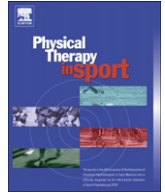


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Original Research

The understanding of the concept of 'rest' in the management of a sports concussion by physical therapy students: A descriptive study

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ABSTRACT

Objectives: To investigate physical therapy students' understanding of the concept of rest following a sport concussion and to ascertain if this understanding changes following a lecture based on current best practice concussion knowledge.

Design: Pre-post observational survey.

Setting: University classroom setting.

Participants: A cohort of 118 (40 male, 78 female) physical therapy students participating in volunteer sports medic training.

Results: Participants provided 320 (pre) and 350 (post) responses depicting activities which should be restricted following a concussion. The responses were classified into three rest-related categories: 'Physical rest', 'Cognitive rest' and 'Mixed' (a combination of physical and cognitive rest). Pre-lecture, approximately 74% of the student's responses were categorized as Physical rest, and 25% under Mixed. There was a shift in the response pattern post-lecture, with 96% of the responses falling in the Mixed category.

Conclusions: The results of the study highlight a lack of understanding of the concept of cognitive rest in concussion management among trainee sport medics. The need for wider dissemination of this concept as recommended by the recent consensus statement on sports concussion is indicated.

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1. Introduction

Central to the growing body of literature on sports concussion are a number of major national and international, summary and agreement (Aubry, Cantu, Dvorak, Graf-Baumann, Johnston, & Kelly, 2002; McCrory, Johnston, Meeuwisse, Aubry, Cantu, & Dvorak, 2005), position (Guskiewicz, Bruce, Cantu, Ferrara, Kelly, & McCrea, 2004) and consensus statements (Herring, Bergfeld, Boland, Boyajian-O'Neill, Cantu, & Hershman, 2005; McCrory, Meeuwisse, Johnston, Dvorak, Aubry, & Molloy, 2009a). These statements provide the best available evidence-based practice information and have a strong focus on the management and safe return-to-play (RTP) of an athlete following a concussion. A common theme in all of these statements relates to the management of a player with

a concussion, and states that a player should 'rest until symptom free'. Furthermore, athletes should not return to the game or practice until they have successfully moved through a series of progressive stages involving functional and sport-specific activities while remaining symptom free (McCrory et al., 2009a). This point is further emphasized in a global assessment and management instrument, the Sport Concussion Assessment Tool (SCAT) (McCrory et al., 2005) and more recently SCAT2 (McCrory, Meeuwisse, Johnston, Dvorak, Aubry, & Molloy, 2009b).

The justification underpinning the advice to rest is based on the need to allow the brain a period of time to recover from the injury, re-establish neurometabolic balances and restore optimal neurological function (McCrory et al., 2009a). In most cases this period of recovery is in the range of 10–14 days, however it can be longer, particularly in children and adolescents (McCrory et al., 2009a; Purcell, 2009). There are concerns that premature RTP may place the player at risk of subsequent injury (Delaney, Lacroix, Leclerc, & Johnston, 2002), including a further injury to the brain itself (Cantu, 1998; Mori, Katayama, & Kawamata, 2006). The duration of the period of rest is generally monitored by the presence/absence of

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symptoms such as headache, dizziness, fatigue and irritability. The determination of the asymptomatic state can be difficult as the presence of symptoms associated with a concussion is evident in the non-concussed population (Iverson & Lange, 2003) and can be produced by physical (Alla, Sullivan, McCrory, Schneiders, & Handcock, 2010) and/or by cognitive activity (Johnston, McCrory, Mohtadi, & Meeuwisse, 2001; McCrory et al., 2009a).

Historically, the concept of rest was primarily associated with requiring the player to refrain from bouts of physical activity and contact activities in particular, but more recently this has been extended to incorporate cognitive activities as well. Currently, the international consensus statement on sports concussion (McCrory et al., 2009a) clearly outlines the importance of this extended understanding of the concept of rest. The translation of this key information by sports medicine professionals to those persons who have been concussed is challenging, as many of them are students (high school, college, university) and may not see taking timeout from their studies as equating to rest. Recently there has been an increased awareness of the importance of a sound management approach for players returning to academic activities (McGrath, 2010). Furthermore, videogames, social networking (e.g. Facebook) and text messaging are viewed by many young persons as integral activities of daily living. These activities may place an additional stress on the recovering brain following a concussion, and further challenge the effectiveness of information delivered by health care providers on the importance of cognitive rest. It is therefore essential that information providers have a clear understanding of those activities which are likely to impact on the recovery process following a concussion.

Physical therapists frequently work with sports teams, including sports which have a high incidence of concussion, such as rugby and ice hockey (Koh, Cassidy, & Watkinson, 2003; Marshall & Spencer, 2001). As such there is an increasing need for physical therapists to be able to reinforce the RTP management practices provided by sports medicine professionals and to communicate this to players on their teams. Little is known about the understanding of the concept of rest by physical therapists, athletic trainers/therapists and by those training to work with sports teams. Thus, the primary aim of this study was to investigate the understanding of the concept of rest in a cohort of physical therapy students who were training to become volunteer sports medics. A second objective was to ascertain if their understanding of the concept of rest changed following a lecture which was based on the then current summary and agreement statement and the SCAT card (McCrory et al., 2005).

2. Methods

A pre-post observational survey design was used. Participants were a cohort of second year physical therapy students from the School of Physiotherapy at the University of Otago (New Zealand) attending an intensive sports medic course, prior to working in the sports community as sports medics (first responders). The topic of concussion management had not been addressed in the students' physical therapy curriculum prior to this training course. The course provided intensive instruction in a range of sports medicine topics, including concussion management. The survey questionnaire was designed to measure the students' understanding of the recognition, assessment and management of a sports concussion. The questionnaire was developed by the study authors with the questions sourced and modified from their experience, previous research (Sye, Sullivan, & McCrory, 2006) and the literature, and included questions specifically designed for the survey. The questionnaire included both dichotomous (yes/no) and open-ended questions and was pilot tested with a small group of students for

comprehension and clarity. The survey sought information on: the demographics of the participants and a previous history of concussion; concussion signs and symptoms; knowledge of concussion management guidelines; the concept of rest following a concussion, and their general knowledge of a concussive brain injury. Although not subjected to a formal validation process, the survey questionnaire was reviewed and revised by the research team (which has a wide experience in concussion knowledge and questionnaire development) and can thus be assumed to exhibit satisfactory content validity.

The questionnaire was administered prior to (pre) and immediately following (post) a lecture focussed on the identification and management of a sports concussion. The completed unmarked questionnaires were placed in a sealed envelope and were returned to the project coordinator (OA). Written informed consent was obtained from each participant prior to the administration of the questionnaire. The study was approved by the University of Otago School of Physiotherapy Human Ethics Committee and was conducted in March 2009 at the beginning of the winter sports season.

This study focuses on one specific aspect of the questionnaire, namely the students understanding of the concept of 'rest' in concussion management. In order to gauge the students' understanding of the term 'rest', the following question was asked:

'If a player who has been concussed was instructed by a Doctor (General Practitioner) to 'rest', what activities would you advise the player against doing? Please list 3 activities'.

The lecture material was based upon the then current summary and agreement statement (McCrory et al., 2005) from the 2004 international Concussion in Sport group's meeting and related SCAT documents which have been widely circulated and cited (Alla, Sullivan, McCrory, & Hale, 2010). The 1.5 h lecture delivered by two experienced university lecturers (SJS, AGS) included a balanced view of the need for both physical and cognitive rest as an integral part of the post-concussion recovery process.

Each participant provided up to three responses to the question related to rest both before and after the lecture. The responses were tabulated and coded into a series of data driven categories representing common activities describing both physical and cognitive domains. In addition, the pattern of responses (profiles) for each participant was quantified by examining the coding of the 1–3 responses they provided as a group. For example, if a participant responded with 1, 2 or 3 items which were categorized as representing the 'Physical rest' domain and contained no items which were classified as being 'Cognitive rest' their response pattern was said to represent a 'Physical rest' profile. In addition, a 'Mixed' profile was defined as a profile containing both physical and cognitive rest items. The number of Physical rest, Cognitive rest and Mixed profiles were recorded as was the shift in profile pre-post lecture. All coding was conducted by four persons experienced in research methodology and data coding who worked to achieve consensus on all aspects of the coding process. All statistical analyses were conducted using SPSS v16.0 (SPSS Inc., Chicago, IL, USA).

3. Results

A total of 118 participants (40 male, 78 female) from the group of 124 students provided responses for the pre- and post-measurement occasions. The mean age of the participants was 20.1 ± 2.9 years (range; 18–36 years) and the majority (98%) had previously completed a first-aid course. Of these, 60% indicated that the course included aspects relating to concussion/brain injury while 32% of participants reported that they had previously been concussed.

A maximum of 354 responses was possible from the group at the pre- and post-measurement occasions of which 322 and 350

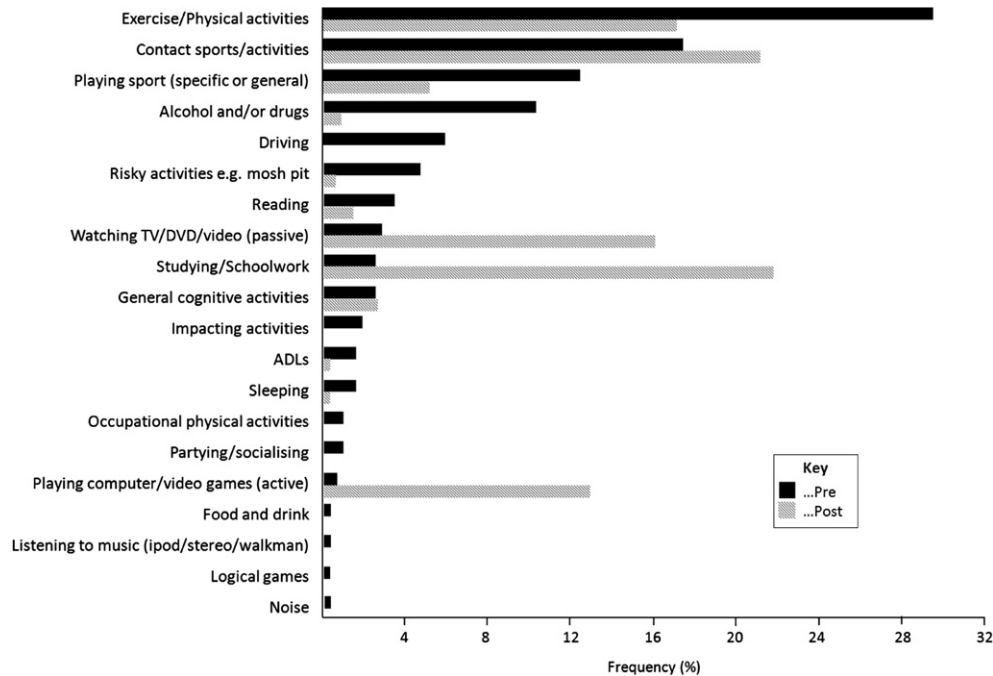


Fig. 1. The frequency of responses at pre- and post-lecture.

responses were generated pre- and post-lecture, respectively. The frequency (%) of responses classified into each of the categories is presented in Fig. 1. The categories with the largest number of responses were 'exercise/physical activity' (30%) recorded prior to the lecture, and 'studying/schoolwork (22%) recorded post-lecture. The low number of cognitively demanding activities (e.g. "studying/schoolwork") reported pre-lecture is of note. The response categories summarizing the individual responses are presented in Table 1. The data suggest that there is a shift in the response profiles from purely physical or cognitive to a mixed response.

The changes in the response profiles following the lecture are presented in Table 2. The strong shift from Physical rest to Mixed indicates a change in the participants understanding of the concept of post-concussion rest.

4. Discussion

The students clearly had a limited understanding of the concept of rest in concussion management prior to the lecture, as the majority responded by suggesting activities of a physical nature, and only a quarter presented a Mixed profile. Collectively this suggests a need for improved awareness relating to important concepts in concussion management. The source of the students' pre-lecture understanding is unknown, but almost all had attended a first-aid course, with a large number reporting that their course included a concussion-related component. A third of the group reported that they had suffered a concussion themselves. However, despite this personal experience their pre-lecture understanding

Table 1
Summary of the pre and post response profiles.

| Profiles | Pre N (%) | Post N (%) |
|----------------|------------|-------------|
| Physical rest | 87 (73.7%) | 4 (3.4%) |
| Cognitive rest | 1 (0.8%) | 1 (0.8%) |
| Mixed | 30 (25.4%) | 113 (95.8%) |

was limited with respect to current thinking on activity restrictions following a concussion (Gagnon, Swaine, & Forget, 2009; McCrory et al., 2009a).

The students produced a wide range of responses using everyday language. The categorization of these pre-lecture responses clearly showed a strong bias towards suggesting that various forms of; exercise, physical activity, and sport were not appropriate activities in the days following a concussion. A smaller number of responses which represented similar activities were coded into specific categories (e.g. 'risky activities', 'impacting activities'). Although these responses reflect good, albeit partial knowledge, the bias towards reporting only activities of a physical nature is of concern and in disagreement with the internationally accepted practices. With only a quarter of the pre-lecture profiles being categorized as Mixed it is clear that there was a limited understanding of the concept of 'rest' by this group. It is recognised that there is possibly some overlap between the categories. However this does not detract from the message generated, and is reinforced by the individual response profiles of the students where there was an overwhelming shift from a pre-lecture Physical rest profile to a post-lecture Mixed profile. The Mixed profile represents a more balanced range of activities and is in keeping with the expectations of concussion management advice (having both physical rest and cognitive rest components). For other

Table 2
Change in the participant's response profiles from pre to post.

| Profiles | Number | Percentage (%) |
|---------------------------------|--------|----------------|
| Physical rest → Physical rest | 4 | 3.4 |
| Physical rest → Cognitive rest | 1 | 0.8 |
| Physical rest → Mixed | 82 | 69.5 |
| Cognitive rest → Cognitive rest | 0 | 0 |
| Cognitive rest → Physical rest | 0 | 0 |
| Cognitive rest → Mixed | 1 | 0.8 |
| Mixed → Cognitive rest | 0 | 0 |
| Mixed → Physical rest | 0 | 0 |
| Mixed → Mixed | 30 | 25.4 |

respondents, the Mixed profile was maintained following the lecture suggesting a reinforcement of their current understanding. As only three responses were permitted for each individual there could have been movements in the patterns of responses which were not reflected in the overall profile, possibly masking changes in individual response profiles.

The concept of 'complete physical and cognitive rest' is clearly embedded in the recent consensus statement and SCAT2 (McCrory et al., 2009a) without detailed elaboration. While the concept of physical rest is well accepted in the sports medicine community, the concept of cognitive rest is less well known. The initial rehabilitation stage ("stage 1. No activity") is outlined in the SCAT2 RTP protocol (McCrory et al., 2009a), which is based on a symptom provocation model. Specifically this addresses the concept of rest as having two components ('physical' and 'mental') while the subsequent stages focus on increasing physical and cognitive challenges. The transfer of this best practice information to the concussed athlete and those concerned with their health is a key issue, and one which needs to be reinforced whenever possible. However this message on the concept of both cognitive and physical rest is not clearly conveyed in key documents, such as the SCAT2 concussion injury advice slip to be given to the concussed athlete. The advice slip suggests that the athlete "Rest and avoid strenuous activity for at least 24 hours" (McCrory et al., 2009b, p. i.88) but does not elaborate on the concept of cognitive rest.

The void in the discussion of what is meant by cognitive rest has been addressed in part by a recent article by McLeod and Gioia (2010) who provided a detailed synopsis of cognitive activities which are thought to be important in concussion management. They identify many of the items (e.g., watching television, playing videogames) which were suggested by the participants in this study as activities which should be avoided as they are likely to provoke symptoms. They also discuss strategies for systematically managing the concussed student athlete back to full academic activities. The academic management of student athletes post-concussion has further been elaborated on in some detail by McGrath (2010), who provides practical educational steps and strategies to assist the student athletes to resume their studies. Underlying this concept is the management of the degree of cognitive activity or rest. While management strategies can be put in place, the understanding of the demands they place on the individual needs to be monitored by the symptoms generated by various activities. This monitoring can be challenging as at any given point in time, non-concussed individuals demonstrate a range of symptoms similar to those associated with a concussion. Moreover, these symptoms can vary with typical day-to-day activities in the university population (Gouvier, Cubic, Jones, Brantley, & Cutlip, 1992; Machulda, Bergquist, Ito, & Chew, 1998) and can be aggravated by physical exertion (Alla, Sullivan, McCrory, Schneiders, et al., 2010; Gaetz & Iverson, 2009).

The change in the responses and the participant's response profiles following the lecture indicates that the students were able to comprehend and retain the information delivered, and adjust their responses accordingly. While this short-term learning is important in reflecting that the 'message was transferred', it does not necessarily translate to a more permanent form of learning which is obviously necessary in professional practice. The students were not being specifically assessed on this component of the course hence there was an inherent motivation to retain the information for professional purposes. While previous studies have focused on the concussion knowledge and understanding by players (Sye et al., 2006), coaches (Guilmette, Malia, & McQuiggan, 2007; Valovich McLeod, Schwartz, & Bay, 2007), parents (Sullivan, Bourne, Choie, Eastwood, Isbister, & McCrory, 2009), and physical

therapists (Sullivan, Schneiders, McCrory, & Gray, 2008), this is the first study to our knowledge to survey the understanding of concussion by physical therapy students. The students were undertaking additional training in preparation to work as volunteer sports medics with high school and community sports teams, particularly with rugby teams. As such there is a high likelihood that they will be in contact with players who have been concussed and their coaches and parents. As front line respondents to an injury, they may be required to answer simple questions regarding concussion management. Consequently their knowledge of key elements of concussion management, including RTP strategies, is important.

While the students clearly modified their responses following the lecture and generally showed a better understanding of the concept of rest, the study did not include a follow-up measurement and there is no guarantee that the newly acquired knowledge was retained. Most professional short training courses do not test for long-term retention, but rather work on the principle that the participant will grow their knowledge via clinical experience and lifelong learning activities: the lack of follow-up represents a limitation of the study and suggests the need for future research in this area.

The cohort studied was a sample of convenience and were motivated to improve their knowledge of sports medicine, and thus may not represent the views of a wider group. As such the findings are limited and may not be generalizable to a wider group of similar trainees. There is a need to extend this line of research to investigate the knowledge and understanding of the concept of rest in concussion management both in selected groups (e.g., parents of young sports persons) and by relevant health professionals. Notwithstanding these limitations, the study provides an initial insight into the understanding of the key term 'rest' by this cohort training to play an important role working with athletes at the community sport level.

5. Conclusions

The result of the study highlights the limited understanding of the concept of rest in concussion management among physical therapy students training as sport medics. A wider dissemination of the concept of rest, as recommended by the recent consensus statement on sports concussion, is indicated.

Conflict of Interest

None declared.

Funding

None declared.

Ethical Statement

The study was approved by the University of Otago, School of Physiotherapy Human Ethics Committee.

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