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## Perceptions of sport science students on the potential applications and limitations of blended learning in their education

### A qualitative study

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Published in: Sports Biomechanics

DOI: 10.1080/14763141.2017.1305439

Published: 03/07/2017

Document Version: Peer reviewed version

Link to publication in Bond University research repository.

*Recommended citation(APA):* Keogh, J. W. L., Gowthorp, L., & McLean, M. (2017). Perceptions of sport science students on the potential applications and limitations of blended learning in their education: A qualitative study. *Sports Biomechanics*, *16*(3), 297-312. https://doi.org/10.1080/14763141.2017.1305439

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1	Perceptions of sport science students on the potential applications and limitations of
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12	University, Gold Coast, Australia.
13	
14	Acknowledgements: The authors wish to acknowledge the students who willingly gave up
15	their time to participate in this research project.
16	
17	Disclosure Statement: None of the authors has any financial interest or benefit arising from
18	the direct applications of their research.
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# 37 Perceptions of sport science students on the potential applications and limitations of 38 blended learning in their education: a qualitative study

39

40 Abstract

41 This study sought to gain insight into blended learning-naive sports science students' understanding and perceptions of the potential benefits and limitations of blended (hybrid) 42 learning, which has been defined as the thoughtful integration of face-to-face and online 43 44 instructional approaches. Five focus groups, each comprising 3-4 students from either the undergraduate or post-graduate sports science programmes were conducted. The focus groups 45 were facilitated by a researcher who was not involved in sports science. Audio recordings of 46 47 the focus groups were transcribed verbatim. NVivo software was used to code the transcripts to identify the themes and subthemes. Students generally had little initial understanding of 48 blended learning. When provided with a definition, they believed that blended learning could 49 50 improve educational outcomes and assist those who were legitimately unable to attend a 51 session. Their reservations about blended learning mainly related to some students not being sufficiently autonomous to undertake independent study, timetabling considerations and 52 access to reliable Internet services. For blended learning to be effective, students felt the 53 online material had to be interactive, engaging, and complement the face-to-face sessions. 54 Better understanding the perceptions of the students in the current study may assist educators 55 who are considering implementing blended learning in their teaching. 56

57 (199 words)

58 Keywords: Active learning; kinesiology; hybrid learning; online learning; pedagogy.

59 Subject classification codes: Teaching Biomechanics.

#### 61 Introduction

Sports and exercise scientists (hereafter referred to as sports scientists) require a strong theoretical understanding in many disciplines including anatomy, physiology, biochemistry, exercise prescription, biomechanics, motor control and learning, sport psychology, and nutrition to underpin their professional practice. The challenge for those responsible for educating and training today's sports scientists is to how best to ensure that our students develop the requisite theoretical knowledge and the practical professional competencies during their studies to be able to practice in an ever-changing and complex world.

69 Barr and Tagg (1975) spurred the reformation of higher educational approaches and practices, particularly in terms of the role of the faculty member (educator) moving from the 70 'sage on the stage' in the instructional (teaching) paradigm to a 'guide on the side' in a 71 72 learning paradigm. Emerging from the need to emphasise active learner engagement in which 73 students construct their own knowledge (rather than being passively provided with information) has been a number of learner-centred approaches such as problem-based 74 75 learning (PBL), case-based learning (CBL), and team-based learning (TBL). With these approaches involving team work and communication (Barr & Tagg, 1995; Dziuban, Hartman, 76 & Moskal, 2004), they are widely adopted in medicine and a number of the allied health 77 professions. 78

The benefits of active engagement compared with traditional lecturing has been reported recently for Science, Engineering, and Mathematics (STEM) in a meta-analysis of 225 studies (Freeman et al., 2014). The active learning approaches were diverse, ranging from occasional group problem-solving, worksheets completed during class time, the use of personal response systems and studio or workshop design sessions. Average examination scores improved by about 6% for active learning sections, with learners in the traditional lectures approximately 1.5 times more likely to fail than those in the active learning classes.

Active learning was effective across all class sizes but was more effective in class sizes of  $\leq$  50.

88 The explosive development of digital and electronic technology over the past 15-20 years has had a significant influence on educational delivery models. During the 1980s and 89 90 1990s, computer-aided instruction (CAI) or computer-aided learning (CAL) were terms commonly used to describe the delivery of modules or courses or how learning was 91 92 supplemented with electronic resources. Today's learners, often referred to as 'digital natives' and 'millennials' (Prensky, 2011) who have grown up with rapidly evolving 93 94 electronic and computer technology, are increasingly demonstrating a decreased tolerance for the traditional lecture (Roehl, Reddy, & Shannon, 2013). Technology has driven learning 95 environments across all education sectors. In higher education, one such approach which 96 97 incorporates active learning and technology is that of blended learning (BL), which has also 98 been referred to as hybrid online learning (Meydanlioglu & Arikan, 2014).

Garrison and Vaughan (2008, p. 5) defined BL as 'the thoughtful fusion of face-to-99 face and online learning experiences'. Recognising that the traditional didactic lecture may 100 not promote high levels of learning for many students, a BL approach frees the face-to-face 101 time from the transmission of information (instruction paradigm) for a range of activities that 102 actively engage learners. BL is thus an approach that requires careful consideration of the 103 104 rationale, theoretical underpinnings, learner background, and diversity and the planning of a 105 judicious mix of what best lends itself to online delivery and what is better delivered in a face-to-face mode (Garrison & Vaughan, 2008). In such an approach, the classroom is often 106 'flipped' (Moffett, 2015; Roehl et al., 2013), with students generally required to prepare for 107 108 face-to-face teaching sessions by becoming familiar with the fundamental concepts in their own time. When they then meet the educator face-to-face, a greater range of active learning 109 activities can be utilised, so that more time is available to explore issues in greater detail, 110

apply knowledge to practical aspects of their intended professions, collaborate with peers or
clarify difficult concepts or misconceptions in real time. So explosive has been the uptake of
BL in higher education that there is potential that it will become the 'new normal' (Norberg,
Dziuban, & Moskal, 2011), although more research is required to better understand how to
maximise its effectiveness (Bernard, Borokhovski, Schmid, Tamim, & Abrami, 2014;
Stockwell, Stockwell, Cennamo, & Jiang, 2015).

117 The most comprehensive evidence supporting the effectiveness of BL has been provided in a meta-analysis by Bernard and co-workers (2014). Bernard and co-workers 118 119 (2014) reported that the BL approach exceeds classroom instruction by about one-third of a standard deviation with respect to educational outcomes. The magnitude of benefit was, 120 however, influenced by how the online aspect was delivered (i.e. cognitive support vs. 121 content/presentation support) and that the inclusion of one or more interactions (e.g. student-122 student/-teacher/-content interaction) enhanced learner achievement. More recently, a 123 randomized control trial involving biochemistry students found that BL significantly 124 improved in-class problem-solving and examination performance and that video assignments 125 increased attendance and satisfaction (Stockwell et al., 2015). The second finding from 126 Stockwell and colleagues (2015) was that students in the traditional instructor-focused lecture 127 group performed less well than those involved in actively solving problems during class 128 despite both groups reporting similar satisfaction with their experiences. This is an important 129 130 finding as it suggests that there may be educational benefits of the BL approach and that students do not perceive the challenges of a BL learning environment negatively compared to 131 a traditional approach. 132

While BL has also been shown to reduce dropout, increasing subject engagement
and/or improving overall learning outcomes in sports science programmes (Walton &
Hepworth, 2013; Xin, Kempland, & Blankson, 2015), there remains a relative lack of

research examining sports science students' perceptions of BL and how best to incorporate it 136 into the curriculum to maximise learning. The wider literature on active learning approaches 137 138 including BL suggests, however, that there can be some student resistance to these approaches (Davidson, 2011; Seidel & Tanner, 2013). Thus, learners should have a clear 139 understanding of what BL constitutes, including acknowledging their need to be more active 140 in the construction of their knowledge. Sports science educators would also benefit from an 141 142 understanding of how their students conceive BL, including the perceived advantages and limitations of this educational approach. 143

144 Two theories, cognitive load theory and self-determination theory, underpin the rationale for adopting a BL approach. Cognitive load theory takes into account the various 145 sub-systems of sensory, working and long-term memory, recognising that as working 146 147 memory is only able to process a limited number of elements at any one time, cognitive load should not exceed working memory (Young, Van Merrienboer, Durning, & Ten Cate, 2014). 148 Cognitive load theory would, therefore, support the use of BL as it would offer learners more 149 meaningful engagement with course theory in smaller, applied units linked to professional 150 practice, with more opportunities to review, repeat, and apply the theory to practice. 151

Self-determination theory which takes consideration of the various aspects of human 152 motivation, i.e. the affective component of learning may also be used to explain some of the 153 benefits of BL (Ten Cate, Kusurkar, & Williams, 2011). Self-determination theory recognises 154 155 that humans have a natural tendency to develop autonomous regulation of behaviour and are intrinsically motivated to learn. For this to happen, however, three fundamental psychological 156 needs should be satisfied: the need for autonomy, competence, and relatedness. In applying 157 self-determination theory to education in general, Ten Cate and colleagues (2011) identify 158 two major tenets: 1) autonomously motivated students thrive in educational settings, and, 2) 159 students benefit when teachers support their autonomy. Thus, in terms of BL, which requires 160

learners to be motivated to undertake self-study, gaining insight into their acceptance of the 161 shift in locus from 'being taught' to being more autonomous in their learning is imperative. 162 Consequently, this study sought to gain the students' perceptions of BL so as to provide sport 163 science educators wishing to introduce BL, a better understanding of how their students may 164 view such a change in their learning environment. 165 In garnering students' perceptions regarding the potential of BL in sport science, four 166 167 research questions framed the study: 1. What do the current Bond University Sports Science students understand by BL? 168 169 2. What do they perceive to be benefits of such an approach? 3. What do they perceive to be some of the obstacles related to BL? 170 4. What aspects of their courses lend themselves to a BL approach? 171 It was hypothesised that while the participants would have little initial understanding of BL, 172 they would see many benefits and some obstacles to the introduction of BL across their 173 degree. 174 175

#### 176 Methods

177 Institutional context

Bond University (Gold Coast, Australia) is a private, non-profit organisation that prides itself 178 179 on being able to offer learners a personalised learning experience through small class sizes 180 and relatively unlimited access to educators. The Bond University School of Health Sciences and Medicine offers a suite of undergraduate and post-graduate sport and health science 181 programs, with the Bachelor of Exercise and Sports Science and the Master's of Sports 182 183 Science coursework programme of relevance to this study. Bond University degrees are also 'accelerated', with the six-semester undergraduate degrees such as the Bachelor of Exercise 184 and Sports Science completed in two years rather than the standard three years. Similarly, 185

the Master of Sports Science is a four-semester program that is completed in one year and
four months. The annual cohort size for the Bachelor of Exercise and Sports Science and the
Masters of Sports Science over the last three years has been approximately 12-15 and 4-5
students, respectively.

In line with the global trends in higher education towards technology-enhanced 190 learning, Bond University programme directors have either implemented, are in the process 191 192 of adopting or are exploring how their degrees can be restructured to offer students a more hybrid and flexible approach to their learning. While faculty members in a number of Bond 193 194 University School of Health Sciences and Medicine programmes have incorporated BL, at the time this study was conducted, BL had not been systematically employed in the Bachelor 195 of Exercise and Sports Science and Masters of Sports Science programs. As such, all 196 197 participants in the study were considered naïve to BL at the University level.

198

#### 199 Study design

As BL had not been used in the Bond University Sports Science degrees, the research team 200 used a qualitative design to explore sports science students' understanding of and perceptions 201 about BL. The focus group method was chosen as this would allow a rich, in-depth analysis 202 of the students' views than would have been garnered from a quantitative Likert scale survey. 203 The focus group method was also selected over the individual interview approach as focus 204 205 groups, defined as 'semi-structured interviews with a number of participants that aim to explore a specific set of issues' (Edwards & Skinner, 2009, p. 112), generally generate more 206 in-depth conversations as individuals may provide additional responses due to their 207 208 interactions with a facilitator guiding the conversation. A semi-structured framework of openended questions around our main research questions was designed (Table 1) to allow for a 209 discussion that explored different student perspectives (Edwards & Skinner, 2009). To 210

211	control for possible bias due to potential power dynamics between individual students and the
212	facilitator, focus groups were conducted by a member of the research team (MM), an
213	experienced medical educator and facilitator, with no educational or administrative role in the
214	Sports Science programmes. Ethical approval to conduct the study was granted from the
215	Bond University Human Research Ethics Committee (RO15198).
216	
217	Insert Table 1 about here
218	Participant recruitment
219	The study was cross-sectional, canvassing students in Years 1 and 2 of the Bachelor degree
220	and in the Master's programme. At the time of the study, all Masters of Sports Science
221	students were in the first year of a recently restructured degree. With no BL in the current
222	undergraduate Bond University Bachelor of Exercise and Sports Science degrees and with

two of the first year Master's students having recently graduated from this Bachelor of
Exercise and Sports Science, it is assumed that most students would have no university level
experience with BL.

An email was sent to all Year 1 and Year 2 Bachelor of Exercise and Sports Science 226 (n = 24) and the four Master's of Sports science students (n = 4) outlining the purpose of the 227 study and asking interested students asked to contact the Principal Investigator. The email 228 229 highlighted that involvement was voluntary and that students could withdraw at any stage 230 with no penalty. They were also informed that the focus groups would be facilitated by an independent researcher, the information collected would be anonymous and that their 231 comments would not be identifiable in any way to their educators or in subsequent 232 233 publications. Based on the number of student responses to the emails, it was decided to conduct focus groups based on the year of study, i.e. Year 1, Year 2 or Masters. Times for 234 focus groups (max. 5 per focus group) were advertised to the potentially interested students 235

236	by a follow-up email. Fifty percent ( $n = 6$ ) of Year 1 students, 67% ( $n = 8$ ) of the Year 2
237	students and 100% ( $n = 4$ ) of the Master's students volunteered. There were thus two focus
238	groups for each year of the undergraduate program and one focus group for the Master's
239	students. The details can be viewed in Table 2 ( $n = 5$ focus groups).
240	
241	Insert Table 2 about here
242	
243	It is important to note that at the time the focus groups were conducted, Year 1
244	students had completed 5-6 months of their two-year degree, i.e. they were in their second
245	semester of their studies, while Year 2 students were in their fifth semester and would
246	graduate within the next six months. Two of the Master's students had completed their
247	Bachelor of Exercise and Sports Science degrees at Bond University and the remaining two
248	had obtained their undergraduate degrees from a Canadian and another Australian university.
249	It was expected that with Year 2 and Master's students in the advanced stages of their
250	respective degrees, they would be able to offer more insight into possible benefits and
251	limitations of a BL approach than would Year 1 students who were relatively new to their
252	tertiary studies.

253

### 254 *Data collection*

The focus groups were conducted at Bond University over a five-week period during June and July 2015. Each focus group met with the facilitator once, with the session lasting about one hour. A framework of open-ended questions was used to facilitate the discussion (Table 1), which was recorded and then professionally transcribed *verbatim*. To ensure anonymity, the transcriber was asked not to identify individual students in the transcripts. The facilitator

260 canvassed the views of each student during the discussion to ensure that all perspectives were261 represented.

262

263 Data analysis

Using the research questions as the framework, transcripts were analysed (coded) in three 264 stages: Open, axial and selective (Neuman, 2011). During the open coding phase, each 265 266 member of the research team (n = 3) independently read the transcripts, identifying preliminary themes and discussion points. During the axial coding phase, the team met to 267 268 discuss the themes and concepts identified during the open coding process. After the main themes had been agreed for each research question, selective coding elaborated on the themes 269 to develop sub-themes. Any data that did not fall within the research question framework in 270 271 terms of the potential applications and limitations of BL in sports science education were classified as 'other'. These 'other' comments generally related to more general aspects of the 272 current course delivery, such as the timing of some subjects and the overlap of content 273 between subjects. These comments will not be discussed in the current submission but have 274 informed curriculum improvements in the two programmes. 275

To assist with data management during the coding process, NVivo v.11 (QSR International, Melbourne, Australia) software was used. NVivo enabled the research team to assign textual data to themes agreed up during the axial coding stage, allowing the narrative exemplars (quotes) to be identified.

280

281 Validity and reliability

As with quantitative research, validity and reliability are important constructs in qualitative

research. According to Yin (2011, p. 78), 'a valid [qualitative] study is one that has properly

284 *collected and interpreted its data*'. Thus, to maximise the potential that our findings are

trustworthy and credible, triangulation was also used. Triangulation is a process in which a 285 researcher adopts a number of complementary methods in order to obtain data that are more 286 287 reliable and valid than data obtained using a single research method (Malcolm, 2008). This research project used various data sources in an attempt to understand the phenomenon being 288 investigated. To this end, separate focus groups for each of the three cohorts were conducted. 289 As there were more Year 1 and Year 2 undergraduate students than Masters of Sports Science 290 291 students, it was also prudent to utilise two focus groups for each of the undergraduate student cohorts to expand the data sources. The same facilitator was used for all five focus groups 292 293 thereby ensuring consistency. Our triangulation approach also contributed to the reliability of our data analysis, whereby each member of the research team independently read the 294 transcripts, followed by a collective and collaborative discussion until consensus was 295 296 reached.

The results include exemplar comments from individuals in the focus groups
identifiable only by their respective year group. As anonymity needed to be maintained, their
gender was also not considered.

300

#### 301 **Results**

The results are presented using the primary research questions as the reporting framework. In 302 terms of exploring students' views on the inclusion of BL in sports science education, where 303 304 appropriate, themes were identified for the four primary research questions in terms of: 1) Students' understanding of BL; 2) Perceived benefits (two themes: Educational and 305 Absence from campus); 3) Potential issues (three themes: Educators' use of BL; Role of the 306 student; Technology); and 4) Suggestions about BL in Sports Science. Undergraduate 307 (Bachelor of Exercise and Sports Science) student responses are represented as Y1 (first year 308 students) and Y2 (second year students), respectively, while the Masters of Sports Science 309

students are represented as M, with FG indicating the particular focus group number per year
level. The focus groups and associated quotes are thus represented in the results as: Y1-FG1;
Y1-FG2; Y2-FG1; Y2-FG2; M-FG1. As noted previously, no individual students were
identified within the focus groups. As a result, quantifying common responses within each
focus group was not possible. As this was an exploratory study, the quotes were purposefully
selected to represent the breadth of the discussion for the three cohorts at different stages of
their professional degrees.

317

318 Students' understanding of BL

319 Generally, students in all focus groups were initially vague about what constituted BL. At the

320 outset, only two students offered a definition, both of which reflected little more than their

321 possible understanding of 'blended' involving a mix of approaches: 'My understanding is,

322 again, using different teaching techniques and that sort of stuff.' (Y1-FG2) and 'A

323 combination of face-to-face learning with online sort of stuff, I guess' (M-FG1).

- Once Garrison & Vaughan's (2008, p. 5) definition of BL had been provided, a Y2-FG2 student, based on her experiences of having been home-schooled, identified that her experiences of distance online learning followed by face-to-face intensives could be regarded as BL. She then offered the following definition:
- *I think blended learning goes to what you are doing as in your theory base, and*
- 329 *attaching that knowledge to what you can actually do in the practical environment.*
- 330 So, blending those two in and having a blended learning. That's what I think. Like
- 331 *learning the theory and practicing that theory.*
- 332

### 333 Perceived benefits of BL

With an understanding of what BL entailed, students in all focus groups were then able to articulate instances in which they perceived BL could be beneficial. These benefits were categorised as either educational or related to personal or extra-curricular activities in terms of absence from classes.

338 Educational benefits

Students in both the undergraduate and post-graduate programmes were critical of aspects of 339 the current timetabled contact hours in which they sometimes had to attend long, back-to-340 341 back didactic lectures (up to 3 hours), admitting that they became cognitively fatigued. They recognised that this was not the most efficient learning method and almost demanded that 342 some of the lecture content be replaced with more case studies that would better prepare them 343 for professional practice. In terms of the educational benefits of BL, focus groups across all 344 year groups identified that an extended time to work on content, usually theory, prior to a 345 face-to-face session would be useful. Therefore, the face-to-face session would be more about 346 the practical application of the theory in terms of their development into exercise and sports 347 348 scientists. A Y2-FG1 student suggested that 'Maybe summarise the main points in a semi-349 podcast before the lecture, so that when you go into the lecture you have an idea about what's going on rather than having to take in so much information.' 350

351 A similar response was offered by a Y1-FG1 student:

352 Just being able to get it, or even if you don't understand what's going on, because

353 there's a lot of theories in this that sometimes you just don't grasp the first time

- around and you need the second time. He [the lecturer] does double back on things,
- 355 *but I think it would make it a bit easier on him as well, if he was to then have a*
- 356 *podcast that we could then just go and get it ourselves, so he could then expect that*
- 357 *we understand everything every time.*

358 Finally, similar views also identified in the Master's students focus group:

So, for example, a lecturer can post up some of his recorded podcasts of videos or something with a 3D model, and then it's just up to students to be proactive, listening to podcasts and then coming to class prepared, and then sitting face-to-face in another lecture in front of the lecturer. And, then, I think with that pretty much you will be able to understand the concept so much better.

Across the different year groups, students also expressed the view that BL would allow multiple opportunities to engage with the content compared with the once-off didactic approach. A Y1-FG2 student stated:

So, having that ability to be able to pause, understand this section, and then going onwards makes it a little bit easier for some people to learn. I do understand why some people rather having everything just thrown at them and then going through it quickly, but I believe that if you can just understand things and then go along at your own pace, rather than always having to follow the class' pace, it is a little bit more beneficial.

A Master's student made a similar, comment about the pace of learning: 'Sometimes people miss in a lecture, miss what the lecture is saying, or aren't completely awake, at least when it online they can go at their own time, their own pace.'

A Y1-FG2 undergraduate explained their way of understanding learning keyconcepts, indicating a potential need for BL:

Anything regarding Anatomy, because that's how I study for Anatomy, when I go to lectures, I don't actually get the concepts. I just have a basic picture of what it is and some terms. But, when I go home, I just watch videos online and I can see the organs. 381 *Absence from campus* 

Both Year 1 and Year 2 undergraduate students identified another perceived benefit of a BL 382 383 approach - that of being able to access online material if they could not legitimately (e.g. University Games, being ill, family issues or work commitments) attend face-to-face 384 sessions. Currently, they have to 'catch up' on their return. The following responses capture 385 386 the students' collective views, with a Y2-FG1 student stating: 'An online opportunity means 387 that you're able to go and schedule other things in your life such as training, work and stuff, and then you can sort of timetable things a little bit more freely. Instead of saying that your 388 389 three hour lecture is from ten until one and you've got to be there'. A similar content was provided by a Y1-FG1 student: 'I'm going away to the Uni Games this semester, so I'm 390 going to miss a lecture, so then having to double back and catch that up...' 391

392

#### 393 Potential issues with BL

Across the five focus groups, a number of potential issues were raised. These were related to how educators may use BL, the role of the student and technology.

396 Educators' use of BL

With respect to how educators would use BL, a concern raised by all focus groups was how BL would be embedded within the timetabled contact hours each week. Specifically, the students felt BL would not work if such a model added to their study workload by requiring them to undertake additional self-directed, online learning while also maintaining the same face-to-face contact hours involving traditional didactic lectures. For example, a Y1-FG1 student stated that '*I think it would be really good if there was less class time. I think if the class time was then used practically, but at the same time if it's doubling our homework, I* 

404 think that would make it really hard with outside commitments.'

405	For those who valued the ability to seek clarification from their educator during a
406	face-to-face session at the time in which they did not understand a concept or application of
407	theory, there were concerns that this could be lost in BL:

- 408 With face-to-face you can ask questions as they come up. So, if it was online
- 409 *and you were really confused about a section, you could probably only re-*
- 410 watch it a few times so you could really clarify what it really means, and
- 411 *you might have a misinterpretation* (Y2-FG1).
- 412 Similarly, the findings suggested misinterpretations may occur when

413 attempting to clarify concepts online by email with the lecturer:

- 414 *I think the other problem with less face-to-face time could be the amount of questions*
- 415 that you might have, and it's obviously that you can explain things, facial expressions
- 416 *come into it, hand gestures come in, but if you email a question from that lecture,*
- 417 *there's always ambiguity in writing, and then if they write something back you're like*
- 418 'Oh okay, that made it more confusing (Y1-FG2).

419

420 *Role of the student* 

Student-related issues in a BL approach were identified by all five focus groups. Students were in favour of the face-to-face learning environment, indicating that they had chosen Bond University for the advertised personalised and transformational learning involving small groups with dedicated educators. As a result, students confessed they often struggle with work outside the structured learning environment, especially with many extra-curricular or external competing obligations as is borne out in this Master's student's comment: I guess the way that I learn, and the way that I seem to learn best is if I dedicate the
actual time to actually come on campus or get in that sort of learning environment,
rather than I just find it very difficult to find time outside of a sort of a structured
learning environment, to do the course work. Especially working full-time and that
sort of thing, there just tends to be things that just 'push it to the side, push it to the
side (M-FG1).

- The students, especially those in Year 2 also recognised that they may not always actresponsibly and be active learners:
- 435 *I think I'm motivated to get as good grades as I possibly can in everything, but if*
- 436 something is easier to do at home, there could be a few days where I'm like, I'll wake
- 437 up and just go 'Nah, I'm going to sit in bed', and I'll just do it online, and then the
  438 chances are you might not even do it online. Then you go to the next week and you're
- 439 *behind and then you try and catch up* (Y1-FG2).

440 Students did acknowledge that they need to take responsibility for their learning: '*I*441 suppose it puts the onus on the student to actually prepare' (Y2-FG2). A similar sentiment
442 was expressed by a student in the same focus group (Y2-FG2) who acknowledged his
443 responsibility for engaging in the required online work: '*There's more responsibility on the*444 student but we're all adults now ...'.

445

446 *Technology* 

Both Year 2 focus groups raised concerns relating to technology in terms of equitable access
to technology, such as a reliable internet service as well as ownership of accessories such as
headphones. This was viewed as impacting on the success of BL for those who may not have

- 450 such access: 'If they don't have Internet it could be a disadvantage, but uni's right here' (Y2-
- 451 FG2). Another student expressed a similar sentiment '*If, for example, you didn't have internet*
- 452 access because your internet broke down, or you didn't have earphones to listen to it for

453 *here. It might be more difficult to get access to it*' (Y2-FG1).

454

#### 455 Student suggestions: BL in Sports Science

Even though the students had limited initial understanding of BL, they were also asked to

457 indicate where or how BL might best be introduced into their respective degrees. The

458 strongest comments came from Year 2 undergraduate students who felt that the nature of the

459 online components should complement the face-to-face sessions. A Y2-FG2 student

460 suggested: 'I think maybe if it was interactive or there was an outcome of the online

461 *component that then applied to the lesson. So rather than just read this, because half the* 

462 people aren't going to read it ... if there was actually an outcome of a task to complete.'

463

#### 464 **Discussion and Implications**

As Bond University has traditionally prided itself on its focus on excellence in face-to-face 465 teaching with accelerated degrees and small class sizes, BL is not an approach with which the 466 467 majority of the sports science students had any experience. It was, therefore, not surprising that prior to being provided with a definition, students in all five focus groups were unable to 468 offer a clear description or definition for what BL entails. Students' relative initial lack of 469 470 understanding of BL supports the importance of canvassing their perspectives and identifying potential issues if Bond University sports science programs was to transition to a BL 471 approach, in line with Bond University's mission to graduate skilled and autonomous 472 professionals. As BL involves a paradigm shift from teaching to learning, garnering student 473 perceptions and providing an explicit rationale of its benefits prior to its implementation is 474

important as some students may be resistant to having to take more responsibility for learning
(Davidson, 2011; Seidel & Tanner, 2013). Without such conversations about what constitutes
BL and the roles of the educator and student, it is unlikely that students would actively
participate in the necessary self-directed learning activities (Cheng & Chau, 2016; Francis &
Shannon, 2013; McGuckin & Sealey, 2013; Naaj, Nachouki, & Ankit, 2012). This lack of
understanding of BL may also then reduce student satisfaction and hinder their achievement
of the expected learning outcomes (Cheng & Chau, 2016; Francis & Shannon, 2013).

It was heartening that even though the students were initially naive about BL in the 482 483 University context, when provided with a definition, they recognised several potential benefits. These included: 1) the ability to access and work through educational materials at 484 their own pace and in their own time; 2) increased ownership of, and responsibility for 485 determining the best way to learn and develop the relevant skills; and, 3) the ability to keep 486 abreast with the content even when absent from the University. These perceived benefits 487 were in line with a range of studies examining the quantifiable benefits as well as student 488 perceptions of BL (Cheng & Chau, 2016; Francis & Shannon, 2013; McGuckin & Sealey, 489 2013; Naaj et al., 2012). 490

Several of the potential benefits of BL students identified are supported by the two 491 learning theories (cognitive load and self-determination) identified earlier as underpinning 492 active learning and learner-centred education. With cognitive load theory describing our 493 494 limited and easily overloaded working memory (Young et al., 2014), it is not surprising that students recognised that BL may be superior to traditional, didactic, and content-driven face-495 to-face lectures when trying to improve theoretical knowledge, especially when the session 496 497 lasted three hours. They also recognised that with some material online, they could be more flexible about when, where and how often they engaged with the content. This was important 498 for those students who indicated they had struggled with some of the earlier concepts or had 499

500 missed class due to illness or a sporting commitment. They also saw merit in then using the face-to-face time as an opportunity to clarify challenging concepts and to apply what they had 501 502 learnt to cases relating to practical aspects of their future practice. Their online engagement of content would free time during face-to-face teaching sessions for discussions and activities 503 they considered most relevant to their professional lives. Such acknowledgements are also 504 consistent with self-determination theory (Ten Cate et al., 2011), as their engagement in more 505 506 practical and career-oriented activities would be presumably underpinned by their motivation to develop their professional identities as future sports scientists or physiotherapists. These 507 508 student perceptions were consistent with the significant positive associations between student perceptions of relevance of biomechanics to their careers and learning gains (Hsieh & 509 Knudson, 2008; Hsieh, Mache, & Knudson, 2012). 510

While all focus groups recognised the potential benefits of BL, they also identified 511 potential issues that might confound improvements in learning. The first related to time and 512 how BL would be incorporated into an already busy timetable and student life schedule. 513 Their concern was that if the timetabled face-to-face schedule remained the same and if they 514 were also expected to undertake additional online activities at home, they would not be able 515 to keep up. They felt that such a situation whereby too much material was provided during 516 face-to-face and online sessions may dampen their motivation and lessen their in-class 517 engagement. These views were consistent with the literature that excessive online activity 518 519 and face-to-face sessions can impede learning (Cheng & Chau, 2016; Francis & Shannon, 520 2013). Educators wishing to successfully implement a BL approach need to ensure that the overall workload for students does not increase. Undergraduate student focus groups also 521 expressed a reservation about whether they would still have sufficient face-to-face contact 522 with educators in a timely manner if they did not understand a concept or the application of 523 theory. These reservations were again consistent with literature, in which the successful 524

implementation of BL requires high quality face-to-face and online learning activities, with
the online activities complementing the face-to-face sessions (Gecer & Dag, 2012; Waha &
Davis, 2014).

Another potential issue identified by the students was that of not completing the 528 independent learning component at home because they had been immersed in a more 529 structured teaching paradigm for so long. Not having previously engaged in self-directed 530 531 study to any great extent, they identified circumstances that would challenge them in completing online learning tasks in the home environment as they would be more likely to 532 533 sleep in, engage in recreational activities or dedicate time to employment. Such honest statements with regard to how they may not uphold their part of a more learner-centred 534 approach appears somewhat consistent with other studies in which the students' personality 535 and preferred learning styles had an impact on the outcomes of more learner-centred 536 approaches (Cheng & Chau, 2016; Kuo, Belland, Schroder, & Walker, 2014). It was 537 heartening that students admitted that they were adults and as such, they needed to take 538 responsibility for their own learning. While many educators believe that all students can 539 successfully engage in self-directed learning at home, we recommend that educators 540 reconsider this assumption and provide strategies to assist students develop the autonomy and 541 motivation to become independent learners. 542

A final reservation expressed by students related to technology, with the Year 2 students concerned that unreliable internet access as well as not being able to access accessories such as headphones or earphones could potentially be a barrier to their engaging in independent study. Such concerns were somewhat consistent with previous studies in which computer and internet literacy have been described as potential barriers to successful BL implementation (Gulbahar & Madran, 2009; Walton & Hepworth, 2013). Educators should therefore assist students who may be disadvantaged by their at-home access to

technology, by ensuring that these students obtain priority access to computer and internetfacilities at the University.

552 It is encouraging that students in all five focus groups were able to offer suggestions about how their sports science degree could be reformed to a more BL approach. To best 553 achieve this, the students felt that the online component had to be interactive and not just a 554 repository of additional readings. In their view, interactive online components would lead to 555 556 greater student engagement with the material, resulting in reduced dropout, improved subject engagement and satisfaction as well as improved grades (Cheng & Chau, 2016; Francis & 557 558 Shannon, 2013; McGuckin & Sealey, 2013; Naaj et al., 2012; Walton & Hepworth, 2013; Xin et al., 2015). They also felt that more of the material provided in a BL model should 559 utilise real-world case studies that simulate likely scenarios they will encounter in their future 560 professions. It was suggested that these case studies could also use a PBL approach which is 561 commonly used in the Doctor of Physiotherapy and MD programmes at Bond University. 562 Active learning strategies such as PBL require the students to work in small groups to 563 identify what they know, what is unknown and how and where to access information to 564 address the case study problem, has been shown to improve decision-making capabilities as 565 well as domain specific knowledge in a variety of health disciplines (Carrio et al., 2016; 566 Zahid, Varghese, Mohammed, & Ayed, 2016). 567

Limitations of this study, should, however, be acknowledged. Qualitative research by its nature focuses on gaining a richer, in-depth understanding of the reasons, beliefs and motives that a group of people may have regarding a particular phenomenon or behaviour than can be obtained using quantitative research methods, e.g. Likert scale questionnaires (Edwards & Skinner, 2009; Garrison & Vaughan, 2008). To better understand these perceptions, qualitative research typically utilises smaller sample sizes than quantitative studies. While the current study (n = 18) involved a sample slightly larger than other

qualitative studies in the BL literature (n = 14-16 participants) (Frimming & Bordelon, 2016;
Gulbahar & Madran, 2009; Harnisch & Taylor-Murison, 2012), our sample involved six Year
1 undergraduate, eight Year 2 undergraduate and all four Master of Sports Science students.
Due to the need for anonymity, we were not able to determine whether students' perceptions
of BL were influenced by demographic characteristics such as their gender, nationality or
educational background.

581 We also acknowledge that Bond University differs from larger public universities in several important ways. In particular, Bond University is a small, non-for-profit private 582 583 university that offers accelerated programmes (three semesters per year) and has a considerably smaller student to staff ratio than larger public universities. As a consequence, 584 these findings may not necessarily apply to larger public universities that may tend to attract 585 students with different characteristics and philosophies about learning and teaching and/or 586 utilise different educator to student ratios and curriculum delivery approaches. While the 587 current project aimed to recruit students with limited experience in BL, this lack of 588 experience may suggest that the students do not have any experience of the actual benefits 589 and limitations of the BL teaching approach. As such, the responses of the participants in this 590 study may be somewhat different from students with more experience with BL. Sport science 591 educators who are interested in developing and maximising the benefits of a BL teaching 592 approach should therefore be aware of how previous BL experience may influence students' 593 594 perceptions.

595 Ultimately, the results of this study have several implications for sports science 596 programme directors who may wish to offer BL. To maximise its likely acceptance and 597 effectiveness, educators need to understand how their students view BL as misconceptions 598 need to be addressed and students guided into becoming more active in their learning. The 599 online components should be interactive and engaging, complementing face-to-face sessions.

As the ability to be a self-directed learner may require the student to develop a range of skills, educators may need to scaffold this skill development. While BL has the potential to become the new 'normal' (Norberg et al., 2011), educators needs to be aware of the inequitable global distribution of resources. Most of the work around BL has been conducted in contexts in which technology is assumed to be readily accessible. As some of our students who are studying at a private university in a developed country have reminded us, internet access and computer literacy may still be potential barriers to implementing BL in some contexts.

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#### 608 Conclusions

The results of this study add to the relatively limited research on sport science students' 609 perceptions of active learning pedagogies such as BL. Although our students had little prior 610 611 understanding or experience of BL, once provided with a definition, they were quick to recognise its potential merit. The likely benefits included greater ownership of their own 612 learning, the ability to work at their own pace and to access educational resources if they 613 were not able to attend face-to-face sessions. They also articulated potential issues with the 614 adoption of BL such as an increased workload, not being able to seek immediate clarification 615 from their educator as well as the challenge to effectively manage their time. They also 616 acknowledged that while students may not initially take ownership of their learning, as 617 adults, they needed to assume this responsibility. Students were also able to offer some 618 619 preliminary suggestions about how BL could be implemented. These suggestions focused on 620 how the online resources needed to be engaging, interactive and complement but not replace face-to-face engagement. We believe that our study may assist sports science educators who 621 are considering replacing a largely didactic teaching approach with BL. It may also be useful 622 for those trying to improve what they currently offer in terms of BL. 623

624

- 625 Acknowledgements: The authors wish to acknowledge the students who willingly gave up
- 626 their time to participate in this research project.

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728 Table I: Focus group student characteristics.

Year	Focus group number and	Other information	Reference used for
group	demographics		each focus group
Year 1	FG1 (2 males; 1 female);	Completed 1 of 6	Y1-FG1
	FG2 (3 males)	semesters	Y1-FG2
Year 2	FG1 (4 females)	4 females) Completed 4 of 6 semesters	Y2-FG1
	FG2 (4 males)		Y2-FG2
Master's	FG1(2 males; 2 females)	2 Bond graduates; 2 international graduates	M-FG1

731 Table II: Semi-structured interview questions used in the focus groups.

Se	mi-structured interview questions
1.	What do you understand by 'blended learning'?
2.	Have you had any prior experience of courses in which your learning could be described as blended?
3.	What do you perceive as the benefits of blended learning in your degree?
4.	What might be some negatives in terms of blended learning in your degree?
5.	Do you see any place for blended learning in your current degree?
6.	In retrospect, were there any particular sections or areas of your degree thus far where there could have been a mixture of online and face-to-face learning?
7.	Can you foresee any future opportunities where this approach might be useful?
8.	Is there anything that we may have not discussed and which you think is
	important?

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