Evaluation of a computer-aided system providing pictorial task instructions and prompts to people with severe intellectual disability

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Abstract

The present study extended the evaluation of a computer-aided system providing pictorial instructions and prompts to promote task performance in people with severe intellectual disability. Four people were presented with two sets of tasks. The participants used the computer-aided system for one set and a card (control) system for the other. The results indicate that the computer-aided system was more effective than the card system with all participants. Three of the participants preferred the computer-aided system, while one favoured the card system.

Keywords computer-aided system, pictorial task instructions, prompts

Introduction

There is a great deal of interest in helping people with severe intellectual disability to acquire and maintain constructive task engagement with minimal staff supervision (Brooke et al. 1995; Anderson et al. 1997). Task engagement is considered to be an important technique for reducing deviant behaviours, dispelling the stigma of idleness and providing physical exercise, and preparing individuals for participation in domestic and possibly community-related forms of occupation (Sandler & McLain 1987; Conley et al. 1989; Beyer et al. 1995; Morgan et al. 1995).

Strategies for achieving satisfactory task engagement can be based on self-instructions (i.e. self-verbalizations), on cards with pictorial instructions, and on a computer-aided system providing pictorial instructions and prompts (Wacker et al. 1985; Hughes & Petersen 1989; Lancioni et al. 1998). The use of self-instructions requires memorizing sequences of words to be used as task cues, which can be difficult. The use of cards with pictorial instructions avoids the need to memorize word sequences. Nevertheless, the subjects must handle the cards accurately (without skipping or mixing them) in order to proceed correctly through the task (Lancioni et al. 1989; Singh et al. 1995). The use of a computer-aided system: (1) allows an orderly presentation of task
instructions without the difficulties of memorizing sequences of verbalizations or handling sequences of cards; and (2) can ensure prompts to counter possible losses of concentration and breaks in performance (Montgomery et al. 1996; Lancioni et al. 1998).

In light of the above factors, the use of a computer-aided system with pictorial instructions and prompts would seem to be a more suitable/powerful strategy for people with severe intellectual disability. A recent study assessing such a computer-aided system versus a card system has confirmed this view (Lancioni et al. 1998). The present study extended the aforementioned assessment with four new participants, who performed simple, vocationally relevant tasks.

Method
Participants
Three men and a woman, RO, MH, JE and DB, aged 23, 20, 19 and 18 years, respectively, participated in the present study. The participants attended a day activity centre and engaged in occupational/vocational tasks, such as sorting objects and making embroideries. During the tasks, the participants were easily distracted and indulged in long breaks in performance. Although no recent IQ scores were available for the participants, they were all diagnosed with severe intellectual disability. The Vineland Adaptive Behavior Scales showed that they subjects had age equivalents of ≈ 3–4 years on daily living skills and ≈ 1–2 years on socialization. They understood simple verbal instructions, uttered a few words and discriminated the simple, black outline drawings of objects which were used as task instructions.

Setting, tasks, measures and reliability
The setting was the activity centre which the participants attended. Eight tasks, divided into two sets of four, were available for each participant. One set concerned cleaning and table setting and the other dealt with food preparation. The number of steps per task varied between 25 and 31 (mean = 28). The measures were the number of task steps performed correctly without intervention by an experimenter, the number of computer prompts, and the participants’ preferences between the computer and card systems. The inter-rater agreement on the first two measures (checked over 20% of the sessions) ranged between 50% and 100% with means above 87%. The inter-rater agreement on preferences (checked on 50% of the responses) was 100%.

Computer-aided system and card system
The computer-aided system included a palm-top computer with a monochrome screen, electronic circuitry, an auditory output device and a vibration box. The palm-top computer, electronic circuitry and auditory output device were contained inside a case measuring 19 × 18 × 5 cm. The case had a 5 × 10 cm window, which showed the computer screen on which the instructions appeared, and a key (see Fig. 1). The auditory output device and the vibration box (the latter was worn by the participant and linked via radio to the palm-top computer) presented the verbal and vibrotactile prompts. The instructions for a task consisted of: (1) 25–31 pictorial representations (black outline drawings) of objects indicating the task steps; and (2) between four and six pictorial representations of smiling faces, interspersed with those of the task steps, indicating reinforcement instances.

Figure 1 Schematic representation of the case housing the palm-top computer, the electronic circuitry and the auditory output device, including the window and the key.
Pressing the key of the computer-aided system caused the first/next representation to appear on the computer screen. If the key was pressed two or more times in succession, the system responded only to the first key press. If the key was not pressed within a pre-set time after the previous key press response (e.g. if the participants had lost their way and become inactive), the system provided a verbal or vibrotactile prompt.

The card system involved cards with pictorial representations of task steps and smiling faces matching those used with the computer-aided system. For each task, a booklet was used which collected the cards representing the steps and those with smiling faces.

Experimental conditions

Both sets of tasks were presented without the systems during baseline. During training, participants used the computer-aided system for one set of tasks and the card system for the other set of tasks according to an alternating treatments design (Sindelar et al. 1985). Sets of tasks and systems were counterbalanced across participants. Training was followed by a maintenance period in which the two sets of tasks continued to be presented with the two systems (as in training). Subsequently, a cross-over test occurred in which the tasks previously presented with the card system were presented with the computer-aided system and vice versa. Finally, the participants’ preferences between systems were assessed. Throughout the study, only one task was presented per session.

Baseline

At each session, the participants were led to a task area and asked to perform a task. The task was considered completed and the session terminated when they failed to perform any step for about 5 min. After the session, the participants received compliments and a sticker. Pre-set numbers of stickers led to small back-up reinforcers.

Training

For each participant, training started with 12 introductory (i.e. familiarization) sessions, six on a task assigned to the computer-aided system and six on a task assigned to the card system. During the following (regular training) sessions, they used the systems on their own. For each task instruction on the computer screen or on a card, the participants performed the corresponding task step. They received compliments and a sticker in relation to representations of smiling faces. The computer-aided system provided a prompt if the participants did not press the key after a pre-set time. The experimenter used prompts/corrections if participants did not respond correctly to an instruction, skipped a card, did not respond to a computer prompt or did not move to a new instruction/step within pre-set times. There were 20 regular training sessions with the computer-aided system and 20 regular training sessions with the card system (five sessions per task).

Maintenance

Three participants had 40–44 sessions with each system; one had only 24 sessions with each system because of his reduced availability. In contrast with training, experimenter intervention was limited to situations in which participants did not respond to a computer prompt or did not advance to a new step within pre-set times. In relation to the smiling faces, the experimenter made the participants perform omitted steps and provided a sticker.

Cross-over test

The difference from the maintenance period was that the tasks previously performed with the computer-aided system were now performed with the card system and vice versa. The test included 16 sessions (two per task).

Preference assessment

In each of the 12 assessment sessions, the participants were presented with the computer system and a booklet, and were required to choose the one with which s/he wanted to work. That choice was then used for a task. Each participant had been exposed to between six and eight introductory choice trials prior to the assessment sessions.
Figure 2 shows the participants’ percentages of correct task steps during baseline, training and maintenance. The percentages were very low during baseline. During training, these reached means of 41 ± 61 with the computer-aided system and 28 ± 46 with the card system (the means with the computer-aided system were 10 ± 27 points higher). The means were 61 ± 77 with the computer-aided system and 30 ± 54 with the card system during maintenance (the means with the computer-aided system were 15 ± 33 points higher). During the cross-over test, the means for the tasks on which the computer-aided system replaced the card system increased to 56 ± 81 and the means for the tasks on which the card system replaced the computer-aided system decreased to 30 ± 39. Compared to the maintenance means, the increase for the computer-aided system tasks was 19 ± 33 points and the decrease for the card system tasks was 31 ± 40 points. The computer-aided system provided the participants with an average of about five prompts per session. During the preference assessment, three participants chose the computer...
system in 10 or all 12 sessions, while one chose the booklet in all 12 sessions.

Discussion

The results of the present study, like those reported by Lancioni et al. (1998), indicate that the computer-aided system was more effective than the card system. The importance of the single facilitating features of the computer-aided system in determining the results is unknown. One could argue that the prompts played a crucial role. All participants received prompts fairly regularly and seemed to react to these positively. The simplicity of the response (i.e. a key press) required by the computer-aided system for the presentation of instructions may also have played a role (e.g. by preventing the mishandling or skipping of instructions). The fact that the computer-aided system responded only to the first key press in case of repeated key presses may have avoided or minimized errors caused by compulsive inaccurate behaviour.

It is unclear whether the features mentioned above could have been responsible for the preference of three participants for the computer-aided system. Such features contributed to make the computer-aided system more effective, and perhaps, also more satisfactory for those participants. The combination of greater success and satisfaction might have been at the basis of their preference. The preference of one participant for the card system is more difficult to explain. Perhaps the greater level of freedom the card system seemed to allow (one could move backwards and forwards through the instructions at will) was the important element behind the preference of this subject.

In conclusion, the higher effectiveness of the computer-aided system in promoting task performance in people with severe intellectual disability (1) could be considered a satisfactory compensation for the fact that such system is more expensive than a card system and requires some special (computer) skills from staff personnel, and (2) could open new positive perspectives within day activity centres, work sites and living units (Parette 1991, 1997; Brooke et al. 1995; Montgomery et al. 1996; Rapley & Beyer 1998).

Acknowledgements

This research was supported by a European Community grant (TIDE 1199 VICAI D). The authors wish to thank the staff of the Zuidwester Centre.

References


Received 11 November 1997; revised 20 July 1998