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1 **Perceptions of sport science students on the potential applications and limitations of**
2 **blended learning in their education: a qualitative study**

3

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

57 (199 words)

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

59 **Subject classification codes:** Teaching Biomechanics.

60

61 **Introduction**

62 Sports and exercise scientists (hereafter referred to as sports scientists) require a strong
63 theoretical understanding in many disciplines including anatomy, physiology, biochemistry,
64 exercise prescription, biomechanics, motor control and learning, sport psychology, and
65 nutrition to underpin their professional practice. The challenge for those responsible for
66 educating and training today's sports scientists is to how best to ensure that our students
67 develop the requisite theoretical knowledge and the practical professional competencies
68 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
70 practices, particularly in terms of the role of the faculty member (educator) moving from the
71 'sage on the stage' in the instructional (teaching) paradigm to a 'guide on the side' in a
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
74 information) has been a number of learner-centred approaches such as problem-based
75 learning (PBL), case-based learning (CBL), and team-based learning (TBL). With these
76 approaches involving team work and communication (Barr & Tagg, 1995; Dziuban, Hartman,
77 & Moskal, 2004), they are widely adopted in medicine and a number of the allied health
78 professions.

79 The benefits of active engagement compared with traditional lecturing has been
80 reported recently for Science, Engineering, and Mathematics (STEM) in a meta-analysis of
81 225 studies (Freeman et al., 2014). The active learning approaches were diverse, ranging
82 from occasional group problem-solving, worksheets completed during class time, the use of
83 personal response systems and studio or workshop design sessions. Average examination
84 scores improved by about 6% for active learning sections, with learners in the traditional
85 lectures approximately 1.5 times more likely to fail than those in the active learning classes.

86 Active learning was effective across all class sizes but was more effective in class sizes of \leq
87 50.

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

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

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

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

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

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

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

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

161 learners to be motivated to undertake self-study, gaining insight into their acceptance of the
162 shift in locus from *'being taught'* to being more autonomous in their learning is imperative.
163 Consequently, this study sought to gain the students' perceptions of BL so as to provide sport
164 science educators wishing to introduce BL, a better understanding of how their students may
165 view such a change in their learning environment.

166 In garnering students' perceptions regarding the potential of BL in sport science, four
167 research questions framed the study:

- 168 1. What do the current Bond University Sports Science students understand by BL?
- 169 2. What do they perceive to be benefits of such an approach?
- 170 3. What do they perceive to be some of the obstacles related to BL?
- 171 4. What aspects of their courses lend themselves to a BL approach?

172 It was hypothesised that while the participants would have little initial understanding of BL,
173 they would see many benefits and some obstacles to the introduction of BL across their
174 degree.

175

176 **Methods**

177 *Institutional context*

178 Bond University (Gold Coast, Australia) is a private, non-profit organisation that prides itself
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
181 and Medicine offers a suite of undergraduate and post-graduate sport and health science
182 programs, with the Bachelor of Exercise and Sports Science and the Master's of Sports
183 Science coursework programme of relevance to this study. Bond University degrees are also
184 'accelerated', with the six-semester undergraduate degrees such as the Bachelor of Exercise
185 and Sports Science completed in two years rather than the standard three years. Similarly,

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

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

198

199 *Study design*

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

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

226 An email was sent to all Year 1 and Year 2 Bachelor of Exercise and Sports Science
227 ($n = 24$) and the four Master's of Sports science students ($n = 4$) outlining the purpose of the
228 study and asking interested students asked to contact the Principal Investigator. The email
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
231 independent researcher, the information collected would be anonymous and that their
232 comments would not be identifiable in any way to their educators or in subsequent
233 publications. Based on the number of student responses to the emails, it was decided to
234 conduct focus groups based on the year of study, i.e. Year 1, Year 2 or Masters. Times for
235 focus groups (max. 5 per focus group) were advertised to the potentially interested students

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*

255 The focus groups were conducted at Bond University over a five-week period during June
256 and July 2015. Each focus group met with the facilitator once, with the session lasting about
257 one hour. A framework of open-ended questions was used to facilitate the discussion (Table
258 1), which was recorded and then professionally transcribed *verbatim*. To ensure anonymity,
259 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 were
261 represented.

262

263 *Data analysis*

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

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

280

281 *Validity and reliability*

282 As with quantitative research, validity and reliability are important constructs in qualitative
283 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

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

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

300

301 **Results**

302 The results are presented using the primary research questions as the reporting framework. In
303 terms of exploring students' views on the inclusion of BL in sports science education, where
304 appropriate, themes were identified for the four primary research questions in terms of:

305 1) *Students' understanding of BL*; 2) *Perceived benefits (two themes: Educational and*
306 *Absence from campus)*; 3) *Potential issues (three themes: Educators' use of BL; Role of the*
307 *student; Technology)*; and 4) *Suggestions about BL in Sports Science*. Undergraduate
308 (Bachelor of Exercise and Sports Science) student responses are represented as Y1 (first year
309 students) and Y2 (second year students), respectively, while the Masters of Sports Science

310 students are represented as M, with FG indicating the particular focus group number per year
311 level. The focus groups and associated quotes are thus represented in the results as: Y1-FG1;
312 Y1-FG2; Y2-FG1; Y2-FG2; M-FG1. As noted previously, no individual students were
313 identified within the focus groups. As a result, quantifying common responses within each
314 focus group was not possible. As this was an exploratory study, the quotes were purposefully
315 selected to represent the breadth of the discussion for the three cohorts at different stages of
316 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).

324 Once Garrison & Vaughan's (2008, p. 5) definition of BL had been provided, a Y2-
325 FG2 student, based on her experiences of having been home-schooled, identified that her
326 experiences of distance online learning followed by face-to-face intensives could be regarded
327 as BL. She then offered the following definition:

328 *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*

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

338 *Educational benefits*

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

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*
354 *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:

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

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

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

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

376 A Y1-FG2 undergraduate explained their way of understanding learning key
377 concepts, indicating a potential need for BL:

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

381 *Absence from campus*

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

392

393 ***Potential issues with BL***

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

396 *Educators' use of BL*

397 With respect to how educators would use BL, a concern raised by all focus groups was how
398 BL would be embedded within the timetabled contact hours each week. Specifically, the
399 students felt BL would not work if such a model added to their study workload by requiring
400 them to undertake additional self-directed, online learning while also maintaining the same
401 face-to-face contact hours involving traditional didactic lectures. For example, a Y1-FG1
402 student stated that '*I think it would be really good if there was less class time. I think if the*
403 *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*

421 *Student-related issues* in a BL approach were identified by all five focus groups. Students
422 were in favour of the face-to-face learning environment, indicating that they had chosen Bond
423 University for the advertised personalised and transformational learning involving small
424 groups with dedicated educators. As a result, students confessed they often struggle with
425 work outside the structured learning environment, especially with many extra-curricular or
426 external competing obligations as is borne out in this Master's student's comment:

427 *I guess the way that I learn, and the way that I seem to learn best is if I dedicate the*
428 *actual time to actually come on campus or get in that sort of learning environment,*
429 *rather than I just find it very difficult to find time outside of a sort of a structured*
430 *learning environment, to do the course work. Especially working full-time and that*
431 *sort of thing, there just tends to be things that just ‘push it to the side, push it to the*
432 *side (M-FG1).*

433 The students, especially those in Year 2 also recognised that they may not always act
434 responsibly 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*

447 Both Year 2 focus groups raised concerns relating to technology in terms of equitable access
448 to technology, such as a reliable internet service as well as ownership of accessories such as
449 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***

456 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**

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

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

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

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

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

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

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

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

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

550 technology, by ensuring that these students obtain priority access to computer and internet
551 facilities at the University.

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

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

575 qualitative studies in the BL literature ($n = 14-16$ participants) (Frimming & Bordelon, 2016;
576 Gulbahar & Madran, 2009; Harnisch & Taylor-Murison, 2012), our sample involved six Year
577 1 undergraduate, eight Year 2 undergraduate and all four Master of Sports Science students.
578 Due to the need for anonymity, we were not able to determine whether students' perceptions
579 of BL were influenced by demographic characteristics such as their gender, nationality or
580 educational background.

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

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

607

608 **Conclusions**

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

624

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727

728 Table I: Focus group student characteristics.

Year group	Focus group number and demographics	Other information	Reference used for each focus group
Year 1	FG1 (2 males; 1 female);	Completed 1 of 6 semesters	Y1-FG1
	FG2 (3 males)		Y1-FG2
Year 2	FG1 (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

729

730

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

Semi-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?
-

732

733