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Using Computerized Games as a Computer-Assisted Instruction Format to Enhance Helping Behaviour in Kindergarteners at-Risk for Learning Disabilities

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Abstract

Computer-assisted instruction (CAI) has been recently provided in various formats from kindergartens on. It brings several potential benefits as a teaching / learning medium. Computerized games, as a CAI format, are in themselves a very important means of instruction for children in particular because of their unique characteristics. This study investigated the effectiveness of a computerized games program on enhancing the helping behavior in kindergartners at- risk for learning disabilities. Participants were fourteen 5- 6 year- old- kindergartners from Zagazig, Egypt. They were divided into two matched groups (experimental& control) with 7 participants each. Experimental method was used, and results indicated that use of computerized games enhanced helping behavior. It is concluded that those computerized games are practical tools to facilitate training and instruction to children at- risk for learning disabilities, and help them be school ready to learn .

Key words. Computerized games, CAI; helping behavior; at- risk for LD

Introduction

Most children with learning disabilities (LD) and their peers at- risk for LD often experience problems in the social arena. Such problems might impede communication and establishing social interactions with others (Hallahan& Kauffman, 2007). Computer and computerized materials in any computer- assisted instruction (CAI) format specially games might be beneficial in this respect because children like them most, and are always attracted to them, and captured by them (Gee, 2003). Therefore, using such a CAI format, and presenting computerized games to those children that might capture them, might be beneficial because it is likely that those games might enhance the development of communication, and reduce their social problems.

Rationale

The computer has played an important role in children`s life, computer- assisted instruction (CAI) plays a similar role, too. It could be used to help them in all the academic fields. It has been recently used with those children with learning disabilities, and even with their peers who are at- risk for learning disabilities whether to help them in school or in daily life as a whole. Computerized games as a CAI format always have the great effect on those children. It can mainly be used to achieve school readiness in those children which in turn might help them start school ready to learn. Therefore, we are in dire need to formulate a goal like this in Egypt where there is not a sufficient number of kindergartens to determine children who are at- risk for LD, achieve behavior modification, and help them be school- ready to learn. Also, we need to determine the original indicators or criteria for those children to enter school in Egypt, and to establish a clear empirical base to indicate the merits of using computerized games as a CAI format in this respect from either a psychological, developmental, or educational perspective.

Purpose of he Study

The purpose of this study was to develop a computerized games program as a computer-assisted instruction format to be used with kindergartners at- risk for learning disabilities, and to examine the effectiveness of such a program on enhancing the helping behavior in those

children. A secondary purpose of the study was to examine the continuing effectiveness of the program during the follow- up period.

Literature Review

Learning disabilities according to The National Joint Committee on Learning Disabilities (NJCLD) is, of course, a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the life span. Problems in self- regulatory behaviors, social perception and social interaction may exist with learning disabilities but do not by themselves constitute a learning disability (Hallahan& Kauffman, 2007; Hallahan et al., 2005). When we are speaking about testing preschool children for learning disabilities, we are really talking about prediction rather than identification as those children are not ordinarily engaged in academics. Hence, the most accurate predictors are preacademic skills (Foorman et al., 1997; Lerner, 2000). These skills are behaviors that are basically needed before formal instruction can begin, such as identification of numbers, shapes, alphabets, and colors in addition to phonological awareness which is important for reading (Torgesen, 2001).

When we think of computerized games, we usually reel to images of exploding targets, flashy graphics, sometimes violent mayhem, pulsing repetitive music and sound effects, in short, everything that makes preschoolers spend long hours losing themselves in an exciting, mesmerizing, pleasurable virtual world. Using such a game as an educational tool, however, is enough to make some educators think of using a computerized game, or even any game, as a learning tool.

Computer-assisted instruction (CAI) most often refers to instruction, whether remedial or not, presented on a computer, and allows drill-and-practice, tutorial, games, or simulation activities offered either by themselves or as supplements to traditional, teacher- directed instruction (Hallahan& Kauffman, 2007). CAI is an interactive instructional method that uses a computer to present material, and track learning. It also enhances the teaching process, usually by focusing on one particular learning task and aiming to improve it (Levy, 1997).

Hence, computer programs are interactive and can illustrate a concept through attractive animation, sound, and demonstration allowing students to progress at their own pace and work individually, or problem solve in a group (Smaldino et al., 2004). Computers offer a different type of activity and a change of pace from teacher-led or group instruction (Fuchs et al., 2006).

Although CAI programs in games mode tend to be entertaining and challenging, gaming is too often seen by educators as a problem activity that unless tightly restricted, is ultimately distracting and even harmful to sound learning practices (Gee, 2003; 2004). In this respect two generalizations emerge from more recent research. First, it is the content of the game that is critical. Successful game programs, whether video games or other formats, have tapped into high levels of motivation and interest. As motivation dies, so learning dies and the extrinsic desire to continue stops (Gee, 2004). Consequently, where content is relevant, gaming should be encouraged as a means to reinforce a wide variety of learning values. Second, the methods and design of games have much to be considered by educators and curriculum developers (Gee, 2003). Good games allow multiple solutions to problems, differential rewards for different levels

of play, and regular feedback about the player's progress (Hallahan et al., 2005; Seferian, 2000) because they often do a masterful job of presenting the basic elements in such a way that the player sees how the game works as a whole system, not as discrete, unrelated units. Basic skills are always practiced, not in isolation, but in sets that go together. In such a way they might form strategies to accomplish goals and carry out activities (Gee, 2003).

Hence, CAI formats, especially games, might arouse cooperation and acceptable social behavior in those children, and might be of great importance to the skill deficiencies they often experience as they allow multiple representations of information, and challenge (Hallahan et al., 2005; Hallahan& Kauffman, 2007), they might arouse the development of social behavior in general, and helping behavior, in particular, which can be seen as some sort of cooperation between children. Therefore, the child may assist his peers in various situations, and the number of his social relations and interactions increased. According to literature (Fuchs et al., 2006; Hall et al., 2000; Hughes& Maccini, 1997; Seferian, 2000; Segers& Verhoeven, 2004), computer and computerized instruction can help reduce the negative effect of being at- risk for learning disabilities, and promote the positive effect that might result in such a strategy as those children are basically attracted to computer, and to what is presented on it.

Campion (1995) saw that a computerized game is preferable by children to traditional education because it has been considered a "fun" activity. The only positive aspect these programs add is the use of the computer itself. With a computer, math problems can at least be displayed with large colorful numbers, and immediate feedback can result from each problem attempted. Thus games themselves have a real educational value as many games do indeed help to develop basic reading, writing and arithmetic skills.

The games which do this in the most structured way, and are usually the most accepted in educational circles, often rely on the interpersonal dynamics of game play. In other words, the game itself is not really much fun to the student participants, but the interactions of the students during play is reinforcing. On the other hand, computerized games always provide stimulation necessary for learning, and using a computer in a game eliminates lengthy computations and board updating, and it allows a game with very complex rules to be started quickly and played by people who do not have to know the intricacies of the rules. They may have to learn the application of the rules to play the game well, but nobody actually has to know the administration of the rules (Campion, 1995 p.175)."

Since most computerized games often appear to become enjoyable, and capture learners` attention most of the time, better instruction can be introduced through them leading to better results as a review of research studies reveals that it has many benefits for children with learning disabilities as an effective medium for mathematics instruction (Hughes& Maccini, 1997), and prereading skills instruction (Hall et al., 2000). It might increase social acceptance to those children which in turn helps to increase the students' willingness to engage in social contact with other students, and enhance communication of non-native speakers of English involved in real time interaction (Peterson, 2008). Furthermore, computerized games, especially those dedicated for language, might in fact deal with specific language impairment (SLI) and could develop phonological awareness skills (Segers& Verhoeven, 2004). It could also lead to significant improvement in attention (Solan et al., 2003), and help children feel more competent to complete the required tasks after training (Seferian, 2000), and enhance problem- solving, and self-management (Miller et al., 2007).

Hypotheses

The present study tries to answer four questions manipulated in the form of the following hypotheses :

1. There are statistically significant differences between mean ranks of experimental and control groups in the post- test of helping behavior favoring the first.
2. There are statistically significant differences between mean ranks of pre- and post- test of helping behavior for experimental group favoring the post- test.
3. There are no statistically significant differences between mean ranks of pre- and post- test of helping behavior for control group.
4. There are no statistically significant differences between mean ranks of helping behavior in post- test and follow- up for experimental group.

Method

Experimental method was used with the computerized games program as an independent variable, and the helping behavior as a dependent one. On the other hand, the experimental design of two groups (experimental & control) was used.

Participants

Participants were 14 male children at- risk for learning disabilities. All of them were from second year kindergarten (KG- II) bearing in mind that kindergarten is not included in the Egyptian hierarchy of education. They were from Zagazig city situated in Sharkiya Governorate, Egypt. They were ranging in chronological age from 5- 6 years with a mean age of 5.65 years, and SD of 1.31 years. They were divided into two equal groups (experimental & control) with 7 participants each. Table (1) below shows the results of such matching between both groups.

Table 1. *Results indicating the two groups are matched*

Variables	**Group**	**Mean rank**	**Sum of ranks**	**U***	**W**	**Z**	**Sig.**
Chronological age	Experimental	7.43	52.00	24.0	52.0	- 0.065	N. Sig.
	Control	7.57	53.00				
Intelligence	Experimental	7.29	51.00	23.0	51.0	- 0.195	N. Sig.
	Control	7.71	54.00				
Social level S	Experimental	8.43	59.00	18.0	46.0	- 0.846	N. Sig.
	Control	6.57	46.00				
Economic level E	Experimental	7.79	54.50	22.5	50.5	- 0.263	N. Sig.
	Control	7.21	50.50				
Cultural level C	Experimental	8.29	58.00	19.0	47.0	- 0.715	N. Sig.
	Control	6.71	47.00				
Total SEC	Experimental	8.29	58.00	19.0	47.0	- 0.711	N. Sig.
	Control	6.71	47.00				
Neurological scan	Experimental	7.79	54.50	22.5	50.5	- 0.263	N. Sig.
	Control	7.21	50.50				
Helping behavior	Experimental	7.43	52.00	24.0	52.0	- 0.065	N. Sig.
	Control	7.57	53.00				

* Letters included refer to non- parametric methods; (U) is Mann- Whitney value, (W) is Wilcoxon value, and (Z) is z value.

Furthermore, they were matched in age, intelligence (average IQ), socio- economic and cultural status (average level) in addition to the helping behavior level as indicated by the pre-test results. Meanwhile, Neurological scanning results indicated that they were neurologically deficient. School teachers` reports, on the other hand, excluded any other impairment suffered by them. A process of informed consent was used to make sure that parents of the participants know what would happen in the experiment and understand that they were allowed to quit the experiment at any time, and that no harm would be done to the participants.

Instruments

As well as the computerized games program as a CAI format, instruments used in the study were diagnostic and measuring in nature where an Arabic version of Stanford- Binet Intelligence Test- IV was used to select participants with an average IQ, and a socio- economic/ cultural status form was also used to select participants with an average level. Furthermore, a test battery for preacademic skills (Mohammed, 2005) was used to make sure that they were deficient in such arena, and according to the results of the Arabic version of Quick Neurological Screening Test such deficiencies were of a neurological basis.

A scale for helping behavior tasks was developed by the author where it was anticipated that participants would cooperate with each other, and help each other to some extent. It was anticipated also to evaluate such behavior if that scale was used. Hence, six tasks were developed to constitute the whole scale with three questions each. There were 3 options before each of them ranging in scores from zero (for not being able to help) to 2 (always helps others). Therefore, each task has got from zero to 2 scores which in turn indicated that the scores dedicated for the scale as a whole ranged from zero to 12 . The higher the score a participant gets, the better. Tasks included in the scale dealt with real situations that always took place in school or in daily life in general i.e. (1) a student had too many books to carry, (2) during play a child was injured and wanted help to stand up and walk, (3) a child lost his pen and found that he had no money to buy a new one, (4) a student could not do his homework because of misunderstanding of the instructions, (5) some one needed money to get a sandwich to eat, and (6) a child felt ill and wanted some one help him go back to home. To ensure reliability of the scale it was readministered (n = 25 participants other than those ones in the study final sample) two weeks after the first administration of the test ($r = 0.793 > 0.01$), and results of internal consistency indicated that (r) values for the item- task correlations ranged from $0.437 > 0.05 – 0.715 > 0.01$. To test the scale validity, a scale for children outdoor social relationships (Mohammed, 2004) was used as a criterion, and ($r= 0.708 > 0.01$) .

A computerized games program as a CAI format contained 60, 4 times a week sessions with a duration of 30 minutes each was developed by the author. Participants were trained by the author to play the group and social games presented. The program consisted of three main phases of which the first contained 6 sessions, and aimed to create familiarity between the author and participants in addition to qualifying them to receive instruction and training presented through games. It was anticipated that both parties i.e. author and participants would be familiar with the other, and participants would clearly understand what should be done. The second phase in which instruction and training were presented through 48 sessions was distributed to six group and social games that required cooperation of all the group members. Each game was presented through five sessions until participants mastered it, then they were trained to apply what they learned practically in two sessions, and participants were evaluated in the last session. Therefore,

each game was presented in eight sessions. Modeling, manual guidance, repetition, and reinforcement were used. The six games included were :

(1) *Math mission:* It includes working with pattern blocks, counting change, weighing and measuring, and sorting. It helps children strengthen early mathematical thinking skills in an unusually fun environment.
(2) *Clifford the Big Red Dog (Phonics): It* is a phonics program that is intimidating or overwhelming. It contains solid free-play activities, as well as a likable theme that are this program's strengths. Although appropriate for any emergent reader, this game is especially useful for children who are reluctant to go further simply because it is pressure-free and encouraging. It is used with children aged 4-6.
(3) *Alice In Vivaldi's Four Seasons: It is a creative arts game t*hat aims to looking for something different, fun, and educational. It works children's brains in fantastic ways as they learn to distinguish sounds and musical instruments. Featuring musical puzzles and games based on Vivaldi's Four Seasons, this fresh software title allows children to play and learn about music and musical instruments in innovative ways. It is also used with children aged 6-up.
(4) *Blue's Room (Blue Talks):* It is a graphically-rich early learning software game. It has activities that offer preschoolers the chance to exercise their deductive reasoning skills in simple but effective ways. It is used with children aged 3-5.
(5) *Star Flyers Alien Space Chase: It is* especially entertaining and does require some thinking skills. It features plenty of arcade action that is never intimidating, some logic puzzles, and a fantastic story line. It is used with children aged 6-up.
(6) *Adventure Workshop 5 (Preschool-1st Grade):* It is a virtual playhouse for young children that is educational as well as fun. It is an excellent early logic program that is used with children aged 3- 6.

The final stage aimed to make quick revision on the content of the games included using the same format in 6 sessions with only one session for each game. To test the effectiveness of the program, it was implemented in a pilot study of 3 participants other than those of the study final sample, and results revealed that (W= 0.00, and Z= - 1.631 > 0.05) which in turn indicated its effectiveness.

Results

Results of the study were summarized in the Table 2. The table shows the presence of statistically significant differences between experimental and control groups in post- test of helping behavior at 0.01 favoring the experimental group as values were all > 0.01. There were also similar statistically significant differences between pre- and post- test of helping behavior for the experimental group favoring the administration with the greater mean i.e. the post one as U, W,& Z values were all > 0.01. The results did not indicate the presence of any statistically significant differences between pre- and post- test of helping behavior for the control group as U, W,& Z values were < 0.05 . There were no statistically significant differences in helping behavior between post- test and follow- up for the experimental group as U, W,& Z values were all < 0.05 .

Table 2. *U, W,& Z values for the differences between experimental and control groups in all measurements of helping behavior*

Measurement	Group	Mean	Mean rank	Sum of ranks	U	W	Z	Sig.
Post- test	Experimental	8.27	11.00	77.00	0.00	28.00	- 3.134	0.01
	Control group	4.41	4.00	28.00				
Experimental	Post- test	8.27	11.00	77.00	0.00	28.00	- 3.141	0.01
Group	Pre- test	4.53	4.00	28.00				
Control group	Post- test	4.41	8.29	58.00	19.00	47.00	- 0.543	N. Sig.
	Pre- test	4.48	6.71	47.00				
Experimental	Post- test	8.27	8.29	58.00	19.00	47.00	- 0.541	N. Sig.
group	Follow- Up	8.32	6.71	47.00				

Discussion

To examine the 4 hypotheses, U, W,& Z values were calculated, and the results indicated the effectiveness of the computerized games program used. Such results might be interpreted in the light of the fact that CAI formats in general and computerized games in particular may in fact be of great importance to the skill deficiencies of the children with learning disabilities, or even their peers at- risk for such learning disabilities (Hallahan et al., 2005; Hallahan& Kauffman, 2007). This of course may be attributed to several reasons that can be identified as follows; (1) CAI in its all formats including computerized games mode provides opportunities to individualize programs and to delineate specific skill deficits far more quickly and with more clarity than can a teacher whose time and resources may be limited, (2) it can also provide an immediate and ongoing feedback to the child on his / her performance, (3) the opportunities for practice can be far greater than can be provided through direct instruction from resource teachers who serve large numbers of children, and (4) most newer CAI formats provide in fact a large array of lessons which focus on specific skills (Fuchs et al., 2006; Gee, 2003, 2004; Hall et al., 2000; Smaldino et al., 2004). Such programs are always designed to ensure that computers do not create further barriers for the learners they are intended to assist, and that computer design and implementation address computers' potential for learners with disabilities in general and those with learning disabilities in particular (Hallahan et al., 2005; Smaldino et al., 2004).

In fact computerized games have undeniable educational values for many reasons i.e. (1) where the learning to take place is specific, (2) learning in such a case is measurable, and (3) it is capable of incorporation into a curriculum, tasks, or activities whether curricular or intracurricular activities. Using the techniques referred to in the present training program, the author could achieve many of those educational goals that participants were anticipated to achieve as most of them have socially behaved in a desirable way that they were previously intended to behave. Their social skills were enhanced as a result of such games which in turn affected their helping behavior in a positive and statistically significant way. Campion (1995)

saw that there are games which incorporate some of the best educational designs. With few chances for failure, the player/learner is lead progressively from his or her current knowledge base to an expanded one. There are even some of these educational games which students will choose to play, not as the least of several evils, but for fun. Very few computer programs fall into this category. Hence we might say that games included in the present study fall into such a category which helped to attain the results revealed.

There are four principles of universal design for digital media that might assist to achieve the desired educational goals; (1) allow for multiple representations of information; (2) provide for multiple means of expression and control; (3) provide customizable support and challenge; and (4) allow customizable content (Gee, 2003; Smaldino et al., 2004). This of course is found in all computerized games included in the program used which in turn makes them enjoyable, and draw learners` attention most of the time. Such capture of attention could be carefully exploited, and by choosing good games we could introduce better instruction to those children enabling ourselves to address all deficiencies those children might have, and achieving good results (Miller et al., 2007) as a review of research studies on computer- assisted instruction CAI reveals that it has many benefits for children with learning disabilities as an effective medium for instruction (Miller et al., 2007; Peterson, 2008; Seferian, 2000), and that the best-supported finding in the research literature is that the use of CAI, in its all formats, as a supplement to traditional, teacher-directed instruction produces positive effects superior to those obtained with traditional instruction alone (Hallahan& Kauffman, 2007).

Generally speaking, this finding holds true for students of different ages and abilities because a well- designed and well implemented computerized games format program used in this respect, might produce an educationally significant improvement in child's final performance (Gee, 2003). What helped to achieve such goals is that according to Campion (1995) in order for a child to choose to play a game, whether educational or not, it must be perceived as fun. So, games were carefully chosen, and children were effectively taught to perceive such games as fun, and to master them. As a result, participants played and interacted with one another, and experienced fun which helped to enhance their helping behavior.

Capper and Copple (1985) argued that CAI users sometimes learn as much as 40 percent faster than those receiving traditional, teacher-directed instruction. Also, student scores on delayed tests indicate that the retention of content learned using computer, games, or any CAI format is superior to retention following traditional instruction alone (Fuchs et al., 2006; Miller et al., 2007). Furthermore, the use of computerized games as a CAI format leads to more positive student attitudes toward education, content, quality of instruction, school in general, and self-as-learner than the use of conventional instruction (Smaldino et al., 2004) which might help them to be school ready to learn.

On the other hand, the variety of computerized games could enhance various abilities in those children. Thus they were also anticipated to be school ready. Elkind (2008) pointed that intellectual ability which is positively affected by such games was seen to reflect readiness before it was changed to be only cognitive readiness. The child must have a good memory and be able to learn, think, observe and communicate. He/ She must be able to understand instructions. The child must also show that he/ she wants to learn which is known as hunger for knowledge. Language development is also necessary for child in primary 1 as he/ she needs to be able to speak, to understand and to express himself/ herself. The child also needs to be emotionally

ready, he/ she must be able to fit into the new environment and show consideration for others. He/ She must be able to control his/ her emotions.

Hence the experimental group children who received the computerized games program as a CAI format have become able to cooperate with one another, and help each other on a practical basis while their control peers were still unable to do so. This observation explained the result that shows the presence of statistically significant differences between both groups in the first hypothesis favoring the experimental group, and the presence of similar differences between pre- and post- tests for the experimental group in the second hypothesis favoring the post- test. Meanwhile, no statistically significant differences were found between pre- and post- tests for the control group. Because such a group did not receive instruction as the experimental one, no change has occurred, and this fact indirectly supported the importance and effectiveness of the program used. Also, no statistically significant differences were found between post- test and follow- up for the experimental group children, and that result went back to what happened during the last phase of the program as the author could reteach them to perform the tasks determined which in turn led to transmission of training through such a period that lasted for two months without any drawbacks .

Limitations

Although it is apparent that the issue of computerized games is one of critical importance especially for children at- risk for learning disabilities so as to help them to be school ready, it is one for which there is little substantive empirical knowledge especially in the Arabic environment to guide our present efforts. There is little agreement about the optimal design principles of such games, the skills that are critical for determining readiness, how such skills might be facilitated for readiness to occur, and how we might accurately assess the various dimensions involved. Also, participants involved in the study were not of a large number that can be accounted on because the great number mentioned to here requires other procedures and efforts, and therefore it needs a team of work to conduct.

Conclusion

Perhaps even beginning to consider kindergartens the first step in the educational hierarchy in Egypt is an impossible task nowadays, as it needs to generalize such kindergartens, and a public decision should be issued to do so. It also seems critical that kindergarten might enhance a range of knowledge and skills related to entering kindergartners' social interactions with their peers, i.e. ease in joining others in play, ability to make and keep friends, and positively interacting with peers. Here lies the helping behavior we should aim to enhance. Finally, it was concluded and recommended to use computerized instruction mainly through games with those children at- risk for LD to enhance their social, emotional, and preacademic skills. It could also be used to help those children to be school ready as those goals are closely related to school readiness, and as a result, children are anticipated to achieve progress later in school.

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