of variation (ANOVA) to test among multiple questionnaire means and to determine which components, if any, significantly differed (Harpe, 2015).

Results

We plotted the frequency distribution of responses to each category of questions: course content, course approach and perceived value of the course (Figures 1, 2, 3) as an initial attempt to describe our data (Delacre et al., 2019). As is evident from Figure 1, the distribution of answers to the first three statements about the uniqueness of the course content appear to be bimodal. While 56% disagreed with Statement 1 (“Before KIN 156, I had no familiarity with mind-body components”) indicating many respondents were familiar with mind-body components prior to taking the course, 42% felt they had never been taught how to use the component of breathing during physical activity (Statement 2: “Before taking KIN 156, I had never

been taught how to use the component of breath when doing physical activity”). Forty-four percent agreed that they were not previously taught how to incorporate imagery-visualization during physical activity (Statement 3). However, responses to the final three statements on “course content” appeared to have slightly different distributions. Almost 63% of respondents felt that before taking KIN 156 they had not been taught how to use proprioception during physical activity (Statement 4). While students’ responses to Statement 5 (Before taking KIN 156, I had never been taught how to stretch properly) showed an even distribution between those who agreed (44%) and those who disagreed (44%), responses to Statement 6 (Before taking KIN 156, I did not know what movement fundamentals were) elicited more somewhat (37%) and strongly agree (35%) responses than any other statements regarding course content.

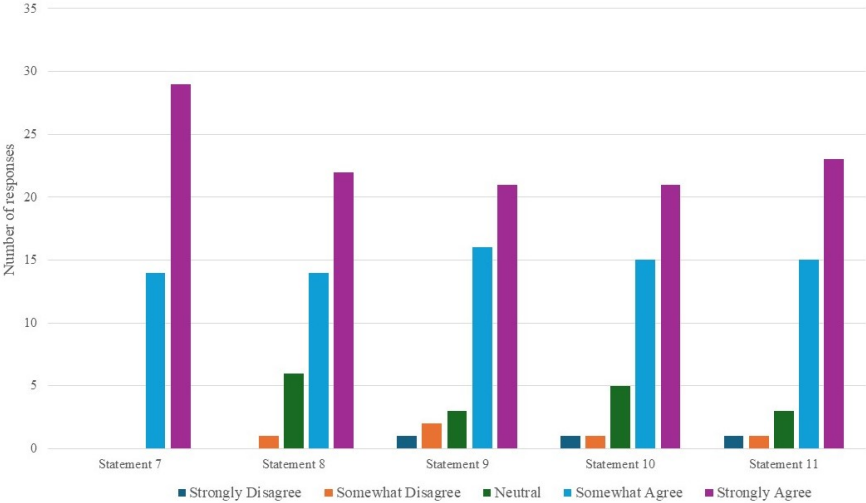
Figure 1
Frequency Distribution of Answers to “Course Content” Statements



In Figure 2, we illustrated the distribution of responses regarding the uniqueness of the course approach (somatic learning). Unlike Figure 1, the responses to all questionnaire statements are heavily skewed toward somewhat and strongly agree, ranging from 84% (Statement 10: During KIN 156 movement labs I was better able to retain / remember biomechanical/anatomical knowledge through doing exercises in my own body) to 100% for Statement 7 (During

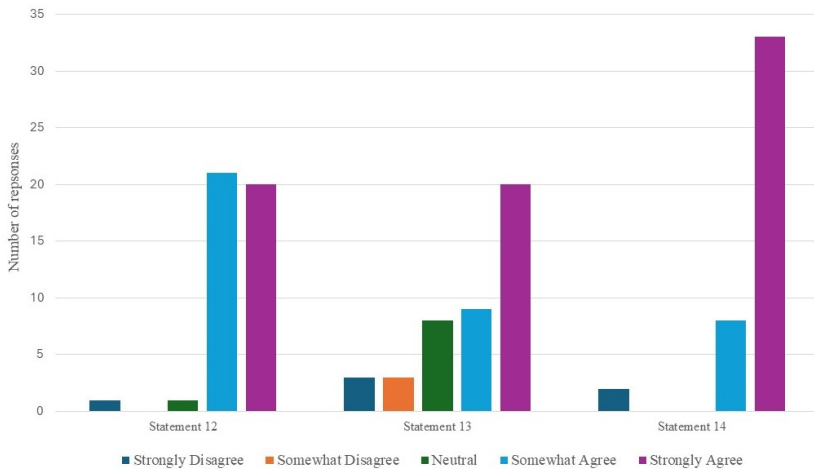
KIN 156, I felt better physically on days where we had movement labs). Eighty-four percent of respondents also noted that they felt psychologically better (Statement 8) on days with movement labs. Our somatic approach enhanced 86% of the respondents’ understanding of biomechanical/anatomical knowledge through doing exercises in their own bodies (Statement 9) and enhanced the ability of 88% of respondents to apply mind-body connection concepts in their everyday lives (Statement 11).

Figure 2
Frequency Distribution of Answers to “Course Approach” Statements (Somatic Learning)



Similar to Figure 2, Figure 3 showed distributions of responses skewed towards somewhat and strongly agree for all statements. While 67% of respondents agreed that the course should be mandatory for all students (Statement 13), overall, a clear majority (95%) felt that the experiential and somatic approach in KIN 156 was valuable as it enhanced their understanding of what the mind-body connection is (Statement 12) and how to retain and apply their learning (Statement 14).

Figure 3
Frequency Distribution of Answers to “Course Value” Statements



Because the responses were treated as a continuous data set, we chose to assess the variation among the responses. Given the skewed distribution of responses illustrated in the above figures, we used a Levene’s test of normality of distribution and homogeneity of variance prior to statistical analysis (Gastwirth et al., 2009). This allowed us to determine if we should employ a one-way ANOVA or a Welch’s ANOVA (Gastwirth et al., 2009). The Levene test showed that our data violated the assumptions of normal distribution and homogeneity of variance ($F = 49.7, p < 0.001$), therefore, we chose to employ a Welch’s ANOVA to determine if significant differences existed among the three groups of responses (Delacre et al., 2019).

Table 1 summarized the average level of responses for each group of statements further illustrating the differences among the three groups. Welch’s ANOVA showed a significant difference among the three groups of statements $F(2,332) = 62.72, p < 0.001$, thus, we used a post-hoc Games-Howell test, for use on parametric data sets with unequal ‘ n ’ and variance, to determine if significant differences existed among the responses to different groups of questions (Shingala & Rajyaguru, 2015). The Games-Howell test showed significant differences existed between ‘course content’ and ‘course approach’ ($M = 1.089, SD = 0.1$) $p < 0.001$ and between ‘course content’ and ‘perceived value of the course’ ($M = 1.027, SD = 0.123$) $p < 0.001$.

No significant difference between “course approach” and “perceived value of the course” was found ($M = 0.062$, $SD = 0.107$), $p = 0.832$.

Table 1

Summary of General Statistics of Responses to Groups of Statements on KIN 156 Course Content, Approach, and Value. AVG = average Likert response per group. STD Deviation = measure of dispersion of Likert response per group.

Group of Statements	Sample Size (n)	AVG	STD Deviation
Content	258	3.28	1.33
Approach	215	4.37	0.84
Value	129	4.31	1.03

Discussion

In this study, our overall aim was to examine students’ experiences of a somatic approach to learning in an undergraduate, first year kinesiology course. Interestingly, the distribution of responses with respect to course content significantly differed from course approach and course value, suggesting that course content was relatively familiar to the respondents. While not providing completely unique content, the impact of KIN 156 can be clearly seen through its pedagogical approach and perceived value. In this section, we start by outlining the effectiveness of using mind-body connection components as a way to combine theory with practice. Then, we consider how our somatic learning approach provided a ‘missing link’, teaching students how to understand, practice and apply concepts using their own bodies. Finally, we examine the value of somatic learning in the students’ experience with KIN 156 and how it could be considered a ‘missing piece’ in kinesiology undergraduate curricula.

Course Content: Integrating Theory with Practice

In KIN 156, the instructor (first author) used mind-body components such as breathing, imagery-visualization and propriocep-

tion, while executing full-body movements, to practice functional anatomy and biomechanics. As is evident in Figure 1, course content was not experienced equally by all participants. As instructors, we were aware that students from all years of undergraduate study (first to fifth year) participated in the course. Although we did not collect personal data on what year each respondent was in when they took the course, it is possible that the bimodal distributions of statements 1-3 in Figure 1 may reflect the wide variety of kinesiology theory and concepts learned in different stages of students' degrees. While other researchers have begun to address this theory-practise gap using 3D interactive digital tools (Bauer et al., 2017; Hoang et al., 2017; Jain et al., 2017; Weyhe et al., 2018), such as projecting an augmented reality of a user's movement on a screen, these tools are ubiquitously expensive and require training to operate, thus, making them inaccessible to many students and faculties.

We know from conversations with the students during the movement labs that some of the participants had done dance and/or aesthetic sports as youth. Although we did not ask the respondents to share their movement background, given that many skills in dance and aesthetic sports require significant amounts of flexibility (e.g., Desfors, 2003), it was unsurprising that there was a distinct separation between those familiar with proper stretching techniques and those who were not.

While a lack of detailed demographic information may have limited our ability to parse possible relations between course content and age/level of education, movement experience and gender, we chose to retain student anonymity in an effort to maximize participation. Despite a lower than hoped for number of participants (50% of possible respondents), our main focus in this study was to examine the efficacy of our pedagogical approach in this new course. Thus, we now turn our attention to respondents' experiences of a somatic learning approach.

Course Approach: The Advantage of Somatic Learning

Understanding the students' experiences and perspectives, in addition to our own experiences as researcher-instructors, is a necessity as we continue to adjust course content and approach to meet the learning outcomes of these new activity courses. Most kinesiology students had some previous movement experience in dance,

sport, or various fitness modalities where bodily knowledge (e.g., body awareness, mind-body connection) was different from cognitive knowledge. Clearly, for the majority of respondents, the somatic approach furthered their conceptual understanding, retention and application of motor learning, biomechanics, anatomy, and qualitative movement analysis (see Figure 2, statements 9, 10, 11 and Figure 3, statement 12). Somatic learning, as a pedagogical approach, was an act of knowledge construction where awareness and action of the physical, social and cognitive self are incorporated (Fortin, 2017; George, 2020; Tsakiris et al., 2006). Therefore, our aim in employing somatic learning was to teach students how to understand, practice and apply kinesiology theory and concepts using their own bodies. While researchers such as Cherdieu et al. (2017) described executing forearm movements while watching a video about forearm anatomy as more effective than passive learning, our study incorporated larger, full body movements (e.g., locomotive and plyometric movements). Rabattu et al. (2022) described full-body movements (albeit for short duration in a classroom setting) as multiple segments or regions of the body moving in relation to each other. They suggested full-body movements were effective as these enabled students to recall spatial information between anatomical structures by feeling them move. This may be especially relevant for upper level (third and fourth year) students in applying and analyzing anatomy/ biomechanics. We underscored the value of full-body movement through the use of exercises designed to enhance students' cognitive and physical understanding of proprioception (e.g., sensing the position of the head relative to the spine in a balance exercise, or sensing the alignment of the chain of the leg on a jump landing).

Cherdieu et al.'s and Rabattu et al.'s studies also differ from ours in that they focused primarily on learning in a single kinesiology discipline (anatomy) whereas we employed a plethora of physiological and psychological theories to enhance anatomical and biomechanical understanding by using mind-body connection components (breath, imagery/visualization and proprioception/sensing). Furthermore, Rabattu et al.'s study took place in a classroom setting, as opposed to a studio or gym, thus restricting students' opportunities for learning through full-body movements. Because users tended to respond differently to each unique digital technology tool, Rabattu et al. (2022)

expressed doubt about the overall effectiveness of these digital technologies. By contrast, our results (Figure 2) showed that enabling kinesiology students of all levels to move their own bodies fully helped connect movement to theoretical knowledge. Our somatic approach in kinesiology is also supported by Dewey's (1997/1938) theory of sensorimotor learning, which notes that physical spaces offer the opportunity to reconnect the mind and body, potentially overcoming the limitations of traditional pedagogy, which support a body/mind split (Green, 2003; Nguyen & Larson, 2015).

Repetition and planning of somatic learning on a weekly basis was consequential in enhancing learning outcomes (understanding and application) compared to the use of sporadic and incidental inclusion of movements in a classroom setting (see Cherdieu et al, 2017; Rabattu et al, 2022). Perhaps our relatively frequent bouts of movement learning (twice a week over 14 weeks) impacted respondents' long-term retention. Previous studies have shown that theoretical and short-duration stationary anatomical learning were retained only for short periods (Cook et al, 2008; Masumoto et al, 2006). Considering that our respondents reflected on experiences that ranged from a few months or over a year in the past, clearly, our somatic learning approach had a significant impact. Somatic learning also provided much needed affective contexts, likely increasing students' engagement (Figure 2, statements 7 and 8) with the content and enabling them to realize more fully their potential as learners. From a teaching perspective, as the course progressed, students required fewer anatomical and biomechanical corrections as they became more aware of their own alignment, breathing, proprioception and ability to use imagery alongside movement. Evidently, our results illustrate that somatic learning can provide a 'missing link' to connect theory and practice in kinesiology. In short, learning through movement was perceived as a highly valuable component of the course.

Course Value: Somatic Learning as the “Missing Piece” in Undergraduate Kinesiology Curricula

As learning functional anatomy and biomechanics is a cornerstone of kinesiology learning, we recognized that it is important to address the learning tools currently in use. As instructors in kinesi-

ology, we found it highly concerning that, prior to taking KIN 156, 72% of the students, ranging from first to fifth (final) year, lacked knowledge of movement fundamentals (Figure 1, statement 6). This is essential to understanding not just anatomy and biomechanics, but how to apply the concepts these knowledges produce. For example, future kinesiologists, coaches, and physiologists may be required to use this type of knowledge through demonstration and explanation of functional exercises that they prescribe to their clients, athletes, and students (Kuklick & Mills, 2023). This suggests that traditional learning approaches in kinesiology may be failing undergraduate students in preparing them to use their knowledge of fundamental movement to correct postural misalignments and develop optimal functioning of clients and athletes' bodies in professional disciplines.

Of primary importance was the enhancement of respondents' retention, understanding and application of anatomy and biomechanics using mind-body practices. The emphasis the respondents placed on the value of their learning experience reinforced the efficacy of our pedagogical shift, where bodies can become sites of knowledge production (understanding, retention) and conduits for positive physical and psychological feelings (Bennett, 2020; Fortin, 2017; George, 2020; Green, 1999). Simply put, moving bodies became better thinking bodies. Our study reinforces the need to retain in-person learning opportunities in a post-COVID world, where sedentary practices and the associated diminishment in mental health continue to be prevalent as a way of cutting costs for underfunded kinesiology departments (Thomas, 2014). We, therefore, suggest that there is a strong need for courses like KIN 156 to employ somatic learning approaches that bridge the connection between theory and practice.

Conclusion

Through our study of student perspectives of somatic learning, we have an improved understanding of how we can combine theoretical knowledge from quantitative fields in kinesiology with real-life movement practice scenarios. We discovered that the course content was not entirely unique to a majority of students, instead, the impact of this course was seen through the students' positive

perspectives of our somatic approach. We were pleased that this type of approach functioned well, operationalizing theory and drawing together currently siloed streams of research in our faculty. Thus, by examining undergraduate student perspectives of learning, we have demonstrated the value of somatic knowledge and learning in the field of kinesiology, contributing to the integration of these two fields as suggested by Bennett (2020). Based on students' responses, it is clear that our somatic approach offered value for both students, us as instructors (better achievement of learning outcomes) and the field of kinesiology (enabling our graduates to combine theory and practice).

Although it wasn't the primary focus of our questionnaire topics, we also highlighted that 100% of students responded that they felt better physically on days where they had movement labs. A further 84% of respondents indicated that they also felt better psychologically on movement lab days. As universities grapple with how they can best support students during a time of increased mental health challenges, having data of students' perspectives is particularly meaningful and could be of use to policymakers.

As we consider future research of student perspectives in a similar third-year course, we underscore the results of two of our course approach statements: 86% of students indicated that our somatic approach enhanced their understanding of biomechanical/anatomical knowledge through doing exercises in their own bodies, and 88% indicated that it gave them the ability to immediately apply the mind-body connection components to their everyday lives. Clearly this approach is working for students and, thus, we suggest further research using qualitative methods to explore student perspectives of somatic learning.

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