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A Comparison of Computer-Assisted Instruction and Traditional Classroom Lecture to Introduce the Occupational Adaptation Theory

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ABSTRACT

The purpose of this study was to compare the effectiveness of computer-assisted instruction (CAI) and traditional classroom lecture (TCL). A randomized two-group pretest/posttest quasi-experimental design was used. Thirty first year students in a Master of Occupational Therapy program located in the southwestern United States were recruited. All participants were female, with a mean age of 25.8 years. Three percent of the participants rated themselves as novice concerning computer skills, 67% average computer skills, and 30% excellent computer skills. Two methods were compared for teaching the basic concepts of the Occupational Adaptation theory: lecture method in which the teacher follows a Power Point presentation, and an interactive, multimedia CD-ROM method, with the same Power Point presentation as lecture. There was no significant difference (p<.05) in baseline knowledge about the theory between the two groups. Results showed significant differences between the two groups in cognitive gains (p < 05.), with the CAI group demonstrating more cognitive gain than the TCL group. Additionally, the CAI group spent 46% less time than the TCL group to cover the material. The results of this study suggested that occupational therapy learners could independently learn theory using computer-assisted instruction materials.

INTRODUCTION

Occupational therapy is concerned with "supporting health and participation in life through engagement in occupation."[1] Supporting health and participation of peoples, organizations, and populations requires an extensive understanding of how these two processes occur and how occupational therapy can foster them. This is one of the purposes of theory. Various occupational therapy authors have identified the need for theoretical training of occupational therapy learners and the implication for the improvement and development of the occupational therapy profession. For example, Mosey stated that occupational therapy learners are ill-prepared to confront practice if they are not well-trained in the use of theory.[2] Kielhofner identified a gap between knowledge and practice because of the way theory is created and applied in the profession.[3] These two views identify the problem that many faculty experience when teaching theory to learners who are anticipating the practical part of their training. Additionally, "occupational therapy theory acquisition is complex. In addition to facts, the learners must learn principles, attitudes, concepts, problem solving skills, and above all, the ability to integrate this knowledge and skill into clinical practice."[4]

Authors in different professions have investigated the effectiveness of computer-assisted instruction materials as teaching methods and offered suggestions for improvement.[5,6] With computer-assisted instruction materials, educators can present

lessons in an interactive way that engages learners' interests. Tiat studied the responses of textile students using multimedia as a substitute for traditional lecture.[7] He found that learners understood the materials better than with traditional methods as they enjoyed learning. Other authors have found similar results.[8-12] Computer-assisted instruction materials facilitate greater depth of learning in contrast to written materials.[13] In practice, this may translate into increased learners' critical thinking skills. This illustrates that computer-assisted instruction materials can improve the teaching-learning experience by motivating learners to master knowledge and develop cognitive skills.

Occupational therapy authors have suggested that further research is necessary to understand the potential of computer-assisted instruction in occupational therapy education. This can be seen by the increase in the number of studies on Web-based classes in recent years.[14-16] Even though web-based materials have become an integral part of occupational therapy education, non-web-based computer-assisted instruction have proved to be effective teaching tools in other professions.[17-19] There is a need to further explore how to integrate computer-assisted instruction into occupational therapy education and research its effectiveness. Thus, the purpose of this study was to compare the effectiveness of computer-assisted instruction materials versus traditional classroom lecture in occupational therapy education.

DESIGN

The study used a two-group, pretest-posttest quasi-experimental design. Participants were a convenience sample of 30 first year students in a Master of Occupational Therapy program located in the southwestern United States. Participants were randomly assigned to a CAI group or a TCL group. There were 33 learners enrolled in the class, but only 30 attended class the day of the study. For the randomization, each participant received a number. Participants with even numbers were assigned to the CAI group and participants with odd numbers to the TCL group. Numbers were assigned for the 33 participants, since three participants did not attend; two odd numbers and one even number were unassigned causing unequal group numbers. Sixteen participants were assigned to the CAI, and fourteen to the TCL group.

The Computer-Assisted Instruction Model. This training involved a group of 16 occupational therapy students. The material was a tutorial created to introduce students to the Occupational Adaptation theory. The content was based on previous publications of the Occupational Adaptation theory.[20-23] The content of the computer-assisted instruction material introduced participants to the basic concepts of the Occupational Adaptation theory. The computer-assisted instruction was a PowerPoint presentation that incorporated graphics and animation, which permitted some interaction with the material. The computer-assisted model started with a brief explanation on how to navigate the CD-ROM. Then it was organized into two sections. Section I presented the objectives of the presentation and how the Occupational Adaptation theory differs from other occupational therapy theories. Section II showed the history of Occupational Adaptation, an overview of the theory, and an explanation of the Occupational Adaptation process, which included examples. Finally, it presented the references, credits, and a link to the online posttest. The posttest was posted online in Survey Monkey software.

Two occupational therapy faculty members with extensive knowledge of the Occupational Adaptation theory and one faculty member from family science with extensive background on computer-assisted instruction material development reviewed the computer-assisted instruction material. Additionally, one undergraduate learner and two masters' learners used the computer-assisted instruction material and took the test to provide feedback on test construction. The researcher considered their suggestions and implemented changes for the final version of the computer-assisted instruction material, i.e., number of slides, gender consistency throughout presentation, and phrasing changes.

The Traditional Classroom Lecture Model. This training entailed teaching a group of 14 occupational therapy participants in a lecture format. A full-time professor presented the lecture. The professor had one hour and fifteen minutes to lecture using the content developed for the computer-assisted instruction material.

Testing Instrument

Knowledge was measured by an instructor-developed 22-item multiple-choice test. The test was used as pre and post with items presented in different order. Content validity analysis was examined using three content experts. Reliability of the test items was examined using KR-20 as an indicator of internal consistency. Coefficients above .70 are considered adequate.[24] Results indicated a reliability coefficient of .73.

Additionally, the pretest included a section on demographic information and participants' computer skills. The responses were based on those developed by Engum et al.[25]

Procedure

During a class session two weeks prior to the training, the class instructor briefly described the study to participants and invited them to participate. Thirty volunteers completed the pretest and posttest. The day of training, participants took the pretest; then they were randomly assigned to the computer-assisted instruction group or the traditional classroom lecture group.

The traditional classroom lecture group stayed in the classroom with the above identified professor for training. The computer-assisted instruction group was directed to a computer lab. Participants in the computer-assisted instruction group received a CD-ROM. They were briefly instructed about the process of completing the computer-assisted instruction training. Further instructions to navigate the CD-ROM were included in the presentation. Participants worked individually. The researcher was available through the session to resolve technical difficulties. After finishing the training, the posttest for the traditional classroom lecture group was a paper and pencil test, while the computer-assisted instruction group took the same test on the computer. In addition, the computer-assisted instruction group took a paper and pencil survey to explore their attitude toward computers. Training was completed within the maximum 90-minutes scheduled class time.

Data Analysis

To examine the effectiveness of teaching methods, a 2 (teaching method) x 2 (time) repeated measures analysis of variance (ANOVA) was performed. An alpha level of .05 was used to determine statistical significance.

All participants were female, with a mean age of 25.8 years (SD $\pm$8.2). Mean age for traditional classroom lecture was 24.8 (SD $\pm$6.9), while the mean age for computer-assisted instruction participants was 26.4 (SD $\pm$9.2).

Three percent of the participants rated themselves as novice concerning computer skills, 67% average computer skills, and 30% excellent computer skills. In general, participants in the training groups reported their computers skills as average.

The two-way mixed model ANOVA indicated that there was no statistical significant difference between the two instructional groups at pretest, $F_{(1,28)} = .001$, $p < .05$. There was a statistically significant difference between pre and post tests in both groups, $F_{(1,28)} = 19.3$,. $p < .05$ and a statistically significant interaction in the posttest between groups, $F_{(2,28)} = 5.05$, $p < 05$. Since the interaction is significant, it was inappropriate to examine the main effects independently.[26] Descriptive statistics for each group are provided in table 1.

Table 1. **Participants' Scores by Instruction Type**

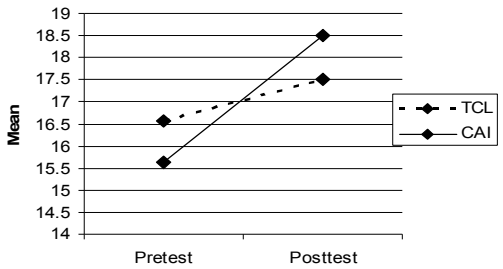
	Pre		Post		
	M	*SD*	*M*	*SD*	*n*
TCL Group	16.6	3.6	17.5	2.9	14
CAI Group	15.6	2.6	18.5	1.4	16

The time allowed for the training and posttest was 75 minutes for both groups. The traditional classroom lecture group took 55 minutes. The mean time for the computer-assisted instruction group was 25.4 minutes ranging from 20 minutes to 32 minutes. This included computer-assisted instruction use and posttest. Time spent in explanation to the study and pretest was not included in this calculation since the explanation and pretest were given while the groups were together.

DISCUSSION

The results of this study suggested that occupational therapy learners could independently learn theory using computer-assisted instruction materials. Although the computer-assisted instruction group started with lower pretest scores, this group scored higher than the traditional classroom lecture group in posttest.

Figure 1. Participants' Improvement in Performance According to Tests Scores



These findings are consistent with some research examining effectiveness of computer-assisted instruction in the allied health professions.[10,27,28] However, these findings are a contrast to most literature within the allied health professions. The majority of studies report that while computer-assisted instruction may be as effective as traditional classroom lecture; it is not superior to traditional classroom lecture as found in the present study.[8,12,25,29-32]

The computer-assisted instruction group improved 13% while the traditional classroom lecture participants improved 4.5% in test scores. The improvement found in the computer-assisted instruction group is higher than the one reported by Jeffries of 10%, but significantly lower than the one reposted by Dewhurst et al. of 50.6%.[33, 34] It is important to mention that pretest scores were an equivalent to C grades for the groups; scores in the posttest reflected a change of C to B grade for the computer-assisted instruction group and no change for the traditional classroom lecture group. This shows that although participants in the groups improved their knowledge of the Occupational Adaptation theory and the computer-assisted instruction group scored statistically significant higher than the traditional classroom lecture group, the training made a relatively small difference in actual posttest scores. This could be due to the high scores participants obtained in the pretest. Therefore, the variability found between pretest and posttest was not higher.

Participants in the computer-assisted instruction group required 46.25% less time to learn the content and had greater knowledge gains than the traditional classroom lecture group. The 46.25% time saved by participants in this study higher than the 24% time reported by Kinney et al.[35]

The above outcomes demonstrated that in this study, computer-assisted instruction produced as good or better results in cognitive gain than traditional classroom lecture in half of the time. These results suggest that computer-assisted instruction materials can be an efficient alternative or a complement to traditional classroom lecture to teach basic cognitive knowledge to occupational therapy learners. Use of computer-assisted instruction material prior to traditional classroom lecture could result in reduced lecture time, increased learners' motivation to participate during instruction, and perhaps an overall perception of a more valued learning. If computer-assisted instruction material can predictably reduce lecturing time, "then classroom lecture time can be spent on higher-level activities such as synthesizing, analyzing, and evaluating ideas."[10] This would allow educators to address learners' questions and discuss topics in greater depth. Educators can also use computer-assisted instruction material with face-to-face learners and distance learners as a mechanism to present content in a self-directed pace and convenient environment.

The computer-assisted instruction material used in this study had minimal interactive and multimedia features. Software that integrates graphics, sound, and animation may be particularly more effective for some learner's with learning differences. Not only can computer-assisted instruction materials help occupational therapy students to learn basic content as demonstrated in this study, but it can also increase computer skills required by the Standards for an Accredited Educational Program for the Occupational Therapist.[36]

Even though learners may successfully learn content in less time, educators may question the cost and time that it takes to develop computer-assisted instruction materials. In this study, time invested in the development of the computer-assisted instruction was not addressed. The time invested to create the computer-assisted instruction material was greater than the time used to plan traditional classroom lecture presentation. Educators may find that computer-assisted instruction development is time consuming, and special software and hardware is needed. However, once the material has been developed, it can be used during several semesters with little or only minimal update. Some colleges have instructional technology departments that assist educators in the development of computer-assisted instruction materials. Educators can consider purchase of already developed programs that will decrease course preparation time and free time to pursue other scholarly activities.

CONCLUSION

All participants in this study increased their knowledge of the Occupational Adaptation theory; however, participants in the computer-assisted instruction group gained more knowledge, based on pre-posttest scores, than participants in the traditional classroom lecture group. The findings of this study add to the already large number of studies assessing the effectiveness of computer-assisted instruction in education and the small number of studies in occupational therapy education.

The results from this study are limited because of its short instruction duration, and the use of a small convenience sample. Therefore, this researcher recommends replicating this study with a bigger sample attending distance classes and traditional classroom lecture.

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