Wii-learning: Using Active Video Games to enhance the learning experience of undergraduate sport psychology students

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Abstract

The aim of the present study was to examine the efficacy of Active Video Games (AVGs) in creating an effective learning experience for undergraduate students. Students enrolled on a Level 5 (i.e., Year 2) sport psychology module (n = 74) participated in four practical seminars demonstrating the impact of four psychological factors (e.g., anxiety) on sports performance. Students engaged in two seminars which included an AVG task (e.g., *Wii Sports*), and two sessions which included a non-AVG task (e.g., *Quoits*). Immediately after the conclusion of each practical session, students were asked to provide qualitative comments to describe and explain their experience of the seminar. Content analysis of students' comments revealed four major themes: *session approach*, *session experience*, *learning experience* and *session feedback*. Each theme is defined and discussed in relation to the efficacy of AVGs as a resource in the teaching of undergraduate sport psychology. The authors also reflect on their experience of adopting the innovative approach and highlight some of the potential challenges practitioners may face when attempting to integrate AVGs into their learning activities.

Keywords: Active Video Games; technology; education; student engagement; constructivism; play.

Introduction

One of the main priorities for practitioners involved in the assessment, learning and teaching of higher education students is (or, in our view, should be) to ensure that sessions and learning activities are as effective and engaging as possible. However, with recent cuts to University budgets and the ever-increasing number of students enrolling onto sport science programmes within higher education in the UK (Universities UK, 2009), practitioners involved in the teaching of sport psychology are being challenged to identify and develop innovative, yet cost effective, ways of enhancing the learning experience of their students. This article aims to outline an innovative approach to the delivery of learning activities as part of an undergraduate sport psychology module which involved the use of Active Video Games (AVGs). The article will highlight the theoretical underpinnings on which the approach was based, describe the specific methods of content delivery, and report some preliminary findings obtained as part of an initial research project designed to evaluate the efficacy of AVGs as a vehicle for learning within higher education. It is hoped that the article will draw attention to novel research being conducted in the area of assessment, learning and teaching, whilst also introducing an innovative approach that may have potential implications not just for teachers of sport-related topics, but for the wider higher education community.

"Constructing" effective learning environments: The case for *Wii*-learning

Within the broad educational literature, there is a great deal of evidence to suggest that in order to create effective learning environments, practitioners should make efforts to design and deliver learning activities that are interactive and engaging (e.g., DeHaan, 2005; Race, 2007). It has been proposed that by providing a learning environment which actively engages undergraduate students in their own learning, students are likely to experience feelings of

autonomy and competence when immersing themselves in the wider learning experience (Guay, Ratelle, & Chanal, 2008). Moreover, greater student autonomy has been consistently associated with enhanced persistence, satisfaction, and academic performance (e.g., Guay et al., 2008; Ratelle, Guay, Vallerand, Larose, & Senécal, 2007; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). Much of the existing literature that has attempted to examine and identify the links between academic motivation and students' affective, behavioural and cognitive responses has been guided by self-determination theory (Ryan & Deci, 2009). However, constructivist theory and its main tenets (for a more detailed outline, see Pereira, 1996) provide a useful alternative mindset for the development and implementation of effective, engaging and intrinsically motivating learning activities within higher education.

In relation to education, constructivist theory or constructivism is generally based on the premise that learners are involved in the building or "construction" of their own learning. This concept of learning is eloquently defined by Gipps and MacGilchrist (1999): "In constructivist learning theory, students learn actively by making sense of new knowledge, making meaning from it, and mapping it onto their existing knowledge map" (p. 47). In other words, constructivism suggests that learners interpret information by relating it to, and eventually integrating it within, existing schemas (i.e., cognitive representations) of the world around them. By relating information to their own perception of reality, constructivists would argue that learners have greater autonomy and control over their learning, which in turn leads to an effective and satisfying learning experience. In fact, according to Eisner (2004), "…it might be said that at its best, education is a process of learning how to become the architect of our own education" (p. 9).

Although constructivism offers an indicative framework of how to enhance students' learning experience, the idea to use AVGs within a Level 5 (i.e., Year 2) sport psychology module was inspired by an initial foray into the constructive alignment literature. According to proponents of constructive alignment (e.g., Biggs, 2003; Schuell, 1986), selected teaching activities should be those that cause students to engage with learning and help create a supportive and encouraging environment. This prompted the researchers of the current study to think about the kind of activities that could be included within an undergraduate module that would not only align with the intended learning outcomes (e.g., analyse, critique and report empirical findings from the sport psychology literature relating them to underpinning theory and sport performance contexts) and assessment method (i.e., three-page lab report), but would also represent teaching methods that result in the creation of a supportive and engaging learning environment.

The integration of technology within educational settings is far from a new concept. Technological innovations have been frequently implemented in attempts to enhance the learning experience of undergraduate students whilst guarding against some of the challenges inherent in trying to work with large and often diverse student groups. Such initiatives that have been applied within the teaching of sport-related disciplines include online assessments (Micklewright, Pearsall, Sellens, & Billam, 2010), collaborative learning exercises presented through virtual learning environments (Walton, Barker, Hepworth, & Stephens, 2007), and the provision of audio feedback via podcasts (Roberts, 2009). However, educational specialists (e.g., Aldrich, 2005; Klopfer & Yoon, 2005; Squires & Jenkins, 2003) have only recently begun to recommend the use of video games and simulations within education with the intention of increasing levels of student engagement and presenting learning in a familiar and accepted format. In fact, there is a growing interest in the educational potential of video

games (Durkin, 2010). The term "serious games" describes video games designed specifically for training and education (Annetta, 2010). Recent studies have shown that playing serious games can increase medical students' objective and subjective ratings of understanding of key principles (Fukuchi, Offutt, Sacks, & Mann, 2000; Mann, Eidelson, Fukuchi, Nissman, Robertson, & Jardines, 2002). Furthermore, students perceive educational games as both useful and appealing (Mann et al., 2002). These encouraging initial findings have led to calls for further examination of the role video game technology can play in solving context-specific problems (e.g., low student satisfaction, poor academic performance) rather than contributing to them.

On closer examination of this literature, it became apparent that the development of tailor-made serious games for educational purposes does not mean that commercially available "off-the-shelf" games cannot be used to achieve similar ends. For example, Kato (2010) recently advocated that "video game technologies have important applications beyond entertainment" (p.118). The advent of Active Video Game interfaces (e.g., *Nintendo Wii, Kinect* for the *XBox 360, Move* for the *Playstation 3*) has attracted attention from researchers eager to investigate whether such commercial technology can provide physiological and psychological health benefits (e.g., Cummings & Duncan, 2010; Graves, Ridgers, & Stratton, 2008; Lanningham-Foster et al., 2006; Russell & Newton, 2008), thus challenging the prevailing assumption that playing video games is always a sedentary activity. Furthermore, O'Neil, Wainess, and Baker (2005) challenged the assumption that video games and effective educational systems are mutually exclusive by arguing that the increased sophistication of video game technology may be harnessed to provide multiple benefits within the teaching and learning environment (e.g., effective and engaging instruction, increased interactivity, the ability to address cognitive and affective learning issues, increases in students' motivation).

Based on the above literature, it became clear that the use of AVGs may provide a valuable and innovative solution within the teaching of the undergraduate sport psychology module specified earlier.

The rationale for deciding to implement the use of AVGs within the teaching of sport psychology draws on theories of play (e.g., Else, 2009; Rieber, 1996) as a way of explaining the mechanisms by which the use of such media might enhance the learning experience of Higher Education students. Rieber (1996) conceptualises play as having the following attributes: "(a) It is usually voluntary; (b) it is intrinsically motivating, that is, it is pleasurable for its own sake and is not dependent on external rewards; (c) it involves some level of active, often physical, engagement; and (d) it is distinct from other behaviour by having a make-believe quality" (p.44). Both children and adults "play" in order to develop not only their physical and spiritual identity, but also their understanding of the world around them (Else, 2009). For example, similar to the role-playing games that young children often engage in (e.g., "cops and robbers"), role play activities are frequently incorporated within educational settings as a way of helping students to develop and apply a range of important skills (e.g., empathic understanding, specific technical abilities). In fact, the potential for using computers and the internet as tools to widen the scope of such activities has already been identified (van Ments, 1999; Warburton, 2009). However, the specific use of AVG technology as a tool for helping students in Higher Education to learn new and complex ideas has yet to be examined.

From a pedagogical perspective, AVGs such as *Nintendo Wii Sports* may facilitate the effective demonstration and conceptualisation of theoretical principles commonly taught within sport psychology. This allows students to experience a range of psychological phenomena in a sports-related context but with the problematic real-world consequences

removed. In addition, given its contemporary and accessible nature (Orry, 2009), it is believed that the use of *Nintendo Wii* in the delivery of teaching can enhance undergraduate students' learning experience by offering learning activities which reflect the students' perceived reality. The use of appropriate technology is also believed to enrich the learning experience by providing opportunities for students to learn to think in new and exciting ways (Eisner, 2004). Thus, the theoretical underpinnings and supporting evidence outlined above provide an appropriate rationale for the use of AVGs within the teaching of undergraduate sport psychology. The next section will provide an overview of the innovative approach that has been implemented within the delivery of a specific Level 5 (i.e., Year 2) sport psychology module entitled "Psychology of Sports Performance".

Overview of the approach and associated methodologies

Despite having a rationale for its implementation, to our knowledge the use of AVGs within the context of Higher Education has not yet been evaluated. By conducting a research study to assess the effectiveness of this innovative approach to teaching, we intend to provide empirical evidence to support the notion that AVGs represent an up-to-date, appropriate and enabling form of technology that may be used for the purposes of enhancing students' learning, as opposed to being influenced solely by intuition and a fledgling evidence base.

The use of AVGs as part of the sport psychology module was employed during the seminar sessions scheduled throughout the course of the first semester of the 2010-11 academic year. Students enrolled on the module (n = 136) participated in a total of four lab-based practical sessions designed to demonstrate the impact of four psychological factors (i.e., stress, anxiety and arousal; social facilitation; causal attributions; self-confidence) on sports performance. These topic areas were also discussed and explained in further detail within a series of one-

hour large group lectures. Two sessions were designed for each practical: one including an AVG task (e.g., *Wii Sports Resort; PDC Darts Championship* on the *Wii*), the other including a non-AVG task (e.g., *Quoits; Magnetic Darts*), with all students given the chance to participate in two AVG and two non-AVG practical sessions before the end of the module.

In order to satisfy issues related to appropriate research design, all non-AVG activities were matched to AVG activities in terms of task difficulty and type of motor skill (e.g., gross, fine). Prior to the project beginning, all study procedures were reviewed and cleared by the Carnegie Faculty Research Ethics Sub-committee. In line with recognised ethical guidelines, all participants were provided with information on the risks, benefits and procedures involved in the study before signing an informed consent form. This was not only important for ethical reasons, but also to ensure that students felt comfortable and reassured prior to engaging in the practical tasks. It also provided students with the option to decline from actively participating in the game-based practical sessions without fear of incurring any kind of penalty (they were still in a position to complete the assessment just by being present at the lab-based practical sessions).

As mentioned, the summative assessment required that students write a three-page report of a lab-based experiment. Specifically, the students were provided with the choice of writing their report based on the methods and findings of one of three lab-based experiments that they attended during the course of the module. The methods and findings of the fourth lab-based practical session were used for the purposes of a formative assessment task which students were able to complete and receive feedback on in preparation for completion of their summative assessment. From this, it is clear that the implementation of the game-based practical sessions was not only closely aligned to the summative assessment, but also

afforded the students the chance to complete a "trial run" of the assessment task, on which they also received valuable tutor and peer feedback. The decision to provide students with some form of choice when completing the assessment was also a direct response to comments provided by students (e.g., "…to make the research report more optional as to its topic") during the previous year's end-of-module evaluation. Students were free to choose either an AVG or non-AVG seminar as the basis of their lab-report.

In order to assess whether the active practical sessions were an effective way of enhancing the students' learning experience, students completed a brief session evaluation form immediately after each practical session. This 11-item measure was used to obtain students' quantitative ratings of perceived usefulness of the session, self-reported engagement during the session, and enjoyment of the session. Students were also afforded the opportunity to provide qualitative data to further explain their ratings.

Preliminary findings

Much of the data for this research project is still in the process of being collected and analysed. However, this section of the article will focus solely on the preliminary findings obtained from students' qualitative comments in response to the practical sessions. After excluding students who missed at least one of the four practical sessions from the analyses, the population sample consisted of 74 students (male = 47, female = 27). Most participants (94.6%) had some previous experience of using AVG technology, with students' self-reported frequency of AVG use ranging from 0-14 hours per week (M = 1.27, SD = 2.61). One third of participants (33.3%) provided comments following at least one of the practical sessions. Around two-thirds (67.4%) of the comments were made following the non-AVG sessions, whereas 32.4% of comments were related to the AVG sessions. Preliminary content

analysis was conducted by the authors in line with Krippendorf's (1980) guidelines. Four major themes emerged from comments relating to both the AVG and non-AVG sessions. These were labelled *session approach*, *session experience*, *learning experience* and *session feedback*. Within each theme, a number of lower order themes were identified (see Table 1), most of which are applicable to both the AVG and non-AVG sessions. Both authors felt that some comments related to more than one theme. Where this was the case, comments were included in the totals for more than one theme (shown in parentheses in Table 1).

INSERT TABLE 1 HERE

Session approach.

Participants commented on the novel approach to both the AVG and non-AVG sessions. One participant suggested the use of the Wii in seminars was "*really good and a different way of putting the information across*". Similarly, the "*different form of approach*" was suggested to make "*it* [non-AVG session] *more interesting*". The non-AVG sessions were also identified as being interactive, which appealed to students: "*I liked how it was interactive*". In contrast, one student commented on the pressure they felt during one of the AVG tasks: "*even though we competed in pairs, the fact that others are still present adds pressure…*". However, a different student felt there was a lack of opportunity to be actively involved in another AVG seminar due to the nature of the task: "*as I wasn't a researcher or participant, I wasn't actively involved*". Whilst these comments highlight some of the benefits of using game-based learning activities to engage student groups, they also reflect some of the challenges of using such methods, even when class sizes would be considered to be moderate (i.e., 20-30 students).

Session experience.

The majority of students' comments related to their experience of the sessions. Participants stated that they found the AVG and non-AVG sessions fun. One student referred to one non-AVG session as a "*fun seminar compared to normal*", whereas another student "*enjoyed the competition*" element of the same session. Similarly, one student described the AVG sessions as "*fun whilst putting across an educational aim*", whilst "*the feeling of beating my friend on the Wii*" was something that another student reported as being enjoyable. However, it is important to remember that not all students (even those studying sport-related subjects) will necessarily thrive in sessions where the emphasis is on competition (consider the student's comment about "*pressure*" in the preceding paragraph).

Some participants referred to the sessions as being effective in maintaining their attention. For example, after participating in an AVG session, one student made the following comment: "*I felt this session kept my attention more effectively in comparison to others…*". Similar comments were also made about the non-AVG sessions (e.g., "*…active learning kept my attention*", "*…kept me awake throughout*"). However, one participant stated "*I have a short attention span naturally*", thus indicating that for some students, the session may have failed to hold their attention effectively regardless of what it involved! Participants also referred to the group's participation during the non-AVG sessions as a reason for their effectiveness: "*Very good session that involved the whole group*", and "*everyone participated in a fun activity…*".

Learning experience.

In their comments, participants demonstrated their awareness of how both the AVG and non-AVG sessions contributed to their learning. Students stated that the AVG sessions "*helped*

improve understanding of social influences" and "*explanations about theory help very much*". Similarly, the non-AVG sessions helped students to "*gain larger amounts of useful information about psychology*" and one student declared they "*aided me in what I needed to focus on when revising for the exam*". The seminars also triggered students to make comments about the experiments that took place. One student suggested that the tutors should "*use a real dartboard*" rather than the *Wii* (presumably in order to increase the validity and reliability of the experiment conducted), whereas another suggestion following a non-AVG session was that participants should get the opportunity to "*practice next time*". Such comments reinforce the notion that game-based exercises in general are a useful means of encouraging students to consider and critique the theoretical underpinnings and methodological implications that should be considered within lab-based experiments.

Session feedback.

The opportunity for participants to provide additional comments led to students offering suggestions for improvements to the seminars. For example, after an AVG session, one student reported that it would be "*better having more tasks to do*". Participants also identified limitations of the sessions, which could be taken into consideration in the future. For example, students reported that some of the AVG sessions "*dragged slightly with everyone having a go at the game*" and they "*would have preferred having something to do whilst other people were playing*". This highlights the need for teaching staff to find an appropriate balance between providing students with equal opportunities to engage with game-based tasks whilst at the same time limiting the potential for apathy from non-participating students. Such comments, therefore, are useful for practitioners who may be considering the introduction of game-based activities within their classes, since they offer suggestions which may aid in the planning and design of appropriate tasks.

Conclusions, Implications and Future Directions

This article has outlined an innovative approach to teaching based on theories of constructivism (e.g., Gipps & MacGilchrist, 1999; Periera, 1996) and play (Else, 2009; Rieber, 1996). Not only do the preliminary findings demonstrate a range of benefits for students (e.g., enjoyment, increased attention, development of transferable skills such as critical analysis) as a result of engaging in game-based learning activities, they also highlight some useful considerations for practitioners wishing to incorporate similar learning activities within their course delivery.

One finding that warrants further discussion falls under the major theme of *session approach*. Students identified that a benefit of both the AVG and non-AVG practical sessions was the relative novelty of the activities in comparison to more commonly-utilised seminar activities. It appears that for the cohort of students represented within the present study, game-based learning of any kind, whether using AVGs or more traditional game-based tasks, was perceived to be a fresh and novel way of approaching the teaching and learning of theoretical concepts related to sport psychology. Educational scholars (e.g., Ames, 1992; Bonk & Cunningham, 1998; Malone & Lepper, 1987) have suggested that learning activities which include some form of novelty are useful as a means of directing students' attention toward relevant material whilst maintaining an effective learning environment. In much the same vein, the present findings provide evidence in favour of the application of novel game-based learning activities within higher education. However, it is important to consider not only the relative longevity of such approaches, but also the extent to which the novelty of game-based learning activities contributes to the benefits implied in the present findings. Whilst we can quantify the number of comments made by students in relation to the novelty of the session approach (i.e., four comments), it is difficult to ascertain the effect size for this factor of

novelty. Furthermore, if the novelty of techniques such as AVGs is a key contributor to their apparent success within the educational context, then it follows that teaching staff may need to apply certain measures in order to ensure that this novelty is protected and maintained as much as possible (e.g., using such techniques sparingly). In the context of the present study, the novelty of the approach is not reflected in the equipment that is used (e.g., 95% of participants had some previous experience of AVGs), but rather the context in which it is applied (i.e., education as opposed to recreation). Presently, it seems that tools such as AVGs may represent an appropriate balance between student familiarity and practical innovation. However, further research is warranted to fully understand the relative life-expectancy of such methods and the extent to which specific factors identified in this study contribute positively to undergraduate students' learning experience.

Although we have identified that there are potential benefits to be gleaned from the introduction of novel teaching methods, it is also worth commenting on the possible perils and pitfalls of using new technology as a mode of teaching. Whilst novelty can be perceived as exciting by some, for others it can be seen as something of a threat. The latter may be particularly true for novice members of teaching staff (Hughes, 2010) where the uncertainty associated with the prospect of using unfamiliar methods and equipment can prove to be quite stressful. Prior to the commencement of the present study, we spent a great deal of time planning the design, delivery and evaluation of each of the four practical seminar sessions. In line with the recommendations of Curzon (2004), this included careful consideration of the students, subject matter, resources, and various constraints (e.g., time, space) to ensure that teaching staff were comfortable delivering the sessions and that there was little chance of technical problems occurring. Teaching staff were also required to liaise closely with the learning support officers and laboratory technicians in order to familiarise themselves with

calibration and set-up procedures. Given that the above activity took place as part of a funded research project, the above considerations could be considered as fairly standard. However, it would be understandable for practitioners to be deterred by the significant effort and time-commitment that is required when attempting to implement new technology into a learning environment. On reflection, we found the AVG equipment itself very easy to familiarise ourselves with, and the sessions were much more enjoyable to facilitate when using this approach; the main challenges revolved around the timetabling of sessions, securing a suitable learning space for the seminars, and structuring the sessions appropriately to allow all students an opportunity to engage in the game-based tasks. Thus, whilst we would encourage colleagues to consider implementing game-based learning activities within their teaching sessions, we would recommend that extensive planning should take place (e.g., conduct pilot testing) before practitioners decide to plough ahead with any major changes to their existing delivery methods.

As mentioned earlier, the preliminary findings reported in this article are part of a larger project examining the efficacy of AVGs as a method of teaching undergraduate sport psychology students. It is anticipated that the results of subsequent analyses (e.g., impact of AVGs on quantitative data obtained from the session evaluation form and students' academic performance), which are due to be reported shortly, will continue to extend the existing knowledge base linked to the use of technology in higher education. The findings of this project will be of interest to educators and may be useful in informing future teaching practice within other higher education institutions. Furthermore, the experimental findings of this particular project, whilst specific to the teaching of sport psychology, are likely to have implications for the teaching of other psychology domains as well as other diverse disciplines (e.g., physical activity and health, nutrition, biomechanics, physiology). It is envisaged that

further research outputs from this initial project will also inspire follow-on investigations in related areas (e.g., the use of AVGs as an intervention within physical activity and rehabilitation contexts).

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Table 1. Higher and lower order themes extracted from students' qualitative responses to AVG and non-AVG practical sessions

HIGHER ORDER THEME	LOWER ORDER THEME	EXAMPLES
Session approach (5, *4*) The way the information in the seminars was delivered	**Novelty of session** (2, *2*)	"I like the seminars as they are different in their approach…"; "*I had fun because it was different*"
	Seminar task (3)	"as I wasn't a researcher or participant, I wasn't actively involved"
	Interactive nature (2)	"…*very interactive throughout*"
Session experience (4, *18*) Participant's experience of being in the seminar	**Attention** (1, *6*)	"I felt this session kept my attention more effectively in comparison to others…"; "*…active learning helped keep my attention*"
	Enjoyment (3, *9*)	"Loved the Wii tasks"; "*…very enjoyable game*"
	Group participation (3)	*"Good, everyone participated in a fun activity…"*
Learning experience (4, *10*) What participants learnt from the seminars	**Overall module content** (2, *6*)	"explanations about theory helps very much"; "*gained larger amounts of useful knowledge about psychology…*"
	Experiment discussion (2, *4*)	"Use a real dartboard [rather than the Wii]"; "*I enjoyed the discussion*"
Session feedback (3, *3*) Feedback provided by participants relating to the structure of the seminar	**Limitations** (1, *2*)	"As I wasn't a researcher or participant, I wasn't really actively involved in the session"; "*The session dragged slightly with everybody having a go at the game…*"
	Suggestions for improvements (2, *1*)	"better having more tasks to do"; "*Practice next time*"

Note: **Bold font** indicates themes related to both AVG and non-AVG sessions;
Normal font indicates themes and totals related to AVG sessions only;
Italic and underlined font indicates themes and totals related to non-AVG sessions only.