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Research Report

Medical Student use of Facebook to Support Preparation for Anatomy Assessments

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Running title: Use of Facebook by medical students

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ABSTRACT

The use of Facebook to support students is an emerging area of educational research. This study explored how a Facebook Page could support Year 2 medical (MBChB) students in preparation for summative anatomy assessments and alleviate test anxiety. Overall, Facebook analytics revealed that in total 49 (19.8% of entire cohort) students posted a comment in preparation for either the first (33 students) or second (34) summative anatomy assessments. 18 students commented in preparation for both. In total, 155 comments were posted, with 83 for the first and 72 for the second. Of the 83 comments, 45 related to checking anatomical information, 30 were requiring assessment information and 8 wanted general course information. For the second assessment this was 52, 14 and 6, respectively. Student perceptions on usage, and impact on learning and assessment preparation were obtained via a five-point Likert-style questionnaire, with 119 students confirming they accessed the Page. Generally, students believed the Page was an effective way to support their learning, and provided information which supported their preparation with increases in perceived confidence and reductions in anxiety. There was no difference between gender, except for males who appeared to be significantly less likely to ask a question as they may be perceived to lack knowledge ($P < 0.05$). This study suggests that Facebook can play an important role in supporting students in preparation for anatomy assessments.

Key words: Gross anatomy education, medical education, e-learning, web-based learning, anatomy assessment, social media, Facebook, engagement

INTRODUCTION

Anatomical education remains an essential component of medical curricula, with its assessment often being of a high-stakes nature to ensure adequate competency. In preparation for such assessments students can experience varying levels of trepidation, anxiety and general unease as they come to terms with both the format of the assessment and the relevant curriculum. This is becoming more evident with students from around the globe embarking on undergraduate education with increased levels of anxiety (Novotney, 2014; Coughlan, 2015), and this being particularly prevalent in healthcare programs (Henning et al., 1998). This anxiety often manifests as students prepare for assessments with test anxiety, specifically, being a complex multidimensional construct that relates to the sense of negative outcomes or failure after an assessment (Zeidner, 1998). Although numerous theoretical models have been proposed there is, as yet, no single theory that takes into consideration all of the complex factors which can lead to test anxiety (Zeidner, 1998; Chapell et al., 2005; Putwain, 2008). Moreover, at present there is very little empirical research that has addressed this issue specifically within anatomy education. Schwartz et al., (2015) provides a comprehensive summary on the potential impact test anxiety could have in preparation, and during, timed high-stakes assessments such as objective structured practical examinations (OSPEs). Test anxiety manifests as periods of increased worry in relation to the upcoming assessment with the student becoming distracted, and lingering negative thoughts unrelated to the actual test material (i.e., potential test failure and comparison to peers) leading to students "blanking out". Furthermore, numerous empirical studies from outside anatomical education have reported that it predominantly affects female students and impacts negatively on student achievement (Hembree, 1988; Chapell et al., 2005). As anatomy remains an essential part of medical, biomedical, dental and allied healthcare programs, and with its assessment often being of a high-stakes nature, the impact of test anxiety on student performance needs to be

better understood. However, due to the literature exploring links between test anxiety and high-stakes anatomy assessments being nascent further research is required to further understand this increasing aspect of anatomical education.

Due to the rapid adoption of technology-enhanced learning (TEL) approaches within anatomical education (Trelease, 2016), blended curricula are becoming increasingly prevalent. One such TEL resource is social media that is establishing itself within medical education (Cheston et al., 2013; White et al., 2013; Roy et al., 2015), with an increasing number of examples being documented (Chtouki et al., 2012; Jaffar, 2012; Hortsch, 2013; Jaffar, 2014; Raikos and Waidyasekara, 2014; Barry et al., 2016; Gonzalez and Gadbury-Amyot, 2016; Hennessy et al., 2016; Jaffar and Eladl, 2016; Lugo-Fagundo et al., 2016). However, with the increased adoption of these TEL resources it is essential that a concomitant increase in evaluation occurs to assess the efficacy of such developments on student learning within the context of their deployment (Roy et al., 2015; Pickering and Joynes, 2016). Recently this level of evaluation has begun to emerge with the use of a Facebook Page (Facebook Inc., Menlo Park, CA) being shown to have links with increased levels of engagement, motivation and collaboration; more recently it has also been suggested that the level of engagement can be correlated to academic achievement (Jaffar, 2014; Jaffar and Eladl, 2016). Furthermore, work by Hennesey et al., (2016) has drawn attention to the use of Twitter (Twitter Inc., San Francisco, CA) in providing a support network within an undergraduate neuroanatomy course. More generally across higher education the use of Facebook and other forms of social media have been shown to provide clear benefits to students, such as increasing the opportunities for discussion, assessment preparation, organizing studies and sharing of resources (Wang, 2013; Donlan, 2014; Albayrak and Yildirim, 2015; Ali, 2016). However, as Kranzberg (1988) stated with his sixth law of

technology use: *"Technology is neither good nor bad; nor is it neutral"*. Therefore, despite the emerging evidence of students benefitting from the utilization of social media, the introduction of such resource is far from straight forward. Recent work has highlighted this potential conflict with a range of negative issues associated with social media being identified, including distraction, anonymity and privacy (Aydin, 2012; Selwyn, 2016). Moreover, the inappropriate use of social media can raise issues such as professionalism and confidentiality which are of particular importance for anatomy students within healthcare curricula. As reported, within medical education the use of social media can be of clear benefit to medical students (Ali, 2016; Cartledge et al., 2016; Hennessy et al., 2016; Jaffar and Eladl, 2016), but being aware of the boundaries and potential pitfalls of posting comments on such platforms is of paramount importance (Peluchette and Karl, 2008; Chretien et al., 2009; Marnocha et al., 2015). Recent research has highlighted the increased incidence of such unprofessional behavior which has resulted in warnings to students and in some cases exclusion from their course (Chretien et al., 2009). This increase in adverse incident reporting has led to the development of policies to deal with this increase (Chretien et al., 2009; White et al., 2016), although this does not necessarily correlate to changes in behavior with some institutions still having to deal with unprofessional postings (Barlow et al., 2015). However, the issue is further complicated with students, doctors and patients all having different thresholds of what is acceptable to post online (Jain et al., 2014; Langenfeld et al., 2014; Langenfeld et al., 2015), and students appearing to be unaware of their professional vulnerability (Osman et al., 2012). Furthermore, as part of their training healthcare students are exposed to a range of sensitive material that needs to be treated appropriately to prevent breaches of confidentiality. This can include patient information, with reports indicating breaches via social media (Chretien et al., 2009; White et al., 2016), but also specifically within anatomy education, where it is possible due to the increased

availability of camera-enabled electronic devices, such as smart phones and tablet devices, to image and then post cadaveric material from the anatomy laboratory. With this increased ease of image acquisition and distribution there is a concomitant potential for abuse, by both students and staff (Bond, 2013; Anonymous, 2014). Issues relating to the ethics of cadaver donation and how they can be visualized are well discussed in the literature (Cornwall, 2016; Jones and King, 2016; Winkelmann, 2016), but there still remains a paucity of empirical evidence to support and guide the appropriate utilization of images. Donor trust, however, is of paramount importance to support the continuing utilization of cadavers in anatomy teaching (Winkelmann, 2016), and it is therefore important that the potential issues of confidentiality and social media are made aware to students. This range of issues are particularly important not only to the individual student, who will face the repercussions of such inappropriate activity, but also patient and donor confidence, and it is therefore essential that teachers are mindful when actively using social media as a teaching tool that students are informed of the boundaries and appropriate behaviors. Although guidelines exist on how social media can be used effectively within medical education, these need to be transposed from the academic setting into the classroom as part of modern healthcare curricula (GMC, 2013; Kind et al., 2014; White et al., 2016).

An additional growing area for concern with the integration of social media into higher education is addiction. Kuss and Griffiths, (2011) provide a comprehensive review of the literature in relation to social media addiction and have highlighted a range of factors such as patterns of usage, motivations for usage, personality traits and negative consequences. Furthermore, recent work by Koc and Gulyagci (2013), Andreassen and Pallesen (2014) and Andreassen (2015) have highlighted how social media addiction shares many similarities with other addictions such as tolerance, withdrawal relapse and mood modification, with empirical evidence suggestive of impaired health and wellbeing being

related. The negative consequences of social media use, and particularly for those students who become addicted, are of particular importance to anatomy teachers and should be considered when introducing such a resource. For example, evidence has highlighted how the level of Facebook correlates to lower performance and less time spent studying, compared to those who did not engage (Kirschner and Karpinski, 2010). Furthermore, the students questioned reported that using Facebook led to distraction, procrastination, and poor time-management. Within healthcare students specifically, the use of social media has been shown to be complex with differing levels of use being highlighted for different social media sites (Masters, 2015), supporting the need for a more focused analysis of which sites influence learning (Andreassen et al., 2012; Griffiths, 2012; Andreassen and Palleson, 2013).

Clearly the role of social media in higher education is particularly complex with a range of positive and negative outcomes associated with the merging of academic delivery into a personal online space. As a way of countering these potentially negative or disruptive issues associated with social media, numerous studies have explored the use of discussion fora situated within a closed virtual learning environment (VLE) with positive impact in terms of engagement and course attainment reported (Choudhury and Gouldsborough, 2012; Green and Hughes, 2013; Green et al., 2014). Anecdotally, however, the use of discussion fora within the VLE at the authors' institution have not proven successful when used previously. Therefore, due to the positive reports of the integration of such platforms into anatomy curricula, the prevalence of internet-enabled electronic devices that allow seamless access to such sites, and with the vast majority of the student population across the globe already accessing these platforms for both social and academic interactions (Madge et al., 2009; Perrin, 2015; Neier and Zayer, 2015; Lupton, 2015), a Facebook Page was integrated into the anatomy teaching of the MBChB (Bachelor of Medicine and Surgery) program.

Aims and Research Questions

The aims of the project were to utilize a social media network to facilitate the sharing of anatomical information and provide an informal platform to raise issues relating to the module's assessment. It was hypothesized that by establishing an open channel of communication and increasing the dialogue between students and the module manager the requirements of the high stakes assessment would be better understood and alleviate test anxiety. This study, therefore, addressed the following research questions:

(1) How does engagement with the Facebook Page vary in regard to gender and prior academic achievement?

(2) Does the level of interaction manifest as changes in assessment outcomes?

(3) What effect does a managed Facebook Page have on student preparation for timed high-stakes anatomy assessments in regard to anxiety and confidence?

MATHERIALS AND METHODS

Course structure and assessment regime

As part of the five-year MBChB program at the School of Medicine, University of Leeds all Year 2 students are required to undertake the Control and Movement module. It runs throughout all of the second year, which is split into three terms, and as the module title infers, there are two strands with these taught concurrently. The Control strand examines the neuroanatomy of the central and peripheral nervous systems, along with the anatomy of the head and neck region. The Movement strand covers the musculoskeletal system to include the anatomy of upper limb, lower limb and vertebral column. The module's curriculum is delivered via a series of didactic lectures, clinical symposia related to common neurological or musculoskeletal disorders (e.g., intracranial tumors; arthritis), dissection-based (limbs) and prosection-based (brain and spinal cord) practical anatomy classes, living and radiological

anatomy/ultrasound small group sessions and case-based tutorials. In addition to these teacher-led sessions there are a number of self-directed learning resources, including: paper-based workbooks, online formative multiple choice questions (MCQs), cadaver demonstration videos, e-Lectures and a detailed reading list, all of which are intended to support consolidation and revision of material. In total, each student receives 104 hours of teacher-led sessions with this distributed as 20×1 hour and 12×1 hour control and movement lectures, respectively; 26×1 hour and 10×1 hour clinical control and movement symposia, respectively; 10×1 hour and 18×2 hours neuroanatomy and musculoskeletal anatomy practical classes, respectively; 3×1 hour ultrasound and radiology classes; 2×1 hour living anatomy classes; 3 x 1 hour clinical case tutorials.

The module's assessment is via two timed spotter style examinations (similar in format to OSPEs) that occur at the end of terms 1 and 2, respectively, and cover material which was taught within that term, only. Each spotter contains 90 multiple choice questions (MCQs; single best answer) or extended matching questions (EMQs), evenly distributed over 30 stations that contain either gross anatomical or osteological specimens, radiographs, or photographed human models to highlight surface structures. Each station contains three MCQs or three EMQs that assess both basic knowledge and application. Each spotter is worth 50% of the overall assessment with compensation permitted so that for a student to successfully complete the module they are required to pass overall once their two spotter scores have been aggregated. The spotter standard is calculated via the Ebel procedure (Ebel, 1979; Ben-David, 2000).

Development and Intended Use of the Facebook Page

The module leader created a Facebook account and then a Facebook Page (Pickering, 2015b). Students would be able to communicate informally amongst each other (peer-peer), and

importantly, with the module manager. The comments posted by the students and the module manager would be available for all to view asynchronously, that is, they would remain on the platform for perpetuity, or until either the commenting individual or the module leader removed them. The page did not contain any learning material as this was already provided to the students via the module's VLE and was not its purpose. The site's unique URL was uploaded to the module's VLE area so students could access the Page and link to it from their internet-enabled electronic device. A Facebook Page was chosen over a Group as previous research into the use of Facebook as an anatomy education tool has used a Page and meaningful comparisons could therefore be drawn (Jaffar, 2014; Jaffar and Eladl, 2016; Lugo-Fagundo et al., 2016). Leeds Medical students receive formal training on the appropriate use, and potential conflicts, of social media during the professionalism strand of their course in Years 1 and 2.

Data Collection and Analysis

The number of students who posted a comment on the Facebook Page in preparation for each spotter were manually counted and sorted by student, date and type of comment (anatomical fact checking, spotter query or general course information query). A mixed methods approach for data collection was employed including a 14-item questionnaire that was released to the entire Year 2 Control and Movement cohort. The questionnaire contained ten five-point Likert-style positively phrased items focusing on general usage, impact on learning and preparation for the spotter, with four items relating to engagement. Qualitative data was obtained via two free-form questions at the end of the questionnaire that asked for the students' perceived strengths and weaknesses of the Facebook Page. Upon receipt and analysis of the quantitative and qualitative data from the questionnaire thematic analysis was conducted and yielded three emergent themes that were agreed by both authors who reviewed

the data (Swanwick, 2014). These were: (1) willingness to post comments in relation to a perceived lack of knowledge; (2) peer-peer interaction; (3) impact on perceived short and long term anxiety and confidence. Subsequently, additional qualitative data was sought specifically from those who commented by email (n = 8), with the returned narrative documented verbatim within the results section. Individual students (S) are denoted by [SX] with X representing the specific student; permission for the reproduction of received correspondence was granted from all students.

Initial data sorting and analysis was performed using Microsoft Excel 2015, version 15.14 (Microsoft Corp., Redmond, WA) with statistical analysis performed in Statistical Package for Social Sciences, version 22 (IBM Corp., Armonk, NY). Likert scale data is presented as mean (M) ± standard deviation (±SD) of the mean, with the percentage of students agreeing with statements also detailed in the text where appropriate (Boone and Boone, 2012). The internal reliability of the instrument was assessed using Cronbach's alpha, with an alpha level between 0.70 and 0.95 deemed appropriate (Tavakol and Dennick 2011). Statistical significance was determined using either Chi-squared (χ^2) or Fisher's Exact test (when the number of expected observations was < 5) for ordinal data obtained via the questionnaire, with 2x3 contingency tables formed from gender (male and female), and levels of agreement with the statements grouped into agree, disagree and neither agree nor disagree. An independent t-test and Pearson correlation was deployed for continuous assessment and usage data. The effect size was calculated using Cohen's d (Becker, 2000). An alpha level was set at ≤ 0.05 for all statistical tests. Ethical approval for the study was granted from the Research Ethics Committee of the University of Leeds School of Medicine (protocol MREC 15-008).

RESULTS

Facebook Usage Analytics

Analyzing the Facebook Page's usage revealed that in total 49 students (19.8% of entire year 2 cohort) posted 155 comments. Of these 49 students, 10 were male and 39 were female, with this ratio not differing significantly from the gender distribution of the MBChB program as a whole, χ^2 (1, n = 248) = 2.61, P > 0.05. Specifically, in preparation for spotter 1 there were 33 students who posted 83 comments, with 45 of these related to anatomical fact checking, 30 requiring spotter information and 8 wanting general course information (Fig.1A). In preparation for spotter 2, 34 students posted 72 comments, with 52 of these related to anatomical fact checking, 14 requiring spotter information and 6 wanting general course information (Fig.1A). Eighteen of the 49 students commented in preparation for both spot tests. Very few comments (2) were made by a fellow student in response to a question or query from another student (peer to peer). When asked to comment on this lack of peer to peer interaction, student feedback revealed several explanations: *"N*o one wanted to seem *arrogant or a 'know*-it-*all'"* [S2]; *"I only replied to a student…*on one occasion, and even then I considered sending a private message incase my explanation was inadequate or possibly even wrong*"* [S6]; *"*I think...people want an expert insight into things, and honestly I think we all value your [module leader] opinion more highly than [textbook] when it comes to spotter answers. I think given the choice of knowing you could answer it properly as oppose*d to us having a guess…e*specially seeing as some of the questions asked were often high level and most people wouldn't know the answer off the top of their head anyway*"* [S7]. Temporally, the number of posts increased as the spotters approached with 51.8% and 63.9% of posts made in the last 10 days of the course and 32.5% and 31.9% in the last 5 days for spotters 1 and 2, respectively (Fig. 1B and C).

In order to assess if any patterns existed between those who commented and previous academic achievement, the results from the student's year 1 anatomy spotters were analyzed. Only students who were positioned within the top 50% of the cohort from the previous year's aggregated anatomy spotter results commented, with the number of comments posted from students in quartiles 3 and 4, not differing significantly, $t(43) = 0.482$, $P > 0.05$ (N.B., the results from four students were not available as they entered the course in year 2). Furthermore, the linear correlation coefficient was calculated and revealed an insignificant positive correlation between the number of comments posted and the year 1 spotter results ($r = 0.231$, $n = 45$, $P > 0.05$).

Feedback from Questionnaire

A self-reporting questionnaire was used to provide quantitative and qualitative information on the level of engagement with the Page, and how it impacted on preparation and learning from the whole cohort. There were 248 Year 2 medical students studying the Control and Movement module during the 2015/16 academic year and all were able to access the Facebook Page. From this cohort 156 (62.9%) students completed the questionnaire. Of these students, 119 (76.3%) confirmed they used the Facebook Page, with this split into 90 (75.6%) female and 29 (24.4%) male. Similar to the results presented from the usage analytics on the gender distribution for those who commented (above), this distribution of gender did not vary significantly from the split within the MBChB cohort as a whole, $\chi^2 (1, n = 248) = 2.24$, $P > 0.05$. Therefore, this data suggests that almost half the cohort (47.9%) accessed the Control and Movement Facebook Page. Qualitative data was collected by two free-form sections in the questionnaire that sought feedback regarding the perceived positive and negatives of the Facebook Page. In total 149 comments were received from 75 (63.0%) individual students, with Table 1 detailing the number of comments received against five positive and five

negative themes. There were 99 positive and 50 negative comments received with a theme being formed when five or more similar comments were collated.

Engagement with the Facebook Page

Regarding location, the vast majority of students accessed the Facebook Page from home, with only a minority of students accessing the course either on campus or whilst travelling on a mobile device (Fig. 2A). The Facebook Page was freely available throughout the duration of the course and figure 2B reveals the level of engagement on a daily basis, with the majority of students engaging with the Page between once every 2-3 days and once a week (85.7%). The main purpose for using the Facebook Page was to read posts by fellow students and the module leader, while asking a question was much lower (18.4%; Fig. 2C; this figure is very similar to the number recorded via the Facebook Usage Analytics, see above). Moreover, only 13.5% of students agreed that they only accessed the Facebook Page to ask a question (Fig.3A). In regard to location, engagement and purpose, no significant difference was observed between gender ($P > 0.05$).

Usage and Impact on Learning, Preparation and Assessment of the Facebook Page

Usage**:** The majority of students agreed that the Facebook Page was effective in presenting anatomical information in an approachable format and that this approach was preferred to email by 69.2% and 59.5%, respectively (Fig.3A), with no between gender significance observed ($P > 0.05$). This was supported by the qualitative feedback received: *"I think I was more likely to ask a question on Facebook than via email because we are all on Facebook anyway so it is really easy, and feels less formal"* [S1]. The cohort was more evenly divided when presented with the statement that referred to not asking a question on the Page as they felt they may be perceived to lack knowledge. Overall, 41.5% agreed with this statement,

with a significant difference being observed between males and females (Fig.3A; 32.1% vs 44.4%; n = 117, P < 0.05).

Numerous comments were received that supported these findings: *"I feel that a lot of people I spoke to were more worried about being perceived as lacking knowledge from you [module leader] rather than other students"* [S4] and *"I think it's the same way no one asks* questions in lectures, just a general fear that people might think you're asking a stupid question. Personally it was less the idea of being judged by fellow students and more coming *across as stupid to you [module leader] and I know other people thought this too"* [S7]. Furthermore, 79.8% of students agreed that they didn't ask a question because it had already been asked by a fellow student (Fig.3A) with this emphasized by: *"If there was a concept I* was unsure about I would sometimes look through the questions that had already been *posted, but would never post a question myself as I wasn't sure if it was a really obvious question or not"* [S6] and *"I think that being able to see other people's questions (and the* answers they got) was just as valuable as having your own questions answered, but the only *way to solve the fear of asking questions in such an exposed platform would take away this"* [S3].

Learning: The use of the Facebook Page seemed to have a considerable positive impact on learning. The vast majority of students believed the Page was an effective tool in advancing their learning (85.0%), it compared favorably to what was already available (88.5%) and provided answers to questions that were previously unknown (Fig. 3B; 98.2%). Only the latter statement revealed a significant difference between gender (P < 0.05).

Preparation: In preparation for the spotters the Facebook Page seemed to have a positive impact on the level of confidence perceived by the cohort with 73.2% agreeing that they felt more confident (Fig 3C). However, the cohort was evenly split when it came to changes in perceived anxiety with 55.4% agreeing they were less anxious (Fig 3C). For both confidence and anxiety there was no between gender significance observed ($P > 0.05$). Comments received from the students in regard to anxiety highlighted that the issue was possibly more complicated: *"I think it d*id help reduce anxiety overall*…*it may have been slightly anxiety-inducing to see what another person had posted and realized *you didn't know the answer yourself"* [S3]; *"definitely helped in reducing anxiety and increasing confidence in the build-up to the spot test. I would definitely recommend it to be continued for future years"* [S4]; *"it gave me slight short-term anxiety when I saw the questions I was not aware of, but definitely gave me confidence overall when I was relieved to have come across it to make sure I was covering *the information that was needed"* [S8]. The internal reliability of the questionnaire was calculated with a Cronbach's alpha of 0.81 recorded.

Assessment: The overall performance in the aggregated spot test for those students who commented (M = 79.4%, SD = 8.35) was compared with those who did not (M = 70.98%, SD = 10.26), with a significant difference and a large effect size being observed, $t(246) = 5.136$, $p < 0.001$, d = 0.89. Furthermore, the impact on assessment for those who commented was also explored with the linear correlation coefficient calculated that revealed a significant correlation between the number of comments posted and the Control and Movement spotter results, $r = 0.307$ (n = 45, $P < 0.05$). None of the students who failed the Control and Movement module commented on the Page, with 12 of the 49 students (24.49%) who did comment positioned in the lower 50% of the cohort.

DISCUSSION

With anatomy remaining a core element of medial curricula around the globe and its assessment often being high-stakes, approaches to support students in their preparation are an important part of curriculum development. This study has investigated the integration of social media into a Year 2 anatomy course as part of an MBChB program. Specifically, it aimed to contribute to this nascent area of research by evaluating the use of a Facebook Page on medical students' preparation for high-stakes timed assessments, across three research areas: (1) engagement by gender and prior academic achievement, (2) levels of engagement and assessment outcomes, and (3) the impact on anxiety and confidence.

Overall Cohort Perceptions

Generally, around half of the Year 2 MBChB cohort accessed the Facebook Page in preparation for the two high-stakes anatomy assessments within the Control and Movement module. This level of engagement followed a similar pattern for other TEL resources within the Leeds anatomy curriculum (Bickerdike et al., 2014; Pickering, 2015a; Swinnerton et al., 2016), with the majority of students accessing the resource at a frequency of several times per week (Fig. 2B). However, as can be observed, and will be discussed, this frequency of engagement is only a snap shot and shouldn't be over-interpreted as individual students are likely to interact with the resource in a very personalized nature (Fig. 2). The actual number of students who commented on the Facebook Page was low, with the majority of students seemingly content to engage by reading the posts of others and the module manager. The explanation for this behavior is likely to be due to a broad variety of reasons, including the query already being asked by a fellow student, not wanting to come across as lacking knowledge, or conversely, being seen as a 'know it all'. Previous studies have already highlighted the phenomenon of 'lurking' on social media (Shafie et al., 2016) and it would

not be surprising if a similar approach was present here. Moreover, seeing as social media is also an online space that many students face with trepidation due to the potential anonymity and privacy issues (Aydin, 2012), the development of a Facebook Page as an educational scaffold needs to be student-centered and managed in such a way that promotes and supports interaction. In fact, due to the issue of anonymity it could be concluded from the data presented, that Facebook is perhaps not the most ideally suited platform for interactions between students and with staff. This was particularly evident with the qualitative feedback (Table 1) that revealed an apprehension to posting that was related to the possible negative perceptions from peers and strikingly the module manager, which would be removed if students could post anonymously or with a pseudonym. However, when viewed alongside the positive feedback received from students in regard to the use of Facebook as a method of communication compared to email, and that it was deemed a suitable platform for delivering course information, its use becomes complex. It should be stated that although the Facebook Page was available, students could still email questions directly to the module manager to ensure that if the main driver for not posting were the negative perceptions from fellow students they still had a communication channel. Despite these apprehensions the students confirmed that the Page supported learning and provided answers to questions that were previously unknown to the individual. This is reinforced with only 19.8% of students posting a comment, and the majority of students disagreeing that they accessed the Facebook Page to ask a question (81.6%). Generally, it appears that the Page was appreciated and of benefit to the cohort. However, for it to serve its purpose effectively there appears to be two specific requirements. Firstly, students need to feel comfortable enough to post a comment which is visible to both their fellow students and the module manager. As only a minority of students posted comments it could be concluded that they were too apprehensive or shy and this deterred them engaging. Secondly, in order to post a comment the student would need to be

sufficiently engaged with the course to be aware of their known unknowns. These are areas of the curriculum which they know need to be learned (known), but remain currently undiscovered (unknown). With this subset of learners sufficiently engaged to know their own deficits in knowledge and then, importantly, being comfortable enough to ask a question on the platform they provided a service for others students to learn from and remedy their areas of weakness in preparation for the assessment. For those students who only read the posts of others this resource may be purely confirmatory; by knowing their areas of weakness, their known unknowns, they obtained the answer without having to post a question themselves online or look elsewhere at other resources. In addition, it is also highlighted that a number of students were unaware that certain aspects of the curriculum were required. These unknown unknowns for some students, and the subsequent answering of them, did appear to create a transient increase in anxiety at the time, but overall this mechanism appeared to be beneficial as they would, ultimately, end up knowing the answer. However, depending on the level of engagement with the Page it is likely a number of students retained a number of unknown unknowns prior to participating in the assessment. These remaining curriculum and knowledge gaps will be one of the major determinants of the student's assessment outcomes.

Overall, of those who accessed the Facebook Page there appeared to be an appreciation of the platform for receiving information in relation to the module's assessments. Although it should be stressed that the effective functioning of the Page was heavily dependent on a subgroup of students who were sufficiently engaged to be aware of their knowledge gaps, and also be prepared to present this on an open platform in front of their peers and the module manager.

Assessment of Commenters

Knowing the details of the individual students who commented on the Page it is possible to describe their engagement characteristics and the impact on assessment outcomes. All of the students who commented were high achievers with them being positioned within the top 50% of the year group based on the anatomy assessments of the preceding year. Although they were more likely to comment compared to other students on the module, the actual number of comments posted did not relate to their prior achievement. This pattern of engagement is generally in line with other work that analyzed the use of Facebook within an anatomy curriculum that similarly showed 'high-performers' contributing more to the total number of engagements (Jaffar and Eladl, 2016). Of the comments posted the module's assessment was the main focus (90.0%) with the majority of comments relating to either the academic content, which was likely to appear in the spotter, or the logistics of the test itself. This reinforces the need for such a resource that supports students in their preparation. Furthermore, an interesting, if not unsurprising, observation was the temporal nature of the comments. It is appreciated that assessment can drive learning in some contexts (McLachlan, 2006; Cilliers, 2015), with this pattern of engagement appearing to be particularly notable within anatomy curricula when the assessment is of a high-stakes or significantly weighted nature (Wormald et al., 2009). This observation of engagement in close proximity to the module's assessment is clear in this study with the majority of comments posted within the last ten days of the course.

It is important to bear in mind that the analytics data presented is only a narrow view of the behavior of the specific students who posted a comment during the module. Obviously, there were a large proportion of students who did not engage with the platform at all, and those who engaged but did not post a comment. However, of those who did engage, the more comments posted correlated with a higher score in the module's assessment, with a significant increase in performance also observed compared to those who did not engage.

Although this correlation between number of comments and assessment outcome cannot be assumed to represent a causal link between Facebook use and assessment outcome, it does suggest that if Facebook use is a measure of engagement, then increased engagement can have a positive impact on learning outcomes. Student engagement as a latent variable is a particularly difficult educational construct to measure and recent work has established three domains: cognitive, emotional and behavioral (Gunuc and Kuzu, 2015). It could be hypothesized that it is the actual level of engagement students employ with course materials that is the main determinant of successful learning, irrespective of which TEL resource is utilized. Simply engaging with learning resources based on the relevant module's curriculum will lead to positive assessment outcomes. This exploratory study using Facebook as a method to support students in preparation for the module's high-stakes assessment has, therefore, provided a window for this diverse pattern of engagement to be observed. It does not suggest that Facebook per se is a tool that imparts knowledge, but can be used as an educational scaffold to confirm areas of doubt and thereby support students to achieve positive assessment outcomes.

As this study has enabled the engagement pattern of medical students use of Facebook to be closely observed it is of interest to note the conduct of their online activity. Previous work has suggested that issues such as professionalism and breaches of confidentiality are problematic when using social media (Chretien et al., 2009; Barlow et al., 2015; White et al., 2016), therefore it must be noted that of all the comments posted by the medical students none were of an inappropriate nature. This is probably to be expected as the students were aware that the Page was closely monitored by the module manager and of the strict confidentiality issues associated with cadaveric material at Leeds, with each student having to confirm compliance with the anatomy facilities rules and regulations. Moreover, the students receive professionalism teaching in regard to online behavior and how this can impact on

their present training and future career. Obviously though, full monitoring of the student's online behavior is not possible and unethical so it is impossible to generalize this behavior to their own personal interactions on Facebook. Similarly, the presence of social media addiction within this context also remains unclear, with the level of posting by individual students not reaching a level which was a cause for concern. However, what remains unclear is how often individual students accessed the Page to see if another comment had been posted and subsequently answered. Moreover, it is also unclear how often students accessed the Page to ask a question or receive an answer during periods of study and subsequently became distracted with other applications on their device which may have reduced their concentration on the task at hand. Although these aspects of the Facebook Page were not the primary purpose they are interesting and warrant further exploration if social media is to be further integrated into anatomy curricula.

Implementation considerations

This paper has commented on the use of a Facebook Page by medical students, however, for the page to run successfully the module manager was required to take a very active role. Due to the lack of peer-peer interaction the onus was very much on the module manager to run the Page and answer all questions. To ensure the Page was an effective learning tool this was done promptly with the majority of queries all answered within 2-hours (this speed of reply by the module manager may have been the cause of the low levels of peer-peer interaction observed). This level of commitment is a burdensome task that should not be underestimated when considering introducing such a resource. However, answering questions via this open platform did provide the students with an opportunity to observe the answers, which may have prevented them sending personal communications via email. For future iterations of the Page it would be recommended that other members of faculty, such as anatomy

demonstrators or facilitators, could take on the role of moderating the comments, or a frequently-asked-questions document could be developed that would contain the aggregated questions from previous years and disseminated to the year group. The overarching rationale for developing and evaluating teaching innovations is to support the education of students, and ultimately help them to achieve better grades and progress through the wider program. Therefore, by having access to empirical evidence of this nature, which highlights how engagement can potentially impact learning in a positive way, this should be shared with future students to highlight good learning practice. However, as a teacher there is only so much one can do by way of providing learning resources and channels of communication for students to engage with, essentially, each student has to take personal responsibility and direct their own learning.

Limitations

This study has a number of limitations which should be taken into consideration when generalizing to other situations. Firstly, the study's data is representative of only those students who engaged with the Facebook Page to either post or view a comment. As these students voluntarily engaged it would be expected that they found the Page beneficial and would like to have it continue for future iterations of the module. The views of students who did not use the Facebook Page were therefore not incorporated into the study. This cohort of user is an important group as they may be users of social media but do not value the cross over between academic and personal online activity. This should be considered by teachers when directing time to implementing a resource which is only used by a fraction of the students. Secondly, the actual impact on text anxiety is limited due to the lack of a validated questionnaire to thoroughly assess levels of anxiety during the module. Although the Facebook Page appeared to have a positive impact on confidence in preparation for the

module assessment's it was not clear that the level of test anxiety was tempered in a meaningful way. Thirdly, in regard to professionalism and confidentiality only those students who commented can be discussed. Although this study has provided an opportunity to view the behavior of students using open online resource it was in an artificial setting with the module manager monitoring the Page regularly. How students use Facebook away from the supervision of a member of staff remains unclear.

Future Directions

Moving forward, the use of social media within anatomy education is an area of nascent research with indicators from this study, and others (Jaffar and Eladl, 2016; Hennessy et al., 2016), suggesting a role in providing curriculum support. Future work will, therefore, endeavor to remedy the limitations mentioned previously. As this study was exploratory in nature further projects will seek to explore the positive and negative impact this resource has on test anxiety using a more robust validated instrument, such as the State-Trait Anxiety Inventory which has been used in previous studies (Spielberger, 1983; Schwartz et al., 2014). Furthermore, due to the positive outcomes documented in this paper, and the potential for future iterations of the Facebook Page to be integrated into the anatomy curricula, a more in depth understanding of social media addiction will be conducted. Finally, in an attempt to remedy the problems with anonymity and apprehension towards posting further qualitative research will be conducted to explore in greater detail the potential solutions which could be put in place to make the platform more appealing to a wider cohort of students.

CONCLUSIONS

The use of a Facebook Page may provide a useful TEL tool to support students in preparation for high-stakes timed anatomy assessments. Although only a minority of students engaged

with the resource to the extent of posting a comment, a clear majority of students accessed the resource to learn new things. The opportunity for all students to have questions and queries answered, however, was dependent on the small cohort of student who had engaged with the course sufficiently to identify their known unknowns and simultaneously be prepared to post these on the Page. It was these students who enabled their peers to benefit by having their previously unknown queries answered. With the introduction of any TEL resource into a curriculum it is important to understand the role of such resources, with this study providing valuable empirical evidence into the utility and benefit of integrating a social media platform into a medical anatomy curriculum.

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NOTES ON CONTRIBUTORS

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TABLES

Table 1. Summary of qualitative feedback received from the student questionnaire including the total number (and percentage) of comments for the perceived strength and weakness themes for the Facebook Page.

Strengths		Weaknesses	
Aggregation of student comments into themes	**Number of comments (%)**	**Aggregation of student comments into themes**	**Number of comments (%)**
Quick response to comments	36 (24.8)	Anonymity	19 (13.1)
Benefit of reading other students comments	24 (16.6)	Increased anxiety	11 (7.6)
Ease of asking questions	14 (9.7)	Perceived lack of knowledge	7 (4.8)
Familiarity and informality of format	11 (7.6)	None	7 (4.8)
Identification of areas in need of additional work	8 (5.5)	Organization of Page	5 (3.4)

Total number of positive comments = 90; total number of negative comments = 55;

percentage represents proportion from total number of comments (145).
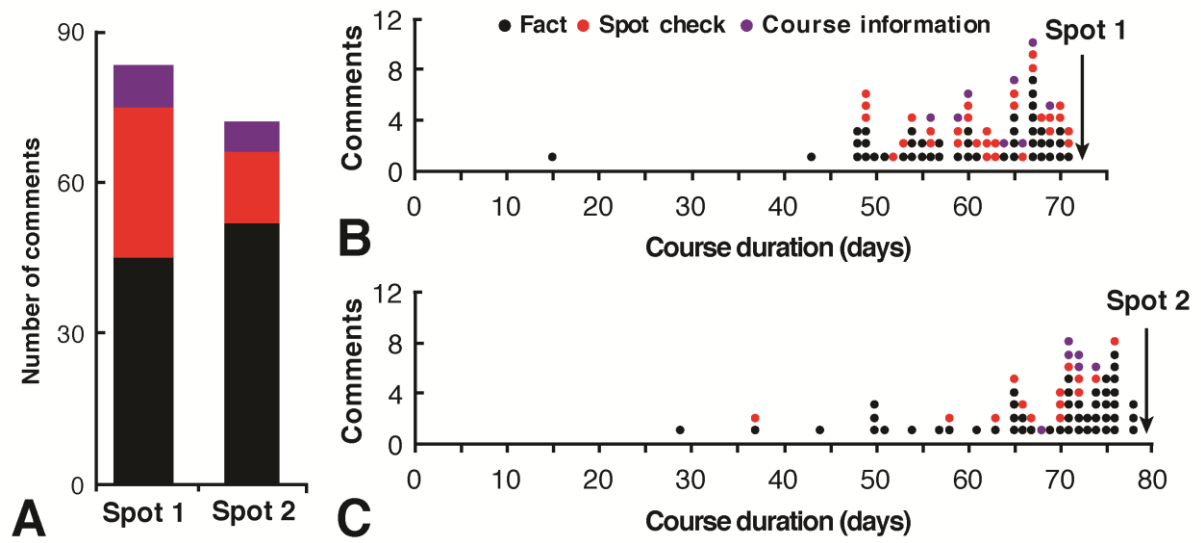
Figure 1. Quantitative data obtained from the Facebook Page revealing the number, type and time during the course comments were posted. A, stacked bar chart revealing the number of comments and type for spotter 1 (spot 1) and 2 (spot 2); B and C, type of comment and when posted during the course for spotter 1 and 2, respectively.
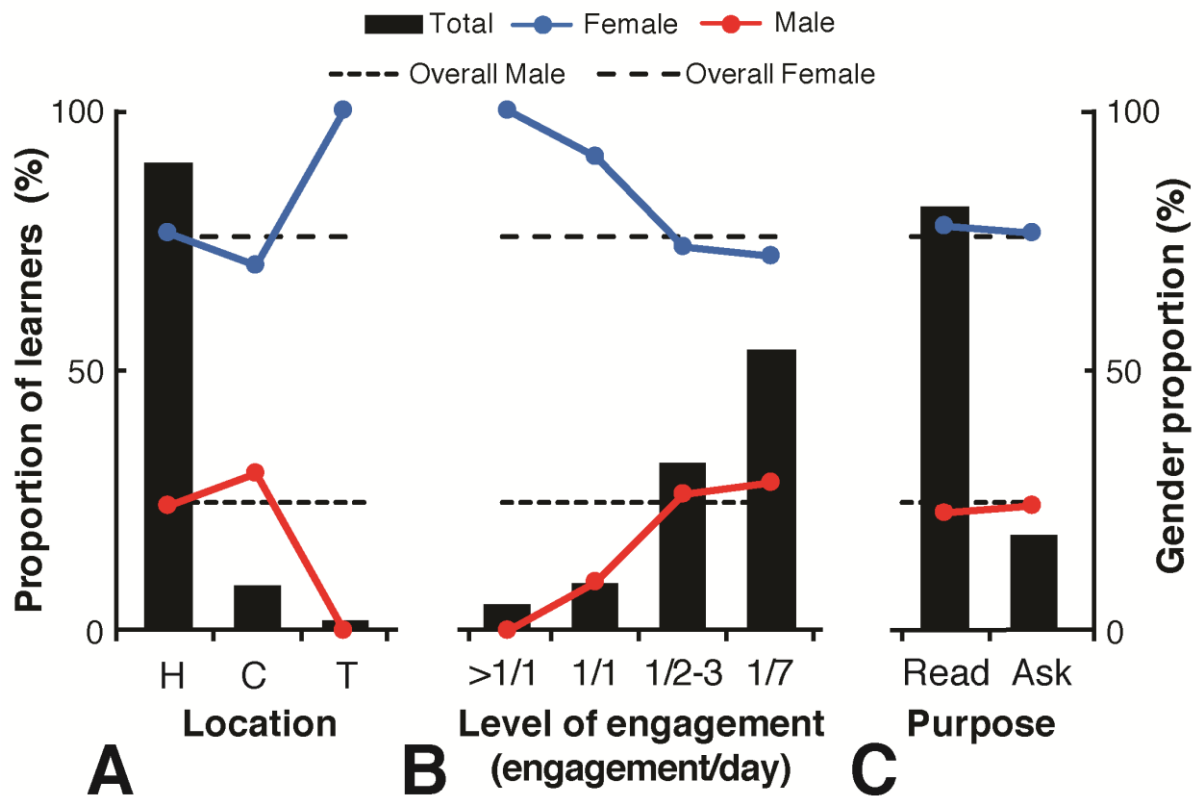
Figure 2. Quantitative date obtained via the questionnaire to show: A, the specific location of access; B, the level of engagement per day; and C, the main purpose for accessing. The left Y-axis represents the proportion of students, with the right Y-axis representing this proportion by gender. The gender distribution for the whole cohort is also provided. H, home; C, campus; T, travelling. N.B., a low number of students responded to travel (2; in A), > 1/1 (6; in B) and 1/1 (11; in B).

Usage of the Facebook Page

A

Impact on Learning

B

Impact on Preparation for Spot Test
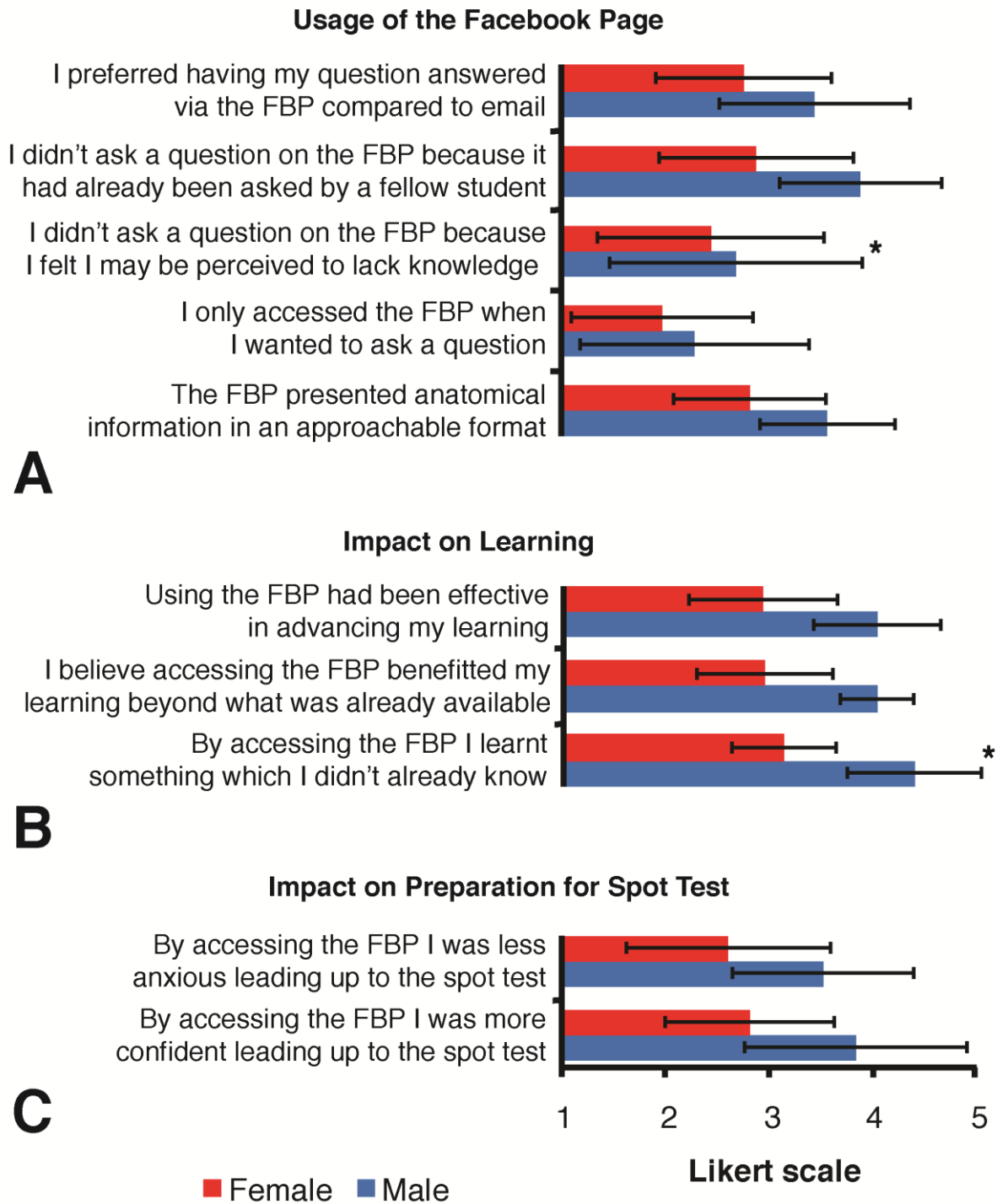

C

■ Female ■ Male

Figure 3. Quantitative data to show the A, usage; B, impact on learning; and C, impact on preparation for spotter, by accessing the Facebook Page. Five-point Likert scale data is presented as mean ± standard deviation of the mean, with: 5 = strongly agree; 4 = agree; 3 = neither agree nor disagree; 2 = disagree; 1 = strongly disagree. n=104-119; * P ≥ 0.05; Cronbach's alpha = 0.81. FBP, Facebook Page.