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Applying the Principles of Perception to Everyday Experiences: A Night Out on the Town

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Abstract

In the present study we aimed to investigate whether applying concepts in visual and auditory perception to familiar scenarios using a small group teaching approach improved students' understanding of and self-efficacy in visual and auditory perception. We presented scenarios to the students in the familiar context of a night out on the town, and included realistic visual and auditory perceptual phenomena in these scenarios. Students' self-efficacy and comprehension was measured pre and post tutorial, and results showed that students' self-efficacy and comprehension significantly improved in all of the tasks measured. Future developments will focus on the effect of this teaching approach on academic performance and comparisons with more traditional teaching approaches.

Keywords: psychology**,** visual perception, small group teaching, self-efficacy, comprehension, tutorial

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Introduction

Context

Students often enter their undergraduate psychology course with a variety of academic experiences and expectations of what psychology entails (Rowley, Hartley, & Larkin, 2008). In particular, first year students often overestimate the "common sense" aspects of psychology (e.g., psychopathology) and underestimate the biological and scientific aspects of the course (Rowley, Hartley, Betts, & Robinson, 2008; Wallwork, Mahoney, & Mason, 2007). This inconsistency in students' expectations and actual experience can impact on academic achievement (Griggs, Jackson & Meyer, 1989; Nathanson, Paulhus & Williams, 2004) and student retention (Harrison, 2006; Yorke & Longden, 2004). One example is the study of human visual and auditory perception, which is included within the cognitive and/or biological psychology component of the British Psychological Society accredited degree (British Psychological Society, 2009). Introductory perception courses typically cover abstract concepts such as the physiology of the senses and how the senses influence behaviour. These "hard science" areas of psychology can appear inconsistent with student's evaluative and individualistic approach to studying psychology (Griggs et al., 1989; Rowley, Hartley, Betts & Robinson, 2008). Furthermore, students generally show most interest in psychology topics related to individual differences and least interest in sensory and physiological processes, and these patterns of interest tend to remain through out the course (Zanich & Grover, 1989). This has the potential to affect students' performance on a significant component of their degree, and also undermine students' self-confidence to achieve in these areas. The aim of the present intervention is to develop a teaching resource that not only increases students' understanding of perception, but also increases confidence in their ability to perform in a less popular aspect of their course.

Resource and Teaching Approach

One effective teaching technique is that of exploring psychological concepts through use of students 'real world' experiences, which can increase motivation and engagement (Katz, 2003). For example, Kozub (1991) found that applying the Gestalt laws of perceptual organisation (which specify how individual elements are perceptually organised into groups) to everyday advertisements produced an enthusiastic response

from students. The initial aim of our intervention was to introduce students to concepts in sensory processing in the context of everyday experience and measure the effects of this intervention on student's comprehension and self confidence. We did this by developing a resource containing a series of scenarios presented in the familiar context of a night out on the town. We included realistic visual and auditory perceptual phenomena in these scenarios (e.g., perceiving colour in indoor and outdoor settings, feeling the vibration of sound waves).

The secondary aim of the intervention was to deliver this resource using a small group teaching approach, within a pre-existing psychology tutorial course. Due to large class sizes, the majority of teaching in introductory psychology is often laboratory or lecture based, yet small group activities are often preferred by students (Cook & Leckey, 1999; Sander, Stevenson, King & Coates, 2000) and associated with better student performance and improved self esteem (Johnson, Johnson & Smith, 1991). The psychology tutorial course covers a range of topics linked to the lecture course and requires students to do preparatory reading and discuss this in detail. Tasks are often divided amongst members of the group and this approach can be effective when delivering difficult or abstract topics in psychology (Meyers, 1997).

Aims of Study

Our pedagogical research question focused on the effectiveness of this intervention in improving students' understanding of and self-confidence in visual and auditory perception.

Evaluation Approach

The tutorial tested knowledge of discrete concepts, thus, we adopted a quantitative evaluation approach to ensure that any increase in student's self confidence and performance was related to the specific learning outcomes of the tutorial. The resource was evaluated using two measures, administered before and after the tutorial: a measure of students' self-efficacy in tasks related to the learning outcomes of the tutorial, and a multiple choice (true/false) test assessing comprehension of these learning outcomes.

Self-efficacy is defined as the confidence a student has in completing a specific task, and has been shown to be a good predictor of performance in a variety of academic contexts (Bandura, 1997; Pajares, 1996) including science (Andrew 1998; Britner & Pajares, 2006) and psychology (Zimmerman & Kitsantas, 2007). Self-efficacy beliefs are task and situation specific and make reference to a particular goal (Bandura, 1986, 1989), and thus, self efficacy is generally measured at a "microanalytic level" than more general self perceptions (Pajares, 1996). Specificity of the self-efficacy assessment and correspondence with the task are important factors in the predictive power of self-efficacy measures (Bandura 1997; Pajares, 1996). Similar to other specific measures of self-efficacy, items were created that represented relevant tasks and students' strength of confidence to successfully complete each task was assessed using a Likert scale (Bandura, 1993; Betz & Hackett, 1983; Finney & Schraw, 2003; Kranzler & Pajares, 1997; Pajares & Miller, 1994; Shell, Murphy & Bruning 1989; Schunk, 1981, 1996). Consistent with Bandura's (1986) guidelines and previous studies of self-efficacy and academic performance, the items on which performance was assessed closely corresponded to the tasks included in the self-efficacy measure, and the performance measure consisted of a multiple choice test (Hackett & Betz, 1989; Finney & Scraw, 2003; Pajares & Miller, 1994). In addition to these quantitative measures, students were asked to provide comments on their experience of the tutorial.

Description of Tutorial

We based the tutorial on the following concepts: colour perception under different illumination, rod and cone based vision, dark adaptation and sound and auditory perception. These concepts lent themselves to everyday experiences which we thought would both appeal to, and be familiar to the students. Also, based on experience with previous years' students, these were difficult concepts to grasp from lectures alone.
Before the tutorial, we asked students to prepare by reading and answering questions on relevant sections of the course text book (Goldstein, 2007). In the tutorial, students worked in small groups (3-4 per group) and discussed questions based on nine scenarios that followed the progress of two students on a night out. Examples of the scenarios and associated questions are included in Appendix A. We provided demonstrations of the concepts (adapted from Goldstein, 2007) for students to try out in the tutorial, and asked students to think of real life examples of the concepts in action.

Method

Participants

Second year undergraduate psychology students (*N* =66) participated in the study as part of their tutorial course, and the study was approved by the psychology departments' ethics committee.

Design

We used a pre-post intervention design, with all students completing the tutorial and tested using the same measures.

Measures

Self-Efficacy. The pre- and post-tutorial self-efficacy questionnaire consisted of 9 self-efficacy statements on current ability to complete a number tasks related to the learning objectives of the tutorial. Similar to the self-efficacy measure developed by Finney and Schraw (2003), participants rated each task using a Likert-type scale ranging from 1 (*no confidence at all*) to 6 (*complete confidence*) for each task (see Appendix B for self-efficacy statements).

Comprehension. The comprehension test consisted of 9 statements, which students had to rate as true or false. Each statement related to concepts covered by the tutorial and the 9 self-efficacy tasks. To avoid effects of question familiarity, we used two versions of the test and counterbalanced the presentation of versions. Half of the students received version 1 as the pre-test and version 2 as the post-test, and the other half received version 2 as the pre-test and version 1 as the post-test. At the post-test, we asked students to indicate whether had done the preparatory reading for the tutorial and for their comments on the tutorial. A selection of students' comments is included in Appendix C.

Procedure

Participants completed the pre-tutorial self-efficacy and comprehension measures 2 weeks prior to the perception tutorial at the end of their regular tutorial class. At the same time, students were given their preparatory textbook reading (Goldstein, 2007). At the next class meeting, participants worked in small groups (3-4 per group), facilitated by their tutor. Students answered questions based on a number of scenarios related to concepts covered in their preparatory reading and received feedback on their answers from the tutor. Participants completed the post-tutorial self-efficacy and comprehension measures at the end of the class.

Results

Self-Efficacy

To investigate whether the intervention improved self-efficacy, we compared self-efficacy scores on each task, pre and post tutorial, using a multivariate analysis of variance (MANOVA). Use of a MANOVA allowed all 9 pre and post self-efficacy scores to be included in 1 analysis and minimised the likelihood of a Type 1 error (Dancey & Reidy, 2004). We conducted a one way repeated-measure MANOVA with one within-participants factor of time administered (pre- and post-tutorial) and with scores on each of the 9 self-efficacy tasks as dependent variables.

The MANOVA revealed a multivariate difference between pre and post tutorial self-efficacy tasks $F(9,57) = 30.3$, $p < .0001$, Wilks Lambda=.17. We conducted separate univariate paired sampled *t*-tests on pre- and post self-efficacy tasks (the α was set at .005 following a Bonferroni adjustment for familywise error). As shown in Table 1, all self-efficacy tasks contributed to the multivariate difference between pre- and post-tutorial self-efficacy (all $ps < .001$).

To investigate the differences between each self-efficacy task independently of the tutorial, paired-samples *t*-tests were conducted separately on the pre- and post-tutorial conditions and compared self-efficacy ratings between each task (the α was set at .0014 following a Bonferroni adjustment for familywise error). In both the pre-tutorial and

post-tutorial conditions, mean self-efficacy was highest for Task 3 and lowest for Task 8 (all *ps* < .001).

Comprehension

Mean correct responses (maximum = 9) for pre- and post-tutorial comprehension tests were 4.1 (*SD* = 1.5) pre-tutorial and 7 (*SD* = 1.6) post-tutorial. A paired samples t-test comparing correct responses pre- and post-tutorial showed a significant increase in correct responses post-tutorial, $t(65) = 11.8$, $p < .0001$).

Table 1. Means and Standard Deviations (in brackets) of Self-Efficacy Ratings for Each Task Before and After Participation in the Tutorial

Self-Efficacy task	Pre-Tutorial	Post-Tutorial
1 Colour and illumination	2.2 (1.1)	4.1 (1.1)
2 Colour constancy	2.7 (1.4)	4.1 (1.1)
3 Rod and cone vision	2.8 (1.1)	4.5 (1.0)
4 Dark adaptation	2.2 (1.0)	4.1 (1.0)
5 Colour perception in darkness	2.2 (1.2)	4.2 (1.2)
6 Visual acuity	2.5 (1.3)	3.8 (1.4)
7 Definition of sound	2.5(1.0)	3.6 (1.1)
8 Location of sound	2.1 (1.0)	3.4 (1.1)
9 Hearing after effects	2.7 (1.1)	4.3 (1.0)
Overall	**2.4 (1.1)**	**4.0 (1.1)**

Discussion

The results show that students' self-efficacy significantly improved in all of the tasks measured, and that overall comprehension improved, as measured by the comprehension test. Students' feedback on the tutorial also suggests that the approach of applying concepts in perception to real life scenarios increased students' engagement in a less popular component of their psychology course. Although self-efficacy improved in all tasks, ratings on this measure varied between tasks, with mean self-efficacy highest for Task 3 (describe how rod and cone vision make it difficult to see details in the dark), and lowest for Task 8 (outline the cues used by the brain to locate

sound). Higher self-efficacy for Task 3 may be due to the fact that the topic on rods and cones was covered in more detail than location of sound in students prescribed preparatory reading (Goldstein 2007) and in the tutorial scenarios. Furthermore, self-efficacy Statement 8 (outline the cues used by the brain to locate sound) may have lacked correspondence with the task required in the tutorial, as students were asked only which direction it was easiest to locate sound (front, back or to the side) and were not asked to explain the underlying cues used by the brain to locate sound. This illustrates the importance of using task specific self-efficacy measures (Pajares, 1996).

Students form their self-efficacy beliefs by integrating several different sources of information (Bandura 1997). For example, interpretation of previous mastery of experience is a strong predictor of self-efficacy beliefs in science (Britner & Pajares, 2006). This may explain the increase in self-efficacy in the present study. If students interpret their previous experience with the perception course as negative (e.g., not what they expected from the psychology course) this could be reflected in their low pretutorial self-efficacy ratings. The scenarios and questions given in the tutorial related clearly to the textbook reading and most students were able to successfully explain the perceptual phenomena in the tutorial scenarios (as demonstrated by the comprehension test scores). Thus, the student's ability to participate in perception related activities successfully and their interpretation of this experience should increase their self-efficacy in the immediate tasks and also help develop more positive self-efficacy beliefs about their future capabilities in the perception course. Social persuasion is another predictor of self-efficacy (Bandura, 1997), and could occur in the form of positive feedback from peers and tutors in the tutorial group, further increasing students confidence and facilitating self-efficacy.

Although the results of the present evaluation are encouraging, there were several limitations in the design. There was no control condition with which to compare the effectiveness of the resource. For example, a traditional lecture or textbook based approach could have provided similar improvements in self-efficacy and comprehension as the small group teaching approach used here. In addition, although the comprehension test gave some indication of performance, the summative assessment of the perception course (in the form of an end of semester examination) did not relate directly to the content of the tutorial, meaning that the effects on academic achievement are unknown.

Delivering the resource via a small group teaching approach appeared to work well, but room remains for improvement. For example, although the majority of those students sampled (85%) had done the preparatory reading a significant number of students (not included in the evaluation) had not done the preparatory reading before the tutorial because they had not attended the previous tutorial. These students spent time in the tutorial reading or relied on other group members to provide the answers, a common problem in small group teaching (Meyers, 1997). One solution would be to provide an online version of the tutorial that allowed students to explore the concepts before attending the tutorial.

Conclusions

Overall the use of a self-efficacy measure to evaluate a teaching approach worked well, and supports the use of self-efficacy in a range of academic settings (Pajares, 1996).
In addition, applying perceptual phenomena to everyday experience in the form of a tutorial produced a positive effect on students' self-efficacy and comprehension, and suggests that this approach could also be effective in other disciplines in the sciences and social sciences (Katz, 2003). However, the effect on academic performance and its relative effectiveness compared with more traditional teaching approaches is unknown. Future developments will include evaluating the tutorial in terms of academic performance, comparisons with traditional teaching approaches and development of an online version of the tutorial.

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Appendix A Examples of Tutorial Scenarios and Questions

Colour and illumination: Katie and Laura are going shopping for a new top to wear that night. Katie finds a red one, and when she tries it on in the shop it looks a warm yellowish red. Laura buys a pale green one, and thinks it gives her a warm glow. They look at their tops when they get outside. When Katie looks at the colour of her top now, it seems a different shade of red, almost pink (and she doesn't do pink!), and Laura's looks a duller green. They wonder whether to take them back to the shop. They reckon they will try on the tops at home first. Under the bathroom light, the tops look the same warm yellowish colours as in the shop, but when they go outside the front door, the colours look different again. As it's a sunny day, they sit out in Laura's garden with a glass (or three) of wine. The difference in the colour of the tops between indoors and outdoors seems less noticeable when surrounded by trees and flowers, than the white front door. They decide they made the right choice after all.

Should she take the top back to the shop? Explain why the colour of the top look slightly different indoors compared to outdoors.

Why is this difference more noticeable when the colours are viewed in the bag compared to other surroundings (e.g. the garden), is it just the wine?

Dark adaptation of the rods and cones. While Katie is fixing her make up in the bathroom, she gets a text from Laura saying she must have missed her at the bus station, so she has gone to meet their friends in the pub nearby. When she arrives, there has been a power cut in the street. The streetlamps have gone off, and there are loads of people milling about in the dark outside the pub. It's so dark that she can't find Laura, but after waiting around for a few minutes, Katie notices she can see a bit more clearly now. After 20 minutes she can see clearly enough to make out outlines of objects.

Why does it become easier to see in the dark after 20 minutes?

Rod and cone Vision. Katie gets so carried away with dancing, she doesn't notice that Laura isn't there anymore. Katie scans the crowd of people on the dancefloor. She keeps looking for Laura's face, but it takes a while, as she has to scan several faces before she finds her.

Why was it difficult for Katie to find Laura's face in a crowd?

Sound and auditory perception. Katie gets separated from Laura again. Katie doesn't mind too much as she has met up with other people, and stays up on the dancefloor most of the night. Just before closing time, Katie can hear Laura shouting her name, but there are so many people around, she can't see her, or even make out which direction Laura's voice is coming from. In the end, Katie finds her, it turns out she was only a few feet behind.

Why was it difficult to locate Katie's voice?

Appendix B Self-Efficacy Statements

1. Describe how changes in illumination affect perception of colour.
2. Describe how surrounding colours can affect colour constancy.
3. Describe how the properties of rod and cone based vision make it difficult to see details in the dark.
4. Describe the process of dark adaptation.
5. Explain why some colours (e.g., blue, green) appear brighter in the dark than others (e.g., red).
6. Outline the differences between central and peripheral vision in terms of visual acuity.
7. Give a physical definition of sound.
8. Outline the cues used by the brain to locate sound.
9. Describe the effects on hearing after being exposed to a noisy environment.

Appendix C Examples of Students' Comments on the Tutorial

"This tutorial helped a lot. I am clearer on dark adaptation now and exposure to loudness."

"Don't like perception much, but the tutorial helped me understand the subject better."

"Found this tutorial extremely helpful and actually found it quite interesting-a hard task to achieve when studying perception."

"Very useful, easier to understand when applied to real life."

"It was quite interesting-not just boring theory, but in situations we can actually relate to."