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Exploring critical media health literacy (CMHL) in the online classroom

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ABSTRACT

Critical media health literacy (CMHL) is concerned with identifying health-related messages in the media, acknowledging the potential effects on health behaviours, critically analyzing the content of the message, and the subsequent application of the message to one's health behaviours (Levin-Zamir & Bertschi, 2018). This exploratory research examined the CMHL skills of students (n = 120) in an entry-level, online asynchronous health and wellness course, by examining their ability to think critically about health-related themes presented in news media articles online and apply course-based knowledge during a Twitter event. Employing a content analysis of tweets from the event, students were found to illustrate CMHL skills when interacting with peers on Twitter, more than when directly assessing online news media. The findings suggest that the course curriculum be altered to include CMHL skills, to better equip students with the ability to identify accurate health information in the media.

Keywords: *critical media health literacy, Twitter, media literacy education, media health literacy, online learning*.

INTRODUCTION

Technology-mediated sources have become a dominant means to access health-related information (Berkman et al., 2010). Related importantly is media health literacy, which is concerned with the production and dissemination of health-related information by media outlets, and most commonly today, internet sources of media (Levin-Zamir et al., 2011). Past research indicates that mass media can have a significant effect on the health-related knowledge and behaviours of adolescents and young adults, acting as both health-compromising and/or health-promoting influences (Levin-Zamir et al., 2011; Squiers et al., 2012). In consideration of this, and the rapid growth of internet-based knowledge, *critical* media health literacy (CMHL) is valuable to understand and explore (Wharf Higgins & Begoray, 2012). CMHL involves critically analyzing the content of health-related messages found on various media platforms, to determine any potential effects, negative or positive, on health-related behaviours, and the subsequent application, or lack thereof, of these messages to one's personal health-related behaviours (Wharf et al., 2012). CMHL allows users to engage with and analyze health messages that are found in the media, determine if they are correct/incorrect, accurate/inaccurate, and how/if the content of these messages is then implemented to a person's life.

Young people, in particular, are often perceived to be increasingly media and health conscious (Goodyear et al., 2019; Gustafson, 2017) and research has found that with the proliferation of social media, (a high proportion being young people[1]) users should possess critical thinking skills to conscientiously and effectively use these platforms in the acquisition and application of knowledge (Levin-Zamir & Bertschi, 2018). The present exploratory study builds on the authors' past research (Rohr, Squires & Peters, 2022), and was particularly interested in understanding postsecondary undergraduate students' CMHL through their application of social and news media as a pedagogical online course component. Specifically, this research examined whether entry-level university students taking a human kinetics and recreation course demonstrated CMHL, using Twitter to connect course-based knowledge on themes of health, fitness, and wellness to similar themes presented in news media. In an increasingly mediated world, CMHL skills are essential when accessing and understanding the health-related information presented on social media.

LITERATURE REVIEW

Social media platforms have become an avenue to access health-related information for users of all ages (Berkman et al., 2010). The health messages that circulate on these platforms can include inaccurate information, even if the source is generally accepted as trusted and reliable (Alnemer et al., 2015). These health-related messages on social media are often fraught with the bi-directionality of the relationship between media use for social media marketing and social media user's perceptions/behaviours, further complicating the intent of health-related media messages. Although health professionals tend to perceive social media sites as less reliable sources of health-related information for their patients, the patients (i.e., social media users) themselves frequently rely on social media for health-related information (Ventola, 2014; Zhou, et al., 2018). This can be problematic, especially when it comes to health-related information, because users may not possess the knowledge/ability to process/understand the information in their personal context (Ventola, 2014). High levels of CMHL can lessen these risks and can also be applied to all media literacy contexts. In an online, self-directed course that is designed to promote health and wellness, CMHL is an imperative skill.

Media literacy

Media literacy can be defined as the ability to identify the hidden messages encoded in different forms of media, and to understand the importance and implications of such messages /meanings (Hobbs & Jensen, 2009; Potter 2010), although, consensus on its exact definition is evasive (Koltay, 2016; Livingstone et al., 2012). Media plays a significant role in disseminating public health information. The integration of media in our daily lives and routines impacts the information we receive from these sources. In Canada, internet users aged 16-24 are the largest accessors of information via online resources, with 88% of this age

[1]A high proportion of social media users are young people – 50 percent of Canadian Twitter users are between 18 and 34 years of age (Gruzd & Mai, 2020).

group reporting accessing the internet at least once per day (Statistics Canada, 2020).

For students enrolled in online learning, all course information is mediated through the internet and the educator is tasked to adapt teaching processes to reflect the habitus of students in the social, mediated world. Students must have solid media literacy skills to properly employ and sift through the onslaught of information available on the internet.

Health literacy

Health literacy is an individual's ability to operationalize the health information they consume through media messages and determine whether that information is health-promoting or health-compromising (Berkman et al., 2010; Liu, Wang, Liu, et al., 2020). Health literacy empowers individuals to make their own informed health decisions that favor health-promoting behaviours, and limit health-compromising behaviour. Critically, this explanation of health literacy includes and accounts for the social determinants of health as literacy levels are impacted by the economic and social conditions (Berkman et al., 2004). Improving social determinants of health, such as health literacy, was highlighted by the Millennium Development Goals in 2008 as a means to improve the equality and accessibility of health-promoting behaviours across social classes and geographic locations.

Berkman and associates (2010) indicate that the definition and our understanding of health literacy is continually impacted by technology. It is therefore important to teach rudimentary health literacy skills to university-aged students, the largest users and accessors of health information via technology (Statistics Canada, 2020). Health literacy is directly connected to health behaviours, in individuals of all ages.

Media health literacy

Health literacy and media literacy are intrinsically connected: an individual's level of health literacy can be impacted by their level of media literacy, as much of the health information available is communicated through mediated channels. Media health literacy (MHL) in particular, is concerned with identifying health-related messages in the media, acknowledging the potential effects on health behaviours, critically analyzing the content of the message, and the subsequent application of the message to one's health behaviours (Levin-Zamir & Bertschi, 2018).

Much like general literacy, an individual's level of MHL is influenced by a number of contextual factors (Levin-Zamir & Bertschi, 2018); for example, age, socioeconomic status, culture, access to technology and experience with technology affect a student's access to and knowledge of MHL (Rababah, Al-Hammouri, Drew, & Aldalaykeh, 2019). A student in rural Africa would typically have lower fluency in MHL than a student in a large Canadian city because technology is less widely available and used less commonly. These contextual factors suggest that students will likely possess various levels of MHL depending on their background and combined life experiences. Therefore, it is necessary to provide equal and accessible rudimentary MHL education for students.

Mass media messages are often implicitly encoded with health-related information that can either promote or compromise health. For example, the ketogenic diet has been widely praised for its rapid results across social media platforms, news media and print media. Despite its widespread popularity and positive media portrayal, long-term adherence is linked to negative health consequences (Dafoe & Gyenes, 2020; Dashti et al., 2006), similar to other fad-type diets. Despite the overall lack of positive empirical findings, fad-type diets proliferate the media we consume. MHL is valuable because it instructs the consumer to consider the explicit and implicit messages encoded in a media production (such as promotional marketing), which instructs the reader/consumer to assess whether or not the information presented is health-promoting or health-compromising (Levin-Zamir & Bertschi, 2018; Liu, Wang & Liu et al., 2020).

It is best to view MHL as a continuum of ability and skill (Levin-Zamir & Bertschi, 2018); ranging from low ability to very capable, to identify how media messages affect our health behaviour and recognizing information may be laden with hidden meaning, marketing ploys or outright misinformation. Media influences our knowledge, behaviours and attitudes, and we are heavily reliant on sources of media for information, through acculturation and processes of meaning making. Greater levels of MHL are correlated with health empowerment, as MHL provides users with the skills and competencies needed to make informed health-related decisions (Johnson & Johnson, 2014; Levin-Zamir & Bertschi, 2018).

Critical media health literacy

CMHL, proposed by Wharf, Higgins and Begoray (2012), is more explicitly concerned with the process by which users engage with MHL and how they apply a critical lens as a central component in this. Although some literature uses these terms interchangeably, they appear to be differentially applied and may actually be referring to, and thus assessing, varying levels of online engagement. Drawing on a scoping review, Wharf Higgins and Begoray (2012) developed a more concise, yet comprehensive and multidisciplinary concept of MHL that explicitly comprised an analytical/critical-thinking component. To identify examples of CMHL, the researchers outlined three defining characteristics: *a skill set*, *empowerment,* and *a competency of engaged citizenship*.

Related to the *skill set*, beyond possessing knowledge of material and understanding existing theory and constructs, postsecondary students are often asked to examine and evaluate information; it is then expected that they create new ideas based on course materials as a means of encouraging engagement. This requires skills not only attached to literacy, but also attached to critical thinking (e.g., requiring reflection, comparison, and interpretation; Wharf Higgins & Begoray, 2012). *Empowerment* is connected to ideas of individual autonomy and choice, rights and freedoms, and a desire to better society/the world. According to Wharf Higgins and Begoray (2012), this guides health-related decision making in seeking appropriate, informed, and accurate information and even calling for changes to our health systems. From the combination of these, *a competency of engaged citizenship* is formed. Rohr, Squires and Peters (2022) promote the adoption of CMHL for work examining these themes, and we will be applying a similar framework in this paper.

Research on the relationship between media, health, and literacy

In the past two decades, the connection between health status, health outcomes, and levels of literacy has been explored and identified as impactful and imperative to health behaviour outcomes. While there is a limited but growing body of research literature identifying a direct link between CMHL on Twitter and the health behaviours of younger adults/youth, the level of CMHL individuals exhibit is relational and dependent on their past exposure to CMHL education, general literacy abilities and socioeconomic background (Lastrucci et al., 2019; Muvuka et al., 2020; Stormacq et al., 2019; Swisher et al., 2020). Students from low-income households are more likely to report engaging in harmful health behaviours (Fleary, Joseph & Pappagianopoulous, 2018). This can be explained by the unique situational/environmental factors that each student experiences. Internet access is affected by class and income level, which radiates down to the availability and accessibility of health information. However, exposure to MHL for lower socio-economic groups was advantageous for positive health behaviours, when compared to those who have a higher baseline knowledge of MHL, reinforcing the influence of the environment and exposure to health behaviours can be mitigated with education and exposure to positive health behaviours (Fleary et al., 2018). A negative relationship was found to exist between age and accessing health information online; younger users are more likely to access the internet for sources of health information, whereas older adults are less likely to participate in technology-mediated forms of health information (Fischer et al., 2014).

Qualitative research explored young/emerging adults' (18 to 30 years old) social media use in collecting information on common health issues (i.e., diabetes, depression, anxiety, and posttraumatic stress disorder; Fergie et al., 2016). Based on semi-structured interviews (N=40), the researchers classified online information-sharing behaviours under one of three types: 1) "prosumption," a combination of conventional production and consumption activities online (i.e., "*prosumers"*); 2) tacit consumption, online consumption of health-related content, as well as support offline, but no production (i.e., "*tacit consumers"*), and 3) non-engagement, offline supports and no engagement with this type of online content (i.e., "*non-engagers"*).

Their results revealed that the presence of external environmental factors – which in this study comprised strong offline social supports – mitigated the relationship/need to seek health-related information or related engagement and support online. This may impact postsecondary students, who have varying degrees of social, educational, and other forms of support or capital in their lives outside those in the course/classroom context (Rababah et al., 2019). There may be some students who are more isolated in comparison to their classmates, particularly during the pandemic, and this can impact how they engage with content and users online. As illustrated, CMHL is impacted by several factors that are unique to the individual based on their

experiences and social supports/relationships/ interactions outside the classroom/online platform.

Health messages on Twitter

A study completed in 2018 compiled 1000 of the most common health-related journal articles and found that 48% of health-related media messages posted to Twitter and Facebook discussing these articles contained disparity in the strength of the language used and the results reported (Haber, Smith, Moscoe et al., 2018); the information was presented in a generalized manner, despite the results not being generalizable (Haber et al., 2018). Further, media representations of the information were more likely to use stronger, more persuasive language than what was used in the original article, misrepresenting the facts portrayed in that article (Haber et al., 2018).

When examining the accuracy of health-related tweets, researchers found that 25.4% of COVID-related tweets contained inaccurate information (Swetland et al., 2021). Albalawi and colleagues (2019) found that 31% of health-related tweets in Saudi Arabia were inaccurate or incorrect by medical doctors (Albalawi et al., 2019). A second Saudi Arabian study found that approximately 52% of respondents reported using Twitter as a source of public health information was a positive experience, specifically for the ease in accessing information, and that the majority of respondents were satisfied to use Twitter as a source of public health information (Alassiri & Alowfi, 2019). It is important to note the differences in culture between Saudi Arabia and North America, and Canada in particular, where our research was conducted. Despite the differences in culture, we believe these studies to be valuable in framing our research, especially when limited research is available. Saudi Arabia has the 4th highest number of Twitter users in the world, and the highest proportion of users relative to their population. Furthermore, the authors of these Saudi Arabian studies were informed by the same authors cited in this paper.

Twitter is an important resource for health information and is used to promote health literacy (Begoray, Banister, Higgins et al., 2014; Zhou et al., 2018). However, it is problematic that any Twitter user can generate media/health information, which may not be accurate, helpful, or based on scientific fact. Tse et al. (2015) identified Facebook and YouTube as more efficient media outlets for the promotion of health literacy compared to Twitter. Despite these findings, health-related information proliferates the mediated Twittersphere, and tweets need not be accurate or correct to elicit engagement.

The current study

In the present study, Twitter was selected as a social media tool—despite it not being the most commonly used social media platform among the average postsecondary student age demographic—as it facilitates social interaction where users can be active in constructing and presenting their identity as one that is often closer to their identity offline. The intent of the present research was to determine if students in an online, highly digitized environment illustrate CMHL skills without being taught them. If they don't, we need to prioritize incorporating CMHL education into the course content and design, as we are requiring students to utilize such capabilities for their Twitter assignments. There are noticeably few studies concerning the use of Twitter to examine CMHL skills, therefore, this research contributes to this gap in the literature.

METHODOLOGY

The purpose of this exploratory research was to examine students' CMHL skills in two sections of an entry-level health and wellness course at a mid-sized Canadian university, to determine if we need to incorporate CMHL skills into the curriculum, as we require these skills of students in the evaluations. This research is part of a multi-tiered project designed to improve teaching strategies and pedagogy, to better serve the needs of students, and prepare them for the course evaluations. Details about the intentionality of curriculum design and approaches can be found in Rohr, Squires and Peters (2022).

The current research collected data from the tweets of a convenience sample of university students enrolled in an entry-level, online asynchronous fitness and wellness course (HKR 1000) at a Canadian university in the spring semester of 2019, before the COVID-19 pandemic took hold.

HKR 1000 is frequently taken as an elective course and there are no prerequisites for enrollment. Students aged 17 years or older who typically are not pursuing health-related careers may be enrolled in this course, meaning they likely have varying levels of health knowledge and operationalization (i.e., CMHL). The course instructor and teaching assistants utilized Twitter-based evaluations for multiple semesters prior to and following the semester when this data was

gathered. The main objective of this evaluation was to develop an understanding of students' CMHL skills, through how they interact with media on Twitter, and to incorporate the results into our teaching strategies, modifying the course and teaching/delivery styles to better serve the needs and wants of the students. HKR 1000 was offered online, so any and all information and data were mediated through the online space (i.e., Brightspace Learning Management System).

Specifically, the focus of this work involved a preliminary assessment of students' existing CMHL abilities through their proficiency to think critically about health information presented in the media.

Participants

The sample was composed of university students enrolled in two sections of an introduction to human kinetics and recreation course, HKR 1000-Fitness and Wellness, comprising 155 students. The data from this study was initially collected from the course assessments and course evaluation questionnaires available for all students to complete at the end of the semester. After consultation with the university ethics board, it was determined that the data aligns with the secondary use of information not initially intended for research, therefore, ethics clearance was not required. Approximately 120 students participated in posting tweets, giving a 77% completion rate. As the data was initially collected for course evaluation purposes, information regarding age, gender, race/ethnicity were not collected.

Twitter activities/events

Twitter was used for three assessments throughout the semester (scheduled in weeks 6, 10 & 12) and students were required to post a total of six tweets, i.e., two tweets per each of the three activities; this was a deliberate course design that can foster communication and interaction in an online classroom (Rohr, Squires, & Peters, 2022). The data reported here were from the week 10 assignment, which instructed students to "locate a recent news story (from the past year), from a recognized, credible news source that exemplified one or more of the health and wellness topics discussed in the course. Share the link for this news story on Twitter, commenting in your tweet on the relevance/importance of the story to individual health and wellness. Consider the words and language used, the images portrayed, the people interviewed, and/or the ultimate perspective taken" (Brightspace, 2019). This assignment was purposefully scheduled later in the semester to provide students sufficient opportunity to gather a basic understanding of the course expectations and also manifest health-related information contained in the news article. We examined students' ability to understand the latent content of the news article, or the underlying meaning of the health-related information they were viewing. We specifically prompted students to think critically about the information presented and how it related to health. We were cognizant, however, that students may not have developed baseline CMHL skills, (i.e., operationalization of health knowledge), despite learning health-related knowledge in this course. Students were expected to use their own discretion with regards to decide what "reputable" news sources may be; this was done purposely to ascertain what students generally deemed to be reputable news sources. No explicit examples of expectations were provided. This again was purposeful; we were measuring existing/baseline CMHL and did not want to direct or sway students with examples. Students were required to include the hashtag in each and every Tweet they made in order for Brightspace, the learning management system, to capture and record their responses.

Much of the existing research can be divided into that which independently examined media literacy only or health literacy only; however, we were interested in measuring CMHL, given the opportune course themes and online activities/evaluations. The requirement of having to locate a reputable online news source through an online course platform leans toward examining media literacy, while asking students to exemplify course concepts, which are all health/wellness related, leans more towards health literacy. We believe such an assignment to be a good measure of CMHL; requiring students to search for an article that epitomizes a course concept shows their ability to apply/put to use/operationalize the information presented.

Students were required to make a total of six tweets throughout the semester. Of the students for who we have data for, approximately 31.6% did not meet the assignment's minimum requirements. Approximately 28.4% of our sample posted exactly six tweets; however, a larger proportion (44%) posted more than required. We were unable to gather this information from 13% of students who either deleted their profiles as soon as the course finished, or who had changed their profile viewing settings to private. From the data available, 68% of students met or exceeded the tweet requirements

while 32%, nearly one-third, of the students did not complete the required number of tweets.

Coding protocol/procedures

Content analyses are commonly used to reveal messages and meaning behind textual data, by determining themes or concepts, which are then quantified and analyzed for meaning and patterns (Erlingsson & Brysiewicz, 2016; Kleinheksel et al., 2020). A content analysis was conducted, and coding protocol was inductively developed while examining the data for patterns in the tweets posted (Fereday & Muir-Cochrane, 2006; Thomas 2003). Themes were then identified from these patterns and quantified to illustrate the frequency of their occurrence. The coding categories were loosely based on the course grading scheme, where the better-quality tweets were indicative of a higher mark, and lower-quality received lower marks. After coding individually, inter-coder agreement was reached between 3 researchers, and the coding categories were decided.

These categories of quality were then placed on the continuum of health literacy (ability to think critically and operationalize the information presented in the article; Levin-Zamir & Bertschi, 2018) to coincide with the categories below (1 on the left, 5 on the right) (see Figure 1). Students who make *critical thinking* or *critical thinking + personalization* tweets are more capable of illustrating how they operationalize the health-related information relayed to them via the media, and therefore, fall towards the right on the CMHL continuum, when compared to those students who make *summary/general statements* or *personal statements* only, who are less capable of illustrating how they operationalize the health-related information relayed to them via the media.

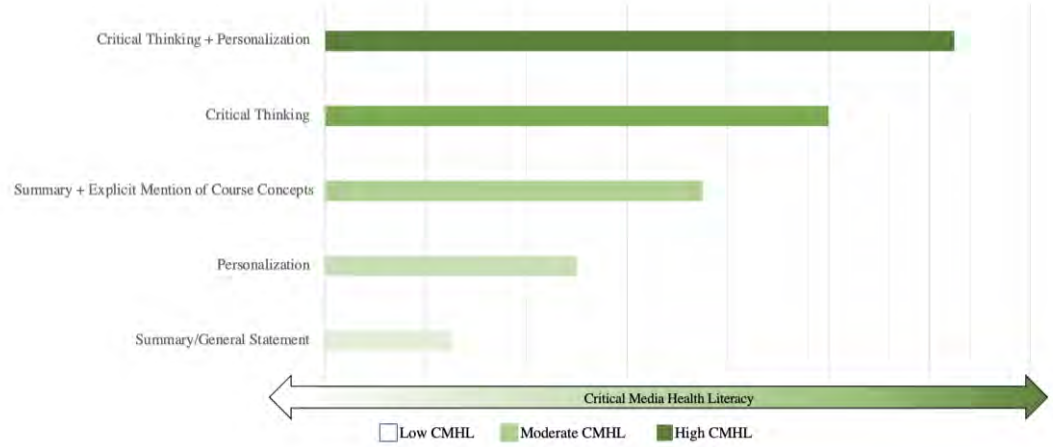

Figure 1. *As critical thinking skills increase, so do CMHL abilities*

Tweets were coded separately by three researchers and then compared for consistency (O'Connor & Joffe, 2020). Coding was based on the five developed critical thinking categories, mirroring the continuum of health literacy: 1) *summary/general statements*, 2) *personal statements,* 3) *summary + explicit mention of course concepts*, 4) *critical thinking*, and 5) *critical thinking + personalization*. The categories were developed organically and inductively, following a general review of the tweets to determine what categories were present. Coding for *critical thinking* would indicate that students have a higher level of health literacy than those who just summarize the information found in the article. Summarizing equates to a lesser indication of health literacy, or thinking critically about the content, reliability, or validity of the information presented in the news article.

Personal statements comprised of "I" statements; for example, "I agree with your tweet! Personally, with siting at a desk all hours of the day my body feels it. We need to make stretching a priority in our lives" (Student 36). Statements were coded as *personal statements* if they spoke only of a personal experience and omitted any reference to course material. *Summary/general statements* were directly related to summarizing the news article students chose for their assignment. For example, "This article shows how to build mental health. This gives a larger over all wellness. It's interesting all the ways you can work in your mental health and how each person may have different needs"

(Student 17). *Summary + explicit mention of course concepts* was the third category, in which a student must have summarized the article and provided a direct and specific reference to the course content. For example, "As we have discussed in the course, people often overlook the dangers of mental illness and the importance of emotional wellness. Schools in Oregon are trying to end the stigma by having mental health days as well as sick days" (Student 111), was coded as *summary + explicit mention of course concepts.*

The fourth category, *critical thinking*, exemplified critical media literacy. Here students were required to illustrate how they operationalize health-promoting or health-compromising information (i.e., can they transition that knowledge to behaviours/beliefs). For example, the following tweet was coded as *critical thinking* "As obesity decreases physical wellness, we can expect other areas of physical wellness to be affected as well - in this case, asthma. By teaching our children proper eating habits, we can help them increase their physical wellness and lower their risk of health issues" (Student 18). Lastly, the fifth category, *critical thinking + personalization* captured tweets that were both illustrating CMHL and included personal examples. All tweets in this category could have been classified as *critical thinking* only, however, student's inclination to include their personal examples was noteworthy, so this category identified these exceptional tweets. For example, "This topic is very relevant to today's ongoing health/wellness challenges! I have experienced this during my BN program. When caring for patients with mental health issues, many of them unfortunately used unhealthy coping mechanisms, such as smoking or unhealthy eating #HKR1000" was coded as a *critical thinking + personalization*.

Data was analyzed using SPSS. Percentage and frequency data are reported. The results reported are not generalizable, and if repeated with different populations, are likely to elicit different results, based on the literature and the fact that CMHL is dependent on several factors external to education.

RESULTS

The results from this exploration of students' CMHL are divided into four main sections, based on the type/item of analysis and include information on the sample of students and their Twitter use for the course, and more specifically, the depth of engagement exhibited in the tweet (referred to as the "quality" of the tweet).

Study sample and Twitter course use

In total, 155 undergraduate students were required to complete the course assignment. Seventy-seven percent of students in the class completed the Twitter event from which our data is pulled, indicating slightly less than one-quarter of the class (23%) did not participate or post any tweets. This data was collected prior to the COVID-19 pandemic and work-/learn-from-home/public health measures, eliminating that as a factor impacting completion rates. A secondary goal of this assignment was to promote engagement and interaction between students in an online course, further explaining why the hashtag was a requirement (Rohr, Squires & Peters, 2022).

Tweets were received from 58 and 62 students in the two course sections, representing a total of 120 students. Of the tweets, 52% were original tweet posts and 47% were response tweets. Overall, the vast majority of students (98%) did not directly reference/cite course readings or resources in their tweet(s). This omission could be for a variety of reasons, including that the assignment instructions did not explicitly state/require citing course readings, the 280-character limit per tweet/imposed by Twitter, as well as individual reluctance/omission.

In order for a student's tweet to be included in the analysis the hashtag #HKR1000 was required. Slightly under one-third (32%) of students failed to include the hashtag in their post ultimately impacting 13% of the responses.

Quality of tweet

As demonstrated in Figure 2, approximately 48% of students' tweets could be classified as the *summary/general statement* category, meaning the tweet either summarized the article they posted or the tweet included what would be considered generalized health statement (for example, exercising helps our physical wellness); 10% of students posted tweets classified as *personal statements only*, where their tweet contained only information that was personal/related to their personal health/wellness; 5% of students summarized the news article and then explicitly mentioned course concepts in their tweet, 24% of students posed tweets considered to be *critical thinking* (i.e. health literacy); and approximately 13% of tweets were classified as *critical thinking and personalization*.

Original tweets and quality

For analysis of the original tweets, approximately 78% were classified as *summary/general statement* tweets; this was by far the most common classification (see Figure 2). This illustrates students were overwhelmingly inclined to summarize the information in their chosen article. The remaining original tweets were coded as *critical thinking* (10%), *summary + explicit mention of course concepts* (7%), *critical thinking + personalization* (3%) and personal statements only (1%). Only 13% of all original tweets were classified as incorporating critical thinking, or CMHL.

Response tweets & quality

Results for the response tweets (Figure 2) illustrate a dramatic difference in the quality of the information contained in the tweet. Here, the majority of tweets, approximately 39% were classified as *critical thinking*, 23% as *critical thinking + personalization*, 20% as *personal statements only*, 15% *summary/general statements* and 2 percent *summary + explicit mention of course concepts*.

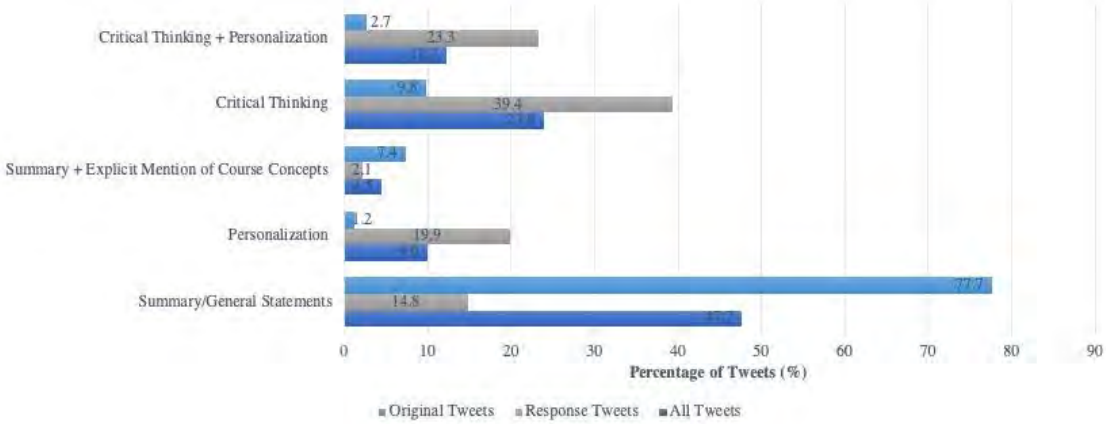

Figure 2. *The quality of the tweet varies based on the category, or type of tweet posted*

Of the categories that incorporate critical thinking, 63% of response tweets were classified as either *critical thinking* or *critical thinking + personalization*. This is significantly higher and by far surpasses the 13% of original tweets that were classified as *critical thinking* or *critical thinking + personalization*. Students were more likely to utilize/illustrate critical thinking (i.e., CMHL) in response tweets compared to original tweets.

DISCUSSION

The purpose of this research was to determine if students in an online, entry-level health and wellness course exhibit CMHL skills, through their critical analysis of news media articles using Twitter. We identified the need to add CMHL training to our course. From all the tweets, approximately half (49%) were *summary/general statement* tweets; 24% were *critical thinking* (i.e., demonstrating health literacy); 13% were *critical thinking and personalization;* 10% were *personal statements* only; and 5% summarized the news article and then explicitly mentioned course concepts. When combining the *critical thinking* and *critical thinking and personalization* categories, 37% of all tweets incorporated critical thinking. The majority of tweets, nearly 50%, summarized the article posted without incorporating any critical thinking, personalization, criticism, or reflection; all skills that are essential in CMHL.

In original tweets, students were overwhelmingly inclined to summarize the information in their chosen article (77%). This is significantly larger than any of the other categories. The critical thinking categories for original tweets only amount to 13% of posts. Students were found to be less able to operationalize the health-related information presented to them in the news article and were more likely to summarize the information presented instead of synthesizing and applying it. Given the limitations of the data collected, we are not able to determine why this occurred. It is anticipated however that these findings are attributed at least in part to

students' inexperience applying information/knowledge and critical thinking skills.

When considering reply/response tweets, 40% were classified as *critical thinking*, the most common of the response tweets; 23% of tweets were *critical thinking + personalization*, 20% as *personal statements* only, 15% *summary/general statements* and 2% *summary + explicit mention of course concepts*. In total, the critical thinking categories comprise 63% of all response tweets. The response tweets illustrate a significantly higher percentage of CMHL and by far surpasses the 13% of original tweets that comprised the critical thinking categories. Students were more likely to utilize/illustrate critical thinking (i.e., CMHL) in response tweets than original tweets. One possible explanation is that by the response tweets, students had read other students' initial tweets/other responses demonstrating a higher level of application and analysis, thereby providing a model for students who had not demonstrated this initially. Students may have also felt more comfortable sharing more, once they saw the support provided by others in the course (Fergie et al., 2016).

Overall, students were less likely to critically engage with the information presented to them on media platforms; they were more likely to summarize the article, which, while valuable was not the purpose of the assignment. A large proportion of students who completed the Twitter events would benefit from additional guidance/practice in CMHL analysis and applying course content to guide them in identifying, assessing, and using information presented online. Engaging with the course material illustrates critical thinking processes, which we believe represents CMHL and the ability of students to comprehend and question the information presented in such media articles.

As presented in the above results, ninety-eight percent of students did not directly cite course readings or resources. This may be attributed to the character limit Twitter places on tweets (i.e., 280 characters/tweet); however, an alternative explanation is that the instructions did not explicitly require students to reference course material; rather students were directed to find a "credible news source that exemplifies one or more of the health and wellness topics discussed in the course" (Brightspace, 2019). Altering the assignment instructions to more clearly direct students to incorporate course content and/or the textbook would clarify the expectations and may result in better outcomes.

Thirty-two percent of students omitted or forgot to include the designated course hashtag. This omission may have been due to a multitude of factors including, students simply forgot, they did not correctly read/understand the instructions, or they misspelled the course hashtag. This was imperative for evaluation, as students and the instructor/teaching assistants could view only those tweets with the specified hashtag. There were more original tweets than reply tweets posted in the event. This may be explained by the fact that students sometimes posted more than one original tweet to fully explain/expand on their initial tweet. This strategy circumvented Twitter's character limit and was within the assignment guidelines. Students may not have read/understood that they were required to reply to a classmate's post, but we do not have further data on these findings. Failure to include the course hashtag and only completing one tweet may not be directly related to CMHL *per se* but is noteworthy as it may indicate student's general media literacy abilities and their ability/inability to navigate online courses. Further research is needed to determine the reasons for such. As our intent of this work is to apply our findings to improve the course, we may adjust the syntax/presentation of directions in future course offerings to make the hashtag requirement more explicit.

As social media users become more confident online and engage more as "prosumers" (Fergie et al., 2016), particularly during the current pandemic/virtual world, it is important to recognize the strong relationship between user's identity and their content production and consumption. Among social media users, these impact one another in multiple ways, and it is further compounded by external factors outside the university/classroom setting. As a result of the varying levels of offline/online support and image management, CMHL is a complicated skill to develop and/or goal to attain using social media activities in the classroom alone. To address some of these differences and effort to make credible content accessible and understood by a greater number of students/young adults, all students would likely benefit from additional pre-Twitter/pre-course lessons and experience in critically examining knowledge production and consumption on social and in news media sources.

CMHL's defining attributes – a *skill set*, *empowerment,* and *a competency of engaged citizenship* (Wharf Higgins & Begoray, 2012) – are highly valuable and often help individuals thrive in educational/professional settings. In addition to exposing students to opportunities to practice these

skills, it is crucial for instructors to first ensure students possess the foundational tools attached to these skills and engaging in these activities. There would be great benefit in focusing on the development and then refining of these skills, so as to prepare students for future roles that will require proficiency in analytical/critical thinking, building *effective* "prosumers" of information (Fergie et al., 2016). The importance of critical thinking for health education has been amplified during the pandemic and with the current news and social media climates and continued growth in these areas, the absence of critical media literacy more generally will present challenges for individuals entering these spaces. Education in and "IRL" practice of these skillsets can have extensive impacts on individuals' knowledge. To establish students' baseline CMHL, instructors/educators can integrate lectures and/or classroom-based activities and informal assessments that ask students to identify or demonstrate examples of critical thinking. These can be distinct activities or modeled after the planned course activities/evaluations. It is also important that instructors provide students with clear evaluation guidelines and expectations as early as possible and avoid any assumptions about students' previous critical thinking experience or CMHL. Based on our findings and the research demonstrating that clear communication of expectations has been found to improve the quality of student work, especially in lower-level university courses (Rapanta et al., 2020), the health and wellness course examined here will be amended to reflect this.

Limitations

Some limitations of the presented research include the sample size, the nature of the data collected and the exploratory basis of the study. Our sample was limited to two mid-sized course sections and the data collected was conducive only to univariate analyses. As the findings are not generalizable outside the present context, should the study be replicated, results may vary based on the nature of CMHL and CMHL's contingency on demographic factors. The Twitter API does not collect users' demographic information, so analyzing and differentiating for age, race, gender, or socioeconomic status was not possible, despite the suggested correlation between MHL and gender (Swisher et al., 2020), race (Muvuka et al., 2020) and socioeconomic status/class (Lastrucci et al., 2019; Stormacq et al., 2019). This information may be valuable in future work, but here, it was not the intent to collect such detailed information; rather we aimed to examine tweets to determine if CMHL skills were evident in an entry-level online health and wellness course. Furthermore, the exploratory nature of the study and lack of prior research specifically concerning CMHL via Twitter elicited some complications with regards to the methodology and analysis. This research, therefore, uniquely contributes to this gap identified in the literature, examining CMHL and social media use together.

CONCLUSION

The increased use and pervasiveness of social media platforms has created new communication networks which have subsequently altered our behaviours to reflect the instantaneous, 24/7 nature of social media platforms and in turn, social media has become a pivotal part of our daily life. Social media platforms are frequently accessed as sources of public health information; they offer instantaneous answers to health-related queries at little to no cost and can be consulted more readily than a medical doctor (Hesse et al., 2010). The plethora of health information available online provides the general population with the opportunity to become self-informed about health and wellness, which may lead to improving and increasing public knowledge and competencies surrounding decision making when it comes to health-promoting or health compromising behaviours (Tonsaker et al., 2014).

We were able to determine that students in our sample were more likely to summarize health-related information they viewed online than operationalize and exhibit the critical thinking skills that comprise CMHL. Students were found to illustrate CMHL skills, critically thinking and engaging with the information presented, when interacting with peers on Twitter (response tweets), more so than when interacting directly with online news media (original tweets). These results illustrate that improvements and adjustments are needed to better fit the needs of our students, which includes educating students about CMHL. Educating students to be more critical of the information consumed online, especially when it is health-related can impact overall wellness and health-compromising or health-promoting behaviours.

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