

Please cite the Published Version

Finlay, MJ , Tinnion, DJ  and Simpson, T  (2022) A virtual versus blended learning approach to higher education during the COVID-19 pandemic: The experiences of a sport and exercise science student cohort. *Journal of Hospitality, Leisure, Sport and Tourism Education*, 30. 100363 ISSN 1473-8376

DOI: <https://doi.org/10.1016/j.jhlste.2021.100363>

Publisher: Elsevier

Version: Accepted Version

Downloaded from: <https://e-space.mmu.ac.uk/639892/>

Usage rights:  [Creative Commons: Attribution-Noncommercial-No Derivative Works 4.0](#)

Additional Information: This is an author accepted manuscript of an article published in *Journal of Hospitality, Leisure, Sport and Tourism Education*, by Elsevier.

Enquiries:

If you have questions about this document, contact openresearch@mmu.ac.uk. Please include the URL of the record in e-space. If you believe that your, or a third party's rights have been compromised through this document please see our Take Down policy (available from <https://www.mmu.ac.uk/library/using-the-library/policies-and-guidelines>)

1 **A Virtual versus Blended Learning Approach to Higher Education During the**
2 **COVID-19 Pandemic: The Experiences of a Sport and Exercise Science**
3 **Student Cohort**

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20 **Abstract**

21 During the 2020/21 academic year most UK universities rapidly developed learning
22 material as part of a move to blended learning, in response to the COVID-19
23 pandemic. This was interspersed with periods of virtual-only delivery, aligning with
24 national lockdowns. The previous literature suggests there are both advantages and
25 disadvantages to virtual-only and blended learning approaches, which may impact on
26 student satisfaction. Student satisfaction scores may be especially insightful in a
27 student cohort enrolled on an applied sport programme, whereby practical seminars
28 and assessments would be severely impacted by social restrictions. Therefore, this
29 study aimed to explore the experiences and perceptions of virtual and blended
30 learning approaches in an undergraduate sport and exercise sciences cohort, during
31 the COVID-19 pandemic. Additionally, this study aimed to explore whether student
32 perceptions of both learning modes differed between and within-year groups. Students
33 completed an adapted version of the national student survey (NSS), pertaining to
34 periods of virtual learning-only (n=81) and blended learning (n=62). When all students
35 were considered, blended learning yielded consistently higher satisfaction scores
36 across all survey sub-sections (teaching on my course, learning opportunities,
37 assessment and feedback, academic support, organisation and management,
38 learning resources, learning community and student voice) resulting in a significantly
39 higher overall course satisfaction score (3.93 ± 0.99 vs 3.55 ± 1.11 ; $p = 0.33$; ES =
40 0.36). When comparing Year 1 and Year 2 students, the former had significantly higher
41 ($p < 0.005$) perception scores for teaching on my course, assessment and feedback,
42 academic support, organisation and management, learning resources and learning
43 community, but not learning opportunities, student voice or Covid-19-specific, for the
44 virtual learning survey. Additionally, within-year group (Year 2) differences were found

in assessment and feedback, academic support and learning community, with higher perception scores reported in the blended learning survey. No significant within-year group differences were observed in Year 1 students. This study provides the first data on student perceptions of a sport and exercise science programme during blended and virtual learning, amidst a global pandemic. The clear preference for blended learning in the current study, suggests sport and exercise science students appreciated the access to face-to-face teaching, despite the social distancing measures in place. Broadly, the findings may assist in governmental and institutional decision making, and in the designing of learning material during periods of social restrictions. These findings may be more beneficial to the design and implementation of face-to-face and/or online components for more applied, science-based courses.

Keywords: Higher education; Teaching; COVID-19; Student perception; Blended learning; Virtual learning.

1. Introduction

The disruptive nature of the COVID-19 pandemic has influenced almost all sectors of society in the UK and Higher Education (HE) is no exception (Aucejo et al. 2020). For teaching, the COVID-19 pandemic undermined the majority of existing practices, with the exception of specific online providers such as The Open University, and forced the teaching and learning experience to change unpredictably and rapidly (Nerantzi, 2020). The response to this challenge has varied between universities in the UK and around the world. In the initial months, as observed in schools (Viner et al. 2020), developed countries largely moved to closed university campuses and relocation of all teaching online. One exception was the USA, where some instances of face-to-face teaching in HE remained (Crawford et al. 2020). Across the 2020/21 academic year, a large majority (88.5%) of UK universities, including the university and course explored in the current study (Edge Hill University – BSc Sport & Exercise Science), eventually adopted a ‘blended-learning’ approach (Student crowd, 2020), although notably, institutes such as Oxford and Cambridge committed entirely to teaching online. Each approach offers unique benefits and presents individual challenges to teaching and learning (Adnan & Anwar, 2020; Burki, 2020; Mishra, Gupta & Shree, 2020; Shim & Lee, 2020; Cavanaugh & Jacquemin, 2015; Means et al. 2013), although the extent to which these modes impact students’ perceptions of higher education remains unclear.

Virtual learning can be defined as learning that can functionally and effectively occur in the absence of traditional classroom environments (Simonson & Schlosser, 2006). Although learning from home is an integral part of HE systems, extended periods of home learning is a rare situation, described by the term ‘emergency online learning’ (Bozkurt & Sharma, 2020; Murphy, 2020). Previous research on the benefits of virtual learning is conflicted. Whilst undergraduate students may need face-to-face contact

with tutors to sufficiently grasp the required contextual knowledge (Adnan & Anwar, 2020; Lane & Whyte, 2006), students may respond favourably to elements of virtual learning such as more comfortable learning environments, or efficient time utilisation via the repeatability of video content either on the university's systems, or youtube (Mishra, Gupta & Shree, 2020; Shim & Lee, 2020).

In contrast to virtual learning, blended learning refers to the integration of virtual learning described earlier, with elements of face-to-face teaching (Castro, 2019; Bower et al. 2015; Hastie et al. 2010). The benefits of blended learning approaches may include the facilitation of flexible learning in higher education (Shim & Lee, 2020), improved student engagement and improved self-regulated learning (Li et al. 2020; Butz et al. 2014; Schunk & Zimmerman, 2012). Previous authors have also noted the greater potential to transfer content into practice in this approach (Demirer & Sahin, 2013).

Sport and exercise science is a particularly applied degree, whereby sub-disciplines such as biomechanics, physiology and psychology are taught within lectures, applied seminars, sport and physical activity sessions and laboratory practicals and assessments (Keogh, Gowthorp & McLean, 2017; Lane & Whyte, 2006). Periods of social restriction, or instances where these activities are limited or unavailable, inevitably impact such applied activity (Millar, 2004). For example, students may not immerse themselves in hands-on learning, or peer-to-peer collaboration, limiting sport and exercise science students' exposure to the practical aspects of sport science or related fields (Gauchi et al. 2009; Pedlar, 2005). In turn, this may negatively impact how students perceive the course overall (Knudson, 2020). Investigations on student perceptions in a sport and exercise science cohort are extremely limited (Keogh,

Gowthorp, & McLean, 2017), with even fewer studies exploring this within the context of the COVID-19 pandemic. Outside of learning, the negative psychological emotions associated with social restrictions must also be noted (Brooks et al. 2020).

As the COVID-19 pandemic is a constantly moving situation, it is important to explore student perceptions of virtual-only and blended learning approaches to a sport and exercise science programme. Typically, subtle differences in the course structure and content arise as students' progress from level 4 to level 6, and are further differentiated by individual pathway choices on the programme. Therefore, it may be interesting to explore differences between year-groups, and indeed within-year groups, to identify potential differences in the impact on student perception. One method that could be used to explore this, is survey-based research.

Survey-based research can effectively gather large amounts of data (Kelley, 2003) and has been used previously to investigate the perceptions of higher education students (Adnan & Anwar. 2020; Hamutoglu et al. 2020; Mishara, Gupta & Shree, 2020; Sukayt, 2020). Perhaps the most well-known example of a student survey, is the National Student Survey (NSS, 2021). Gathering the student perceptions of teaching and learning in both virtual learning and blended learning during the COVID-19 pandemic, may be useful to assess and compare the efficacy of both modes. Further, this data could be used to influence future government and institutional policy on teaching and learning in periods of restriction, or even as alternative forms of education. Lastly, the comparison of student perceptions in a virtual or blended learning environment may assist in the course decision making of prospective students, considering the ongoing pandemic. Therefore, this study explored the following research questions (RQ):

RQ1 - To what extent did student perceptions of both virtual learning-only and blended learning modes differ on a sport and exercise science programme, amidst the COVID-19 pandemic?

RQ2 – Did the student perceptions of both learning modes differ between-year groups and within-year groups on a Sport and Exercise Science programme.

2. Methods

This study utilised an online self-administered survey to examine the experiences of undergraduate students during periods of virtual learning-only and blended-learning during the COVID-19 pandemic.

2.1.1 Procedures

Two surveys titled “*A (Virtual Learning-only/Blended learning) Approach to Higher Education during the COVID-19 Pandemic: The Experiences of a Sport and Exercise Science Cohort*” were produced with Google forms software (Google, US) and distributed during the 2020-21 academic year. All participants were students enrolled on Year 1 to Year 3 of a BSc (Hons) Sport and Exercise Science degree at Edge Hill University. Specifically, students on 9 select modules where graduate teaching assistants (GTA) were responsible for teaching delivery, were given the opportunity to complete the survey. The “virtual learning-only” survey was distributed online via the institution's learner management system at a time when COVID-19 restrictions were in place and teaching was “virtual”. The “blended-learning” survey was distributed both online and in-person at a time where a blended approach of face-to-face and virtual learning was implemented. Both surveys could be accessed voluntarily and

anonymously. The blended learning survey could be accessed via an open weblink upon scanning a QR code in class, and the virtual-only survey could be accessed by following a weblink on the universities learner management system (LMS). The above methods were implemented to minimise the sharing of stationery and adhering to the governmental and institutional policy on social distancing. Students were informed of the benefits and risks of participating in the survey upon reading the accompanied information on the study procedures and provided informed consent.

The content of the surveys was adapted from the National Student Survey (NSS), with select questions added specific to the COVID-19 pandemic (NSS, 2021) (see appendix A). The NSS was chosen as it is the most recognised survey on student perceptions. There are some limitations of the NSS survey which should be noted, such as the assessment of average scores for a particular survey element, despite the inter-individual differences in learning orientation and engagement in students (Bennett & Kane, 2014). Likewise, module grades may be influenced by student perceptions of the university as a whole (Bennett & Kane, 2014). Nevertheless, the current authors agreed that the NSS survey was an appropriate survey to administer due to its consistency, unambiguous and concise wording of questions, and a lack of leading questions. The 28-item survey anonymously assessed nine aspects of student satisfaction (teaching on my course, learning opportunities, assessment and feedback, academic support, organisation and management, learning resources, student voice, COVID-19 safety, overall satisfaction) using a 1 (definitely disagree) - 5 (definitely agree) Likert-scale. The final, open-ended question further assessed student perception of the virtual/blended experience. Participants were required to answer all questions. Notifications of duplicate responses enabled the researchers to omit such responses from the analysis. Ethical approval for this study was provided

by the University's Research Ethics Sub-committee (URESC) and was conducted in accordance with the Helsinki Declaration. The current study adhered to the BERA guidelines and GDPR regulations in relation to participants privacy and data storage (Bera, 2018).

2.1.2 Statistical analyses

The majority of questions were 5-point Likert-scale. Comparisons between the two learning modes (virtual and blended) in addition to the between and within-year group differences were analysed via independent samples t - tests (Howell, 2010). Where Levene's test for equality of variances was violated, the appropriate statistical corrections were applied. Regarding the final open-ended question, a 6-stage thematic analysis process (Braun & Clarke, 2006) was performed by the research team. This comprised; data familiarization, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and lastly producing the report. Specifically, short narrative text was analysed and coded, prior to identifying and reviewing patterns in the data, and defining themes. All data was presented as Mean $\pm$ SD. Significance level was set at $P \leq 0.05$. Cohen's d effect size was also calculated, comprising the following thresholds: trivial = 0.20, small = 0.20-0.49, moderate = 0.50-0.80, and large = ≥ 0.8 (Cohen, 1998).

3. Results

Table 1 provides the overall survey responses, whilst table 2 provides a breakdown of responses by year group. Table 3 highlights the main themes, sub-themes, definitions and example answers from the thematic analysis. In total, 203 undergraduates

enrolled on a sport and exercise science course were invited to complete both the virtual learning and blended learning surveys. Of those invited, 81 participants (Year 1 = 37, Year 2 = 31, and Year 3 = 13) and 62 participants (Year 1 = 51, Year 2 = 11, Year 3 = 0) completed the virtual learning and blended learning surveys, respectively. Total response rate for the surveys was finalised at 35%. Given the unsatisfactory response rate within Year 3 students, the decision was made to reduce the comparison of each teaching mode to Year 1 versus Year 2 students only, prior to statistical analysis. Additional detail on this is provided in the limitations section below.

Results highlighted in table 1 indicate that students overall reported significantly ($p \leq 0.05$) higher scores for academic support, organisation and management, learning resources, learning community and student voice for the blended learning approach, as compared to the virtual learning approach.

Table 1. Sub-section scores for all respondents. Values closer to 1 represent lower satisfaction, with values closer to 5 representing greater satisfaction.

	Virtual learning-only (n = 81)		Blended learning (n = 62)		Diff	P value	ES (d)
	Mean	SD	Mean	SD			
Teaching on my course	3.85	0.83	3.97	0.64	0.12	.288	0.16
Learning opportunities	3.80	1.05	4.04	0.69	0.24	.059	0.27
Assessment and feedback	3.97	0.95	4.16	0.62	0.19	.108	0.24
Academic support	3.81	1.02	4.10	0.69	0.29	.030*	0.33
Organisation and management	3.74	1.08	4.03	0.81	0.28	.046*	0.30
Learning resources	3.84	1.05	4.17	0.78	0.33	.020*	0.36
Learning community	3.56	1.00	3.90	0.91	0.34	.043*	0.36
Student voice	3.65	0.92	3.95	0.74	0.30	.015*	0.36
COVID-19-specific	4.30	0.79	4.42	0.71	0.12	.335	0.16
Overall course satisfaction	3.55	1.11	3.93	0.99	0.38	.033*	0.36

Data are Mean $\pm$ SD. *denotes a significant difference between learning modes. ($p \leq 0.05$). ES = Effect size (d = Cohen's d).

227 Independent t-test analysis revealed no significant differences between survey sub-
228 sections across Year 1 and Year 2 students for the blended learning survey (table 2).
229 Analysis did, however, reveal significant differences in responses between Year 1 and
230 Year 2 students for “teaching on my course” ($t = 3.744$, $df = 68$, $p < .001$; $ES = 0.85$);
231 “assessment and feedback” ($t = 2.616$, $df = 68$, $p = 0.011$; $ES = 0.32$); “academic
232 support” ($t = .003$, $df = 68$, $p = 0.003$; $ES = 0.57$); “organisation and management” (t
233 $= 2.467$, $df = 68$, $p = 0.016$; $ES = 0.72$); “learning resources” ($t = 1.996$, $df = 68$, $p =$
234 0.05 ; $ES = 0.50$) and “learning community” ($t = 2.769$, $df = 68$, $p = 0.007$; $ES = 0.44$)
235 for the virtual learning survey. However, no significant differences were found for
236 questions on learning opportunities, student voice or Covid-19-specific.

Table 2 Sub-section scores for Year 1 and Year 2 students. Values closer to 1 representing lowest satisfaction, and values closer to 5 representing greater satisfaction.

	Virtual learning				Blended learning			
	Year 1		Year 2		Year 1		Year 2	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Teaching on my course	4.05	0.61	3.53	0.61	3.97	0.71	3.89	0.91
Learning opportunities	4.08	0.70	3.45	0.96	4.04	0.69	3.86	1.11
Assessment and feedback	4.07	0.71	3.88	0.46	4.16	0.61	4.41	0.44
Academic support	4.02	0.85	3.56	0.77	4.10	0.96	4.36	0.64
Organisation and management	4.00	0.91	3.36	0.87	4.03	0.80	4.03	1.0
Learning resources	4.08	0.92	3.66	0.75	4.17	0.78	4.21	1.04
Learning community	3.74	1.31	3.19	1.16	3.90	0.91	4.18	1.15
Student voice	3.85	0.72	3.44	0.61	3.95	0.74	3.91	0.88
COVID-19-specific	4.53	0.73	4.13	0.79	4.27	0.98	3.73	1.21
Overall course satisfaction	3.72	1.08	3.25	1.19	3.94	0.71	4.27	0.75

Data are Mean $\pm$ SD.

Within-year group analysis revealed no significant differences for responses between the online and blended learning for Year 1 students. For Year 2 students there was a significant difference between blended and virtual learning for assessment and feedback ($t = 2.795$, $df = 27.936$, $p = 0.009$; $ES = 1.18$); Academic support ($t = 3.040$, $df = 41$, $p = 0.004$; $ES = 1.13$) and Learning community ($t = 2.413$, $df = 41$, $p = 0.020$; $ES = 0.86$) (see table 2).

Table 3 presents the main themes and sub-themes associated with the thematic analysis. Examples of short-text answers are also provided. The main themes identified were teaching, learning, student wellbeing, and other (where it was not possible to attribute a response to a specific category). The main themes were divided into 2 categories, positive and negative responses. The example answers in table 3

253 reflect the general preference for blended learning, due to reasons such as the
 254 opportunity to partake in applied sessions, whilst several students told of the difficulties
 255 with virtual learning.

256 Table 3 Main themes and sub-themes identified from the thematic analysis, inclusive of
 257 definitions and example answers.

Main theme	Sub-theme	Definition	Virtual learning example	Blended learning example
Teaching	Positive	Students reported a positive experience of teaching	"Staff have been very helpful in putting on extra drop-in sessions, break out rooms were ok."	"Practicals have been good, the lecturers have tried to make it as fun and educational as possible despite masks and restrictions to labs."
	Negative	Students reported a negative experience of teaching	"Lack of practical sessions."	"The online element of blended learning is useless."
Learning	Positive	Students reported a positive experience of learning	"All sessions being uploaded to blackboard to go back on and review. Think this should continue after."	"Good use of practical sessions following theory when able to."
	Negative	Students reported a negative experience of learning	"Dissertation has been heavily impacted by the move to online."	"Online content is pretty pointless, can't concentrate at home"
Student wellbeing	Positive	Students reported positive experiences regarding mental health, motivation and work ethic	"Enjoyed the home working environment, reduced travel."	N/A
	Negative	Students reported negative experiences regarding mental health, motivation, work ethic etc.	"Mental health, motivation and work ethic has decreased as we are struggling and need more support at times."	N/A
Other	Positive	General positive comments that may not be categorised as a specific theme.	"Many positives."	"Much better"
	Negative	General negative comments that may not be categorised as a specific theme.	"Mostly negative."	N/A

4. Discussion

This current study aimed to utilise survey-based research to explore undergraduate sport and exercise science student perceptions of virtual and blended learning modes during the COVID-19 pandemic (RQ1). Additionally, this work compared between- and-within-year group differences in student perceptions of each learning mode (RQ2). Addressing RQ1, overall course satisfaction was higher in the blended as compared to virtual learning. More specifically, scores were significantly higher for academic support, organisation and management, learning resources, learning community and student voice in support of blended rather than virtual learning.

To understand the differences in overall satisfaction between blended and virtual learning modes, it is necessary to explore survey responses for each survey section. Unsurprisingly, three of five sections where significant differences in satisfaction scores were observed had 'social underpinnings' (academic support, learning community and student voice) and in this regard, the isolation imposed by COVID-19 during periods of virtual learning, likely contributed to some of the differences observed. For example, Laffey, Lin & Lin (2006) contend that education is a social practice and successful learning is facilitated by consistent social interactions (i.e., peer to peer and instructor to student) (Kim, Kwon & Cho, 2011). This social constructivism view, whereby learners "learn" within a proximal zone of development where the task is challenging and where the learner can attend to important aspects of information wherever viable (Subban, 2006), does not separate cognitive and affective learning and emphasises the learning community and student bonds which can support academic success (Delfino & Manca, 2007). The present study's results suggest that students may have experienced poorer social interaction with virtual learning as compared to blended-learning approaches due to the lack of face-to-face

interaction with peers and teaching staff. Yet, previous research has suggested that some students, perhaps those who may be particularly shy, may feel more comfortable and exhibit higher learner engagement in a virtual environment, compared to face-to-face (Caspi et al. 2006; McBrien et al. 2009). Interestingly, and perhaps in contrast to the above statement, numerous students surveyed in the current study told of a lack of communication and engagement in virtual sessions (i.e. seminars), whereby a lack of camera and microphone use was noted, for example:

“certain online learning tasks such as when we use breakout groups are difficult to complete, with some other students not turning on their webcam.”

Communication is central to the usual timetable of laboratory and physical activity sessions for sport and exercise science students (i.e. “academic support”, “learning community”; “student voice”) and is crucial for the development of competent professionals (Keogh, Gowthorpe & McLean, 2017; Lane & Whyte, 2006). Thompson & Zeuli (1999) talk about the classroom as a scientific community, one that is ideally governed by the same norms of argument and evidence as governs discussion in the discipline itself. These small communities use such a form of communication and other conventions to help them struggle through challenging problems, developing systems of shared knowledge that gradually evolve in the direction of the knowledge held by those at the heart of the discipline. Removing the typical laboratory sessions is, in a simple way, removing a large part of the scientific or ‘learning community’ and in doing so, significantly alters the development of Sports Scientists which may have partly contributed towards the negative perceptions of virtual learning, for example:

“Some work is hard to understand from a lack of lab sessions, but we are still expected to know what to do.”

Millar (2004) argues that practical work is essential to developing students' scientific knowledge, given that the subject matter of science is of the material world, it seems natural, and rather obvious, that learning science should involve seeing, handling and manipulating real objects and materials. Where there is an attempt to convey practical skills in an online environment, the challenge becomes how to retain the authenticity of the course content in the absence of tangible examples (Britt, 2015) and directly assessing students' applied skills (Lane & Whyte, 2006; Pedlar, 2005), i.e. blood sampling. The effect of this would vary through each of the general sub-disciplines (Biomechanics, Physiology and Psychology). Supporting this, the following comment also stands out in criticism of virtual learning:

"Couldn't put learning into practice and little relevance to the real world."

Nevertheless, despite the potentially socially isolated nature of virtual learning, Soffer & Nachmias, (2018) found that online modes of learning resulted in better understanding of course structure, better communication with staff and as a result higher satisfaction. Yet in the present study, perceptions of "organisation and management and academic support were higher for blended as compared to virtual learning. These differences in perceptions could be influenced by the lack of organisational cohesion, due to constrained learning designs (Hodges et al. 2020) between tutors on the Sport and Exercise Science programme, with one student highlighting:

"Every lecturer uses blackboard differently, so the online content is in different places in each module. Some are really easy to find, others are extremely difficult."

Some students may have limited access to technology or may struggle to adapt to changes in an online learning structure (Martin & Bolliger, 2018; Vaughan, 2007). This may partly explain the lower perceptions of “academic support, “organisation and management” access to “learning resources” and “learning community” in the current study, during the periods of virtual learning only. Conversely, students may value having more time to process information in virtual settings, such as recorded content (Mishra, Gupta & Shree, 2020; Hratinski, 2008). Indeed, this was a commonly held view reported by students in the current study, whereby the opportunity to learn flexibly and complete assessments from home was welcomed by some students who did have access to appropriate technology. This may partly explain the lack of negative responses associated with ‘teaching on my course’, ‘learning opportunities’ and ‘assessment and feedback’ reported during virtual learning.

Perceptions of teaching and learning in higher education are unique to each individual and so, in this way, it is difficult to generalise each student's own perceptions (Lowe & Cook, 2003). In the present study for example, some students responded positively to certain aspects of the survey (i.e. ‘academic support’) whilst others did not, in one case a student remarked:

“Support from tutors was really helpful.”

Whereas another student responded:

“Online learning didn't help and certain staff were unhelpful.”

These differences were ever apparent in the analysis of year group differences. In relation to RQ2, 1st year students had significantly higher perception scores in the following sections of the virtual learning survey; teaching on my course; assessment and feedback; academic support; organisation and management; learning resources and learning community, when compared to their 2nd year counterparts. There may be many reasons for these findings, one of which could be explained by the slight differences in the course structure and content. At Edge Hill University, there is an emphasis on the development of fundamental knowledge through introductory modules. In contrast, subsequent years typically form the development of the applied skills required of a sport and exercise scientist (Lane & Whyte, 2006; Pedlar, 2005). As such, 2nd year students may be exposed to greater disruption, when compared to 1st years. Indeed, when exploring within-year differences, 2nd year students had more positive perceptions to assessment and feedback, academic support and learning community during blended learning, when compared to virtual learning.

An additional factor that may explain differences, may be the fact that 1st year students had no prior higher education experience of a 'normal' academic year. In contrast, 2nd year students were afforded the experience of a year of "normal" face-to-face teaching prior to the COVID-19 pandemic. Therefore, 2nd year students may be better suited to compare the virtual-only and pre-COVID-19 or 'normal' experience, and would likely perceive any change of approach to virtual learning in a negative way. This could also conceivably apply to 3rd year undergraduates, though that specific cohort was not directly compared. In the context of teaching on my course, assessment and feedback, learning resources, and learning community, a typical academic year in the sport and exercise sciences would include participation in practical sessions and assessments,

such as those mentioned throughout the study (Knudson, 2020; Lane & Whyte, 2006). Again, the sudden switch to virtual learning may affect those students who had prior experience of practically_learning and applying the skills of a sport and exercise scientist (Pedlar, 2005). Likewise, those students who were familiar with face-to-face contact with teaching staff, which may involve informal assessment feedback or general support, could conceivably view virtual contact and correspondence as inferior.

4.1.1 Limitations

The authors note several study limitations. Firstly, as mentioned previously the findings are limited to a sport and exercise science cohort at a single higher education institution. This was constrained to 9 select modules whereby the authors, as GTA's and PhD students, were responsible for teaching delivery. It is worth noting the variation in the % of respondents across year groups, whereby only 1 of the 9 modules taught by a GTA, was a Year 3 module. Thus, comparisons between Year 3 students and other year groups was not possible. Nevertheless, the findings provide an insight into student perceptions of blended and virtual and may be used to inform future pedagogical approaches. Additionally, there may be wide ranging inter-individual interpretations of the survey's content. For example, how students deem something as interesting, intellectually stimulating or fair feedback, is down to each individual (Bennet & Kane, 2014). Furthermore, many students could not be reached for reasons such as periods of self-isolation. Lastly, it is possible that the ordering of learning modes in the academic year (virtual learning followed by blended learning), may have had an influence on student perceptions. Future research could expand on the current analysis and explore potential trends in student grades and attendance in virtual or

blended learning settings as per Nieuwoudt (2020), specifically during the pandemic. This could offer a more thorough analysis further to student perceptions, on the effects of learning during both virtual and blended learning approaches.

5. Conclusion

This paper highlights perceived differences between a virtual learning-only and blended learning approach of UK students during a global pandemic. Overall, the findings of the study suggest that sport and exercise science students at Edge Hill University had higher perceptions of blended as compared to virtual learning. The limited opportunity for social interaction and the difficulty to maintain authenticity of the practical course elements likely contributed to poorer perceptions of virtual learning. Nevertheless, student's perceptions of "teaching on my course" and "learning opportunities" did not differ between learning modes highlighting that virtual and blended learning appear to satisfy student's expectations at least from a teaching and learning opportunity perspective. Moving forward, this study highlights that virtual learning environments need to actively engage students to facilitate social interaction and be delivered using coordinated approaches to ensure consistent use of learning technology across sub-disciplines of sport and exercise science. An important challenge for pedagogical design is to ensure that the authenticity of practical course elements (e.g., blood sampling, maximal exercise procedures) are maintained through periods of social restrictions (i.e., due to Governmental and institutional COVID-19 policies). Although the findings are limited to a single programme at one higher education institution, the findings from this study could be used to inform and enhance

future pedagogical approaches to optimise students' learning and academic experience during periods of social restrictions.

6. Acknowledgements

The authors wish to thank the students who took part in the surveys.

7. Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

8. References

1. Adnan, M., & Anwar, K. (2020). Online Learning amid the COVID-19 Pandemic: Students' Perspectives. *Journal of Pedagogical Sociology and Psychology*, 2, 45-51.
2. Aucejo, M., French, J., Araya, M. P. U., & Zafar, B. (2020). The impact of COVID-19 on student experiences and expectations: Evidence from a survey. *Journal of Public Economics*, 191, 104271.
3. Bennett, R., & Kane, S. (2014). Students' interpretations of the meanings of questionnaire items in the National Student Survey. *Quality in Higher Education*, 20(2), 129-164.
4. British Educational Research Association (BERA) (2018) *Ethical guidelines for educational research*, 4th edn. Retrieved 14 February 2021, from <https://www.bera.ac.uk/researchers-resources/publications/ethical-guidelines-for-educational-research-2018>.

5. Bower, M., Dalgarno, B., Kennedy, G.E., Lee, M. J. W., & Kenney, J. (2015). Design and implementation factors in blended synchronous learning environments: Outcomes from a cross-case analysis, *Computers & Education*, 86, 1-17.
6. Bozkurt, A., & R. C. Sharma. (2020). "Emergency Remote Teaching in a Time of Global Crisis Due to CoronaVirus Pandemic." *Asian Journal of Distance Education*, 15 (1). Retrieved 19 March 2021, from <http://asianjde.org/ojs/index.php/AsianJDE/article/view/447>.
7. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
8. Britt, M. (2015). How to better engage online students with online strategies. *College Student Journal*, 49(3), 399-404.
9. Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet*. Retrieved 25 September 202, from [https://doi.org/10.1016/S0140-6736\(20\)30460-8](https://doi.org/10.1016/S0140-6736(20)30460-8).
10. Burki, T. K. (2020). COVID-19: consequences for higher education. *The Lancet Oncology*, 21(6), 758.
11. Butz, N. T. (2014). Motivation in Synchronous Hybrid Graduate Business Programs: A Self-Determination Approach to Contrasting Online and On-Campus Students. *MERLOT Journal of online Learning and Teaching*, 10(2), 211-227.

12. Caspi, A., Chajut, E., Saporta, K., & Beyth-Marom, R. (2006). The influence of personality on social participation in learning environments. *Learning and Individual Differences*, 16(2), 129-144.
13. Castro, R. (2019). "Blended Learning in Higher Education: Trends and Capabilities." *Education and Information Technologies*, 24, 2523–2546.
14. Cavanaugh, J., & Jacquemin, S. (2015). A Large Sample Comparison of Grade Based Student Learning Outcomes in Online vs. Face-to-Face Courses. *Computer Science*. Retrieved 13 March 2021 from [10.24059/OLJ.V19I2.454](#).
15. Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
16. Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., Magni, P., & Lam, S. (2020). 'COVID-19: 20 countries' higher education intra-period digital pedagogy responses'. *Journal of Applied Learning & Teaching*, 3(1), 1-20.
17. Delfino, M., & Manca, S. (2007). The expression of social presence through the use of figurative language in a web-based learning environment. *Computers in Human Behaviour*, 23, 2190-2211.
18. Demirer, V., & Sahin, I. (2013). "Effect of Blended Learning Environment on Transfer of Learning: An Experimental Study." *Journal of Computer Assisted Learning*, 29: 518–529.
19. Gauci, S. A., Dantas, A. M., Williams, D. A., & Kemm, R. E. (2009). Promoting student-centered active learning in lectures with a personal response system. *Advances in Physiology Education*, 33(1), 60-71.

20. Hamutoglu, N.B., Topal, M., & Gezgin, D. M. (2020). Investigating Direct and Indirect Effects of Social Media Addiction, Social Media Usage and Personality Traits on FOMO. *International Journal of Progressive Education*, 16(2), 248-261.
21. Hastie, M., Hung, I., Chen, N., & Kinshuk (2010). A blended synchronous learning model for educational international collaboration. *Innovations in Education and Teaching International*, 47, 24- 29.
22. Hodges, C.B., Moore, S., Lockee, B., Trust, T., & Bond, M.A. (2020). The Difference Between Emergency Remote Teaching and Online Learning. *Educational Review*. Retrieved 04 March 2021, from <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning>.
23. Howell, D. C. Statistical methods for psychology (7th Ed.). Belmont, Ca: Wadsworth. 2010: 141-144.
24. Hrastinski, S. (2008). The potential of synchronous communication to enhance participation in online discussions: A case study of two e-learning courses. *Information & Management*, 45(7), 499-506.
25. Kelley K. (2003). Good practice in the conduct and reporting of survey research. *International Journal of Quality in Health Care*, 15(3), 261-266.
26. Keogh, J., 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.

27. Kim, J., Kwon, Y., & Cho, D. (2011). Investigating factors that influence social presence and learning outcomes in distance higher education. *Computers & Education*, 57(2), 1512-1520.
28. Knudson D. (2020) A tale of two instructional experiences: student engagement in active learning and emergency remote learning of biomechanics. *Sports Biomechanics*. Retrieved 09 April 2021 from <https://doi.org/10.1080/14763141.2020.1810306>.
29. Lane, A.M., & Whyte, G.P. (2006). From Education to Application: Sport and Exercise Sciences Courses in the Preparation of Applied Sport Scientists. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 5(2), 89-93.
30. Laffey, J., Lin, G.Y., & Lin, Y. (2006). Assessing Social Ability in Online Learning Environments. *Journal of Interactive Learning Research*, 17(2), 163-177.
31. Li, X., Yang, Y., Chu S. K. W., Zainuddin Z. & Zhang Y. (2020) Applying blended synchronous teaching and learning for flexible learning in higher education: an action research study at a university in Hong Kong. *Asia Pacific Journal of Education*. Retrieved 19 April 2021, from <https://doi.org/10.1080/02188791.2020.1766417>.
32. Lowe, H., & Cook, A. (2003). Mind the Gap: Are students prepared for higher education? *Journal of Further and Higher Education*, 27:1, 53-76.
33. Martin, F., & Bolliger, D. (2018). Engagement Matters: Student Perceptions on the Importance of Engagement Strategies in the Online Learning Environment. *Online Learning*, 22(1), 205-222.

34. McBrien J. L., Cheng R., & Jones P. (2009). Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning. *The International Review of Research in Open and Distributed Learning*, 10(3), 1–17.
35. Means, B., Toyama, Y., Murphy, R., & Baki, M. (2013). The Effectiveness of Online and Blended Learning: A Meta-Analysis of the Empirical Literature. *Teachers College Record*, 115, 1-147.
36. Millar, R. (2004). The role of practical work in the teaching and learning of science. *Commissioned paper-Committee on High School Science Laboratories: Role and Vision*. Washington DC: National Academy of Sciences, 308, 1-24.
37. Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, 1, 100012-100012. Retrieved 29 January 2021, from <https://doi.org/10.1016/j.ijedro.2020.100012>.
38. Murphy, M. (2020). COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemporary Security Policy*, 41(3), 492-505.
39. National student survey – NSS (2021). Available from <https://www.thestudentsurvey.com/>.

40. Nerantzi, C. (2020). The use of peer instruction and flipped learning to support flexible blended learning during and after the COVID-19 Pandemic. *International Journal of Management and Applied Research*, 7(2), 184-195.
41. Nieuwoudt, J. E. (2020). Investigating synchronous and asynchronous class attendance as predictors of academic success in online education. *Australasian Journal of Education and Technology*. Retrieved 24 March 2021, from <https://doi.org/10.14742/ajet.5137>.
42. Pedlar, C. (2005). From theory to practice. *The Sport and Exercise Scientist*, 4, 17.
43. Schunk, D. H. & Zimmerman, B. J. (2013). Self-Regulation and Learning. In Reynolds, W. M., Miller, G. E., & Weiner, I. B (Ed 2), *Handbook of Psychology*: 7. Retrieved 27 March 2021, from <https://doi.org/10.1002/9781118133880.hop207003>
44. Shim, T., & Lee, S. (2020). College students' experience of emergency remote teaching due to COVID-19, *Children and Youth Services. Review*, 119, 105578, <https://doi.org/10.1016/j.childyouth.2020.105578>.
45. Simonson, M., & Schlosser, L.A. (2006). Distance Education: Definition and Glossary of Terms. *Computer Science*.
46. Soffer, T., & Nachmias, R. (2018). Effectiveness of learning in online academic courses compared with face-to-face courses in higher education. *Journal of Computer Assisted Learning*, 43, 534– 543.

47. Student crowd (2020). Available from
<https://www.studentcrowd.com/article/university-responses-to-covid-19>.
48. Subban, P. (2006). Differentiated Instruction: A Research Basis. *International education journal*, 7, 935-947.
49. Sukayt, A. (2020). Psychological impact of COVID-19 and lockdown among university students in Malaysia: Implications and policy recommendations. *International journal of environmental research and public health*, 17(17), 6206.
50. Thompson, C. L., & Zeuli, J. S. (1999). The frame and the tapestry: Standards-based reform and professional development. Teaching as the learning profession: Handbook of policy and practice. San Francisco. Jossey-Bass Inc.
51. Vaughan, N. (2007). Perspectives on Blended Learning in Higher Education. *International journal on e-learning*, 6, 81-94.
52. Viner, R., Russell, S., Croker, H., Packer, J., Ward, J., Stansfield, C., Mytton, O., Bonell, C., & Booy, R. (2020). School closure and management practices during coronavirus outbreaks including COVID-19: A rapid systematic review. *The Lancet. Child & Adolescent Health*, 4, 397 - 404.

9. Appendix A

	Sections and Questions
S1	Teaching on my course
Q1	Staff are good at explaining things
Q2	Staff have made the subject interesting.
Q3	The course is intellectually stimulating.
Q4	My course has challenged me to achieve my best work.
S2	Learning opportunities
Q1	My course has provided me with opportunities to explore ideas or concepts in depth.
Q2	My course has provided me with opportunities to bring information and ideas together from different topics.
Q3	My course has provided me with opportunities to apply what I have learnt.
S3	Assessment and feedback
Q1	The criteria used in marking have been clear in advance.
Q2	Marking and assessment has been fair.
Q3	Feedback on my work has been timely.
Q4	I have received helpful comments on my work.
S4	Academic support
Q1	I have been able to contact staff when I needed to.
Q2	I have received sufficient advice and guidance in relation to my course.
Q3	Good advice was available when I needed to make study choices on my course.
S5	Organisation and management
Q1	The course is well organised and is running smoothly.
Q2	The timescale works efficiently for me.
Q3	Any changes in the course or teaching have been communicated effectively.
S6	Learning resources
Q1	The IT resources and facilities provided have supported my learning well.
Q2	The library resources (e.g. books, online services and learning spaces) have supported my learning well.
Q3	I have been able to access course-specific resources (e.g. equipment, facilities, software, collections) when I needed to.
S7	Learning community
Q1	I feel part of a community of staff and students.
Q2	I have had adequate opportunities to work with other students as part of my course.

S8	Student voice
Q1	I have had adequate opportunities to provide feedback on my course.
Q2	Staff value students' views and opinions about the course.
Q3	The students' union (association or guild) effectively represents students' academic interests.
S9	Overall satisfaction
Q1	Overall, I am satisfied with the quality of the virtual learning-only experience on my course.
S10	COVID-19-specific
Q2	To what extent did I feel safe in a virtual learning-only environment, during the COVID-19 pandemic?