Sports concussion management using Facebook: A feasibility study of an innovative adjunct “iCon”

Context:
Sports concussion is currently the focus of much international attention. Innovative methods of facilitating management following this injury need to be investigated to assist athletic trainers.

Objective:
The objective of this study was to investigate the feasibility of using a Facebook concussion management program termed "iCon" ("interactive concussion management") to facilitate the safe return to play (RTP) of young persons following a sports concussion.

Design:
This qualitative study was designed as a single-group observational feasibility study using programme evaluation methodology, with the focus on gauging the suitability of the Facebook management strategy for a potential larger study.

Setting:
iCon involved a Facebook group containing interactive elements, with moderation and support from trained healthcare professionals.

Patients or Other Participants:
Eleven participants completed the study (n=9 males, n=2 females), and ranged from 18 to 28 years old.

Data Collection and Analysis:
The study was conducted over a three-month period, with participant questionnaires administered pre- and post-intervention. The primary focus was on the qualitative
experiences of the participants in the study, and the effect of iCon on their RTP. Usage data was also collected during the study.

Results:

At the completion of the study, all participants (100%) stated that they would recommend an intervention such as iCon to others, with their supporting quotes all indicating that iCon has the potential to improve the management of concussion amongst this cohort. The majority of participants (n=9 or 82%) stated they were better informed with regards to their RTP because of participating in iCon.

Conclusions:

This interactive adjunct to traditional concussion management was appreciated amongst this particular participant group and indicated feasibility for a future, larger study of iCon. Athletic trainers should consider the role that multimedia technologies may play in assisting with the management of sports concussion.

Keywords: Internet, Social Media, Brain Concussion, Facebook, Programme Evaluation.
Introduction:

Sports concussion is currently considered a “hot topic”, both in the mainstream media [1, 2] and in the scholarly literature [3, 4]. The impact of concussion has dominated the dialogue in many professional sports [5-7], and its implications are recognised at the amateur level [8]. The cost of sport concussion can be defined in financial [9], and societal terms [10], as well as impact on well-being (health)[11]. Due to these consequences much focus has been placed on technologies which can aid the detection of concussion [12, 13], however, less attention has been placed on facilitating and managing recovery following concussion. Given the accepted significance of sports concussion as a leading public health concern [14], it is prudent to explore a wide array of approaches in order to facilitate the recovery of individuals following a sports concussion and assist the role that athletic trainers play in this process [15]. An area of healthcare which has not been fully explored in respect to sports concussion is “eHealth” which is defined as “health services and information delivered or enhanced through the Internet and related technologies” [16]. While early eHealth interventions were centered around simplistic communication methods such as text messaging [17], the sophisticated nature of the internet has led to more nuanced approaches being developed to online health interventions [18]. The advent and widespread uptake of social media has been a factor in this process [19]. Social media (including platforms such as Facebook, Twitter and YouTube) are now ubiquitous throughout society and are widely used for a variety of everyday purposes, including as a popular adjunct in healthcare [20-22]. Some exploration of the use of evolving technologies to assist the management of sports concussion has recently been described in the clinical literature [23, 24], and there is also a growing awareness of the role that technology can play in the detection of sports concussion [25, 26]. The emergence of smartphone applications (or “apps”) in the field of health has seen the development of multiple apps which are tailored towards sports concussion [27, 28]. A
systematic review by Lee and colleagues [25] demonstrated that the currently available concussion-related apps are targeted towards a wide range of consumers (including: medical professionals, the general public, and the parents of young sports persons). The content of the concussion information present in these apps was shown to vary in its quality and consistency, with many concussion-related apps failing to provide information to consumers that adhered to best-practice concussion guidelines [25].

Prior research has described the use of websites and social media for the dissemination of concussion-related information. An earlier study by Ahmed et al (2010) described a content evaluation of concussion-related Facebook groups, and used the term “iSupport” to describe the process by which persons with a concussion were communicating with each other and seeking support via Facebook [29]. The same authors also analyzed concussion-related websites and found that the standard of online information available for consumers was inconsistent [30], while further investigations have been conducted into the content of concussion-related information on Twitter [31, 32]. Facebook support groups have been shown to be beneficial for a range of conditions including breast cancer [33], diabetes [34], and for the parents of preterm infants [35]. The use of innovative strategies and technologies to assist the diagnosis and management of concussion has been recognized and recommended in the concussion in sport (CIS) consensus statement [3] and the National Athletic Trainer’s Association position statement [15]. Furthermore, the use of social media has been mentioned as a means of facilitating concussion education [36].

With the widespread use of social media (in particular Facebook), allied with the high prevalence of sports concussion in the younger population, an exploration of the use of Facebook to assist an individual in managing the recovery process was indicated. Therefore, the aim of this study was to establish the feasibility of a Facebook concussion management strategy termed “iCon” (“interactive concussion management”) to facilitate the management
and safe return to play of young persons with a sports concussion. The successful implementation of a concussion management adjunct such as iCon could lead to a range of benefits including; providing the patient with interactive and real-time feedback, giving ATs an additional tool to help manage their player’s return to play, and potentially easing some of the burden from the patient’s medical provider.

Methods

Study design

This qualitative study was designed as a single-group observational feasibility study, with the focus on gauging the suitability of the Facebook management strategy for a potential larger study [37]. Programme Evaluation methodology [38] was adopted to help assess its feasibility, and this methodology was selected to provide a comprehensive approach which extended beyond outcome measures. By using this approach, it was anticipated that the multiple facets of the study (including the participant satisfaction and dynamics within the intervention) could be evaluated. Data were collected prior to, during, and following the introduction of iCon. The study began after the first participant was entered into the group, and ended 90 days after this point.

Ethical approval:

Ethical approval was obtained from the University of XXXX Human Ethics Committee, XXXXX, prior to commencing this study.

Design of iCon:

Previous related studies [29, 30] indicated that online resources were a potentially valuable means of assisting an individual with a concussion. Prior to the creation of iCon, consultation
was undertaken with different key stakeholder groups; namely young persons with a sports concussion [39] and the primary care physicians responsible for their care [40]. These primary stakeholders were supportive of Facebook to be used in this manner. An explorative study was also undertaken of the ethical issues related to the use of Facebook to deliver a concussion intervention [41], and these issues helped to shape the creation of the iCon content and operation.

iCon was designed to augment the face-to-face interactions individuals had with their primary care physician. iCon was a Facebook group that was specifically designed for the purposes of this trial, and contained the following key features (see Table 1):

- Best-practice concussion information at the time of the study;
- The ability to obtain real-time feedback from experienced medical personnel;
- A vehicle for peer support via interaction with other individuals who had sustained a concussion in iCon.

For the purposes of privacy and confidentiality, iCon was established as a “secret” Facebook group. This ensured that only the participants in iCon would be able to see the information posted within the group, and that individuals external to iCon would not be able to view its contents. Given that elite sportspersons would typically have access to high-level medical services and have different needs to those of recreational athletes, iCon was targeted as a community based intervention for non-professional athletes.

**iCon content**

All advice and recommendations in iCon were based on the most up-to-date concussion information at the time the study was conducted, namely the 2008 international consensus
Since this study was completed these guidelines have been superseded by the 2012 international consensus statement [3] however the main premise relating to concussion management is unchanged. The key content features of iCon are outlined in Table 1.

**iCon Staff**

Two individuals were responsible for providing input during iCon- the iCon Facilitator (iCF) and the iCon Physician. The iCon Facilitator (XXX) was the person responsible for the day-to-day management of iCon, and posted information relating to concussion and answered any questions that were raised by the participants. The iCF was a sports physical therapist trained to postgraduate level, who at the time of the study had 9 years of clinical experience (including 5 years of working in elite sport). The iCF recorded details relating to participant interaction during the pilot study, and monitored iCon on a daily basis (minimum x3/day, 7 days/week, for the 90-day period of the trial). A Facebook profile was created for the iCF specifically for the purposes of this study. This profile contained information relating to their professional/academic credentials, but no information relating to their personal life, hobbies, interests etc. The iCF used this profile solely for the study. Any medical questions which were outside of the iCF’s scope of practice were referred to the iCon Physician. The iCon Physician served in a consultancy capacity. Queries were forwarded to the iCon Physician by email, and his reply would be posted on iCon by the iCF. The iCon Physician was a primary care clinician at a university health center, had significant experience in working with sports teams, young person’s health, and had frequently encountered sports persons presenting with concussion as part of his clinical caseload.

**Participants**
The target population was males and females between the ages of 16 and 30 years who had sustained a recent concussion [44] while playing recreational or competitive sport. Participants included those with a medical diagnosis or self-reported symptoms of concussion, following an injury mechanism as defined in the 2008 consensus statement [42]. Individuals were not required to have a medically confirmed diagnosis of concussion prior to registering for the study, nor were they required to be cleared prior to return to play (although this was strongly encouraged through their participation in iCon). All participants in the study were advised to seek medical review following their concussion if they had not already done so. Individuals could not enroll into the study less than 3 days after their injury in order to provide them with cognitive rest after their injury, and had to be able to consent to participation. In order to participate in iCon all individuals had to either have a Facebook account or be willing to create one for the purposes of the study, and had to have regular access to the internet for the duration of their participation.

Sports concussions were the sole focus of this study, and individuals with a concussion originating from other causes (e.g. road traffic accidents) were excluded. This was due to the particular needs (specifically in return to play) associated with a sports-related concussion. The age (16-30 years) reflected the demographic group who are at the highest risk of concussion due to their participation in contact/collision sports [45, 46], and participants were excluded if they were outside this age range. Participants were also excluded if their injury involved hospitalisation for greater than 48 hours (suggesting more serious brain injury), if they were unable to communicate verbally or in written English, or if they had concussion-like symptoms due to other reported neurological conditions.

Participant recruitment:
Participants were able to enter iCon as soon as they had been identified and consented. A comprehensive recruitment strategy in a provincial region of XXXXXX was used which included: Referral from clinical staff members at medical practices and local sports injury clinics; Poster advertisements at: medical practices/supermarkets/sports centers/residential university residential colleges; postings on Facebook groups relevant to the target population; emails to mailing lists for University students and staff; and by word of mouth.

Once a participant had consented to the study (using an online information form and consent sheet) and was enrolled in iCon, they were sent an introductory Facebook message welcoming them to the group. This message outlined the “house rules” for the group on topics including: Uploading and sharing links/videos/photos; communicating with the iCF and iCon Physician; and interactions with other iCon participants. Participants were invited to contribute to iCon as often as they felt comfortable, and no pressure was placed on them to contribute. Throughout the study, participants were informed that cognitive rest was a key component of early concussion management. They were therefore instructed to use iCon for short periods of time (no more than a few minutes at a time) in the early stages of their recovery from concussion, and to increase their time spent participating in iCon as their symptoms subsided or they felt this necessary/helpful.

Participants were told on their entry to the study that although iCon was likely to be of most value to them in the first 3 weeks after their concussion, they were welcome to stay in iCon after their symptoms resolved or diminished. Rationale for staying in the group was to allow those with experience and advice to serve as a support group and help newer participants, in keeping with previous work of online support groups [47]. The 90-day period for iCon was chosen to coincide with the winter sports season, when a significant number of concussions
are generally reported due to the prevalence of the scheduling of collision sports [48].

Although the intention was that participants would remain in the study until its conclusion, they were free to leave at any time.

Pre iCon interview

The purpose of the pre iCon interview was to obtain information regarding user familiarity with Facebook, as well as injury information. The Pre-iCon interview and post-iCon interview questions were generated by three members of the research team (XXX, XXX, XXX), following exhaustive discussions regarding the major factors associated with the concussive injury, its management, and subsequent return to play. The structured pre-iCon interview was conducted by telephone by the iCF immediately prior to the participant entering iCon. This interview collected demographic data and other information relating to the participants and its content is outlined in Table 2. Data was collected related to concussion symptoms and severity of symptoms as per the Sports Concussion Assessment Tool 2 [44], and concussion knowledge was collected as a self-reported score. Following the collection of data from the pre-and post-iCon interviews, relevant, verbatim quotes were extracted from the interviews which best illustrated the content theme. Irrelevant comments (e.g. “you know”, and “well, umm”) were also removed; samples of the verbatim quotes are included in the results section.

At the conclusion of the interview, the responses to all questions were read back to the participants for verification. Once the pre-iCon interview was concluded, the participant then provided the iCF with their Facebook username (i.e. “Ed Knock”) and the email address associated with their Facebook account (e.g. “edknock@hotmail.com”) to enable the
facilitator to identify their Facebook account. Once their Facebook account was identified, they were added to the iCon group.

Post-iCon interview

Participants were asked to inform (via Facebook message, email or telephone) the iCF once they had left the group, so that the iCF could then arrange for the post-iCon interview to be conducted. For those participants who remained in the group until the 90-day study concluded, the follow-up interview was conducted after this time. The post-iCon interview was conducted by telephone within one week of their exit from iCon (regardless of their mode of exit) and some of the content from this interview is outlined in Table 2. As per the pre-iCon interview, verbatim quotes were extracted from the post-iCon interview. At the conclusion of the study, all participants were prompted to seek any further medical assistance relating to their concussion from their medical practitioner, if required.

Data organization:

In keeping with the theoretical underpinning of the study, it was important to gather data on several elements of the intervention in order to obtain a holistic understanding of how iCon functioned. Table 3 shows the participant demographic data, whilst the remaining data were classified into three broad categories:

- **Outcome data**: Included to show changes in the symptoms and knowledge of the participants (Tables 4 and 5);
- **Operational data**: Gathered to show how participants used iCon (Table 6);
- **Evaluation data**: Used to gauge the opinions of the participants towards iCon and their satisfaction with the support received in iCon (Table 7).
**Results**

**Participant demographic information:**

A total of 11 participants participated in the study (Table 3). The majority of participants (N=7) identified themselves as XXXXX, while the other reported participant ethnicities included XXXXX (N=1), XXXXX (N=2), and XXXXX (N=1). Playing Rugby Union was the most common cause of concussion amongst the participants (N=6); the other sports which led to injury were soccer (N=2), basketball (N=1), netball (N=1), and skiing (N=1). All participants had a Facebook account and were familiar with the use of Facebook.

**Outcome data:**

Tables 4 and 5 contain a summary of the “cleaned”, verbatim quotes from the pre- and post-iCon interviews. As shown in Table 4 almost all of the participants (10/11) reported that their concussion knowledge had increased during iCon, with only one participant (#04) stating no change. Key learning points highlighted by the participants following iCon included: the need to rest following concussion (including allowing undisturbed sleep); the importance of a graded RTP; and the need to be symptom-free prior to returning to sport. Table 5 also demonstrates that iCon had a notable effect on the RTP decisions, with 9/11 participants stating they were better informed with their RTP because of participating in iCon. However, of these 9 participants, only 2 followed the advice provided by iCon regarding seeking medical clearance prior to RTP.

**Operational data:**

To show the extent of their interaction with content in iCon, activity data for all of the participants in iCon was also recorded. It was not possible to see when participants had
logged in, and therefore this was determined by the visible contributions that participants had made to the group or to the iCF. Three participants (#03, #04, and #11) had no activity recorded for their time in iCon. Of the remaining participants only one participant (#01) sent private messages to the iCF, with all of the other participants (with the exception of #06) making one or more public posts in iCon. The option of “liking” content on Facebook was used by three participants (#01, #02, and #05), and a total of 5 topics from four participants (#01, #02, #05, and #07) were considered outside of the scope of practice of the iCF and were therefore referred onto the iCon Physician.

In addition to these activity data, the post-iCon interview contained questions relating to the participants’ usage of iCon and the quotes from these interviews are summarized in Table 6. Participants reported visiting iCon for varying durations, with 5 participants stating that they interacted with iCon “3-4 times each day” and all participants spending between 2 minutes and 30 minutes on iCon during each visit. Almost all of the participants (10/11) stated that they did not use Facebook during the study period more than they would usually, with the majority of these (N=9) suggesting that their similar usage patterns of Facebook during the study period was not related to any worsening of symptoms. One participant (#02) stated that they did use Facebook more than usual because of iCon during the duration of the study “to check for new information daily”.

**Evaluation data:**

One of the key measures of the study was the participant’s satisfaction with iCon. To better understand the participant’s satisfaction with the different elements of support in iCon, they were questioned with regards to their satisfaction with the iCF/iCon Physician and their satisfaction with the other participants. Table 7 shows both the satisfaction scores and accompanying quotes demonstrating that the participants felt supported through iCon.
Maximum satisfaction scores (5/5) were reported by 8/11 participants for the support from the iCF/iCon Physician. Fewer participants scored the support from the other participants as highly beneficial, while 4/11 participants also stated that they felt “very satisfied” with the support from their peers. The quotes accompanying the satisfaction scores for support from the other participants highlighted the lack of interaction between participants as a potential explanation for this. All of the participants stated that they felt secure in sharing information in iCon, and no concerns were raised by participants regarding security. The final question of the post-iCon interview asked if the participants would recommend iCon, and all participants (N=11) stated that they would.

**Discussion:**

The primary goal of this study was to evaluate the feasibility of a novel and innovative approach to concussion management, and in doing so to drive and inform future research. This innovative program is one of the first examples of using a social media approach to facilitate safe return-to-play following a sports concussion. One of the key findings that emerged was that all participants (N=11) stated that “they would” recommend iCon to others. The post-iCon interview data indicated that iCon showed potential to be successful on a larger scale, with supporting quotes such as “All questions asked were answered really quick, and it was easier than phoning the physician and asking for advice” (Participant #05) suggesting that the use of Facebook as an adjunct for concussion management was appealing to this cohort of individuals. Another indication of the success of the iCon were the satisfaction scores and accompanying quotes, which indicated that the participants were predominantly “very satisfied” with the support they were given in iCon, both from the iCF/iCon Physician and from the other participants.
A notable aspect of the intervention was that the majority (8/11, 73%) of participants stated that their return to play decisions were influenced by iCon. Education is recognized as being crucial in the management of sports-related concussion [50], and the importance of this knowledge transfer process related specifically to concussion has been highlighted in the literature [51, 52]. The post-iCon questionnaire data indicated that using iCon directly affected their decision making in this regard in seeking a more conservative return to play, and it is inferred that the participants would also be better informed of the need to seek medical review in the event that they were concussed in the future. This study was not designed to analyze the long-term behavioral changes of the participants; thus there is no way of knowing if there were any long-term changes in this behavior or retained concussion knowledge [53].

It was anticipated that the majority of participants in the study would see a reduction in their symptom scores regardless of their participation on iCon, and this was confirmed in the data. Although it is assumed that the symptom self-reporting by telephone in the pre and post-iCon interviews was accurate, it must be acknowledged that differences have been reported in concussion symptom reporting between interviews and from self-reporting questionnaires [54]. Participant activity in iCon was not expected to be uniform, and it was thus unsurprising that three participants (#3, #4, and #11) had no activity at all recorded for their time in Facebook. This does not mean that these individuals did not use iCon during the period of the study, but rather that they did not make any public postings in the group. It may have been that these participants demonstrated the behavior of “lurkers” (passive participants in online groups), with studies showing that lurkers may gain as much benefit from online groups as active posters [55]. Although the post-iCon interview did not question this explicitly, the satisfaction scores for these three participants were high (4/5 or 5/5) and indicate that they still obtained some benefit from participating in iCon. Earlier work has
identified individuals with concussion supporting each other in Facebook concussion groups [56], however in iCon there was relatively little iSupport (“interactive support”) witnessed between participants in terms of offering messages of support relating to concussion. It may have been that interaction occurred through private messages between participants in iCon, although it was not possible to measure this as these private messages are only visible to the sender and recipient.

Although the utilisation of Facebook for social support by individuals with both traumatic brain injury [57] and concussion [29] has been previously investigated, the use of Facebook by healthcare professionals to assist the recovery following a sports concussion is a new concept. This innovative method of interacting with individuals with a sports concussion is associated with a myriad of associated ethical issues [41], with a major consideration being the concept of cognitive rest [58]. The 2008 CIS consensus statement [44], which constituted the guiding principles at the time of this study discusses the importance of cognitive rest following concussion, and this has been further reinforced in the most recent consensus statement [3]. It could be argued that using Facebook when recovering from concussion is contrary to this advice. However the authors are in agreement with others [59] that total cognitive rest is impractical, and that using social media for concussion management in a controlled manner could be beneficial to the recovery process. The 2012 CIS consensus statement [3] does not advocate total cognitive rest, with Gibson et al [59] also suggesting that prolonged cognitive rest following concussion is not entirely advisable and should be approached cautiously. Steps were taken to address this factor; at the time of joining iCon participants were clearly instructed to cease using Facebook if their symptoms worsened, and to only use iCon for limited periods in the early stages following their injury.

Despite sustained efforts and the use of an extensive recruitment process only 11 participants were enrolled into the study, representing a relatively small sample size. The timing of the
study coincided with the winter sports season when concussion rates were highest, and as a result it was expected that a larger number of participants would be recruited. Reasons for the relatively small sample size could include the lack of reporting or recognition of concussion. Several studies have highlighted that concussions are typically under-reported in young rugby players [60-62] and in sport in general [63-65], and this lack of reporting would have limited the ability of local medical personnel to alert these individuals to the study. The process of knowledge transfer is only possible if individuals are keen to participate in their self-management, and this lack of engagement is a barrier that needs to be overcome if concussion interventions such as iCon are to be successful on a larger scale. Given the sample size in this group, the guarantee of success for this approach in a larger population cannot be stated with certainty. The nature of an intervention such as iCon is that the information within it is fluid, and therefore the content and advice could be targeted to a specific group, organisation, or sporting code. This may be beneficial for athletic trainers working with different sporting populations, and could assist their efforts to manage concussion at a state level. ATs will frequently have to manage sports concussion in their clinical environment, and novel methods to improve compliance with concussion management should be encouraged. In some instances, it is not appropriate or feasible for individuals with concussion to return to clinic for follow-up, and innovations such as iCon may serve as a mechanism for ATs to utilise across multiple environments.

Inclusion criteria for iCon did not specify that participants needed to be symptomatic upon entering the group, only that they needed to have had a sports-related concussion within the past 3 weeks. As a consequence, several participants reported none or very few concussion symptoms upon entry to iCon. It can be speculated that these participants may have benefitted more from their participation in iCon if they were enrolled in the study sooner after their concussion while they were still symptomatic, as the information given to them in iCon
would assist in the management of their symptoms. Earlier identification and enrolment of participants would enable this to be evaluated. The implications in terms of the financial costs involved are difficult to predict, but it may be that rolling out a system such as iCon on a larger scale may incur costs from the length of time needed for multiple clinicians to develop and maintain accurate information, and review and respond to posts from participants. A final consideration is that the pre-iCon interview did not ask about how participants primarily accessed Facebook; namely whether they did this via a desktop computer at school/work/university, through a laptop computer, or using a mobile device (a cell phone or tablet device such as an iPad). Further questioning regarding this area may have provided additional insight as to how participants accessed iCon, and also help to shape the design of future online concussion interventions.

This interactive adjunct to traditional concussion management strategies was appreciated amongst this particular participant group and indicated feasibility for a future, larger study of iCon. Given the relatively low numbers of participants in this trial, one way of ensuring larger numbers in the future would be to conduct a multi-centre trial (especially given the current greater awareness of concussion). Larger participant numbers would have a consequential effect on the moderation of the group, and may require more than one individual to perform the roles of iCF and iCon Physician respectively. Since this study ended there has been a sharp rise in the use of smartphone apps for health, including in the field of sports medicine [25, 66]. It is recognised that innovations such as online health interventions evolve and change over time [67], and at present the use of smartphone apps is gaining attention in relation to concussion [25, 68]. In addition to a future trial of iCon, further exploration of concussion-related technologies is warranted to assess their role in assisting with the management of sports concussion.


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