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Self-directed career preference selection for individuals with intellectual disabilities: Using computer technology to enhance self-determination

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Abstract. *Objectives:* To conduct a preliminary study investigating the application of a self-directed video and audio software program to assist individuals with intellectual disabilities to express their vocational job preferences. A working software prototype, called *WorkSight*, was developed and field tested.
Study design: The effectiveness of the *WorkSight* approach was assessed by comparing it to currently used career assessment tools via ratings by educators and agency professionals. *WorkSight* was also tested in terms of its efficacy to match the job preferences that were predicted by the same educators and agency professionals. A total of 25 adults with intellectual disabilities participated in this study.
Results: Adults with intellectual disabilities were able to use the computer-based job preference assessment to determine career and job priorities.
Conclusions: The use of technology providing multimedia-based work information has promise to enable persons with intellectual disabilities to express preferences and to improve job placement and matching activities.

Keywords: Self-determination, vocational rehabilitation, developmental disabilities, mental retardation, technology, computer use, choice making, preference

1. Introduction

An underlying assumption of most innovative practices to support the employment and career development of people with intellectual disabilities is that a person's job is identified to support the person to reach a longer-term career goal or objective, and that this career goal (and thus, the person's current job) is based on the person's preferences, interests, and abilities [9]. Indeed, the Vocational Rehabilitation Act itself is rooted in a foundation of supporting recipients of VR services to make choices and express preferences. The Findings from Congress in the Act noted that the experience of disability does not mitigate the right of citizens of our country to enjoy self-determination, make choices, and pursue meaningful careers. The Findings from the Act also stated that the goals of the nation should properly include the goal of providing individuals with disabilities the tools necessary to make informed choices and decisions. The 1998 amendments to the Act further strengthened and emphasized the centrality of informed choice in the rehabilitation process.

This emphasis on choice and preferences is not always, however, matched in rehabilitation practices with

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people with intellectual disabilities for a variety of reasons. Many people with intellectual disabilities often have limited experiences upon which to base the development of personal preferences, including limited experiences in work-related areas [8,11]. This is exacerbated by difficulties many people with intellectual disabilities have in communication and by the fact that they are often dependent upon others to support them to function in community and work-based environments. As a result, many people with intellectual disabilities are not self-determined [12] and are unable or not provided the opportunity to express job and work-related preferences. Even in what is considered "model" job development and placement practices, the onus is almost exclusively on the job developer or rehabilitation counselor to identify potential job sites and then to match that job site with an appropriate employee. While individual preferences are certainly taken into account in such a job matching process, there are usually no systematic means to ensure that those preferences are, indeed, the person's current preferences or that they are based on a wide enough array of experiences upon which to form preferences. Consequently, in conjunction with demands on the job developer or rehabilitation counselor related to limited options for job options for people with more severe disabilities, such a process has the potential to result in job matches predicated more on factors outside the individual than on his or her true preferences.

The process of determining individual preferences for job and career options is an important component to ensure that job placement is not just a function of factors external to the individual. Such processes are uniquely challenging for people with intellectual disabilities. Current methods of job matching are either inadequate for this population or too expensive. A common method employed to try to determine job preferences has been to present words or pictures to the job seeker, who then selects preferences from these alternatives [1]. This provides an inexpensive means of preference indication and is easily repeated through a series of trials to check for consistency of choice. However, this method often results in inconsistency of choices by people with intellectual disabilities, due at least in part to the lack of information provided by words or pictures for individuals with intellectual disability [6]. In one instance experienced by one of the authors, a person with an intellectual disability who selected a drawing of a dog with the words "animal care" underneath in such a process indicated, when questioned, that he simply meant that he would like to own a dog. The same person (who could not read) was unable, on three consecutive attempts, to accurately indicate what the picture of "cleaning cages" in relation to an animal care position meant. Yet, without knowing this person well, one might assume from the results of the assessment that a job in animal care was a preference when, in fact, we really only know he would like to own a dog. Additional drawbacks for this method with persons with intellectual disabilities include the lack of detailed information presented about a job by line drawings or pictures and uncertainty about what a person is attending to when expressing preferences [2].

Vocational agencies have also used a method of job matching that involves transporting persons receiving supports to a variety of community work environments so as to reduce the need for cognitive representations (pictures, line drawings) of what certain jobs might be like [10]. While this method may address some of the conceptualization issues noted previously and may be necessary for some persons, the time required for this activity pragmatically limits the opportunity for people to make comparisons between a wider array of community work sites. In one example from the authors' experience, it took a vocational training staff person approximately two and one half hours to conduct visits at two community employment sites for one person with intellectual disability. However, the next site visit was not able to be scheduled until a week later, after which the job seeker was unable to indicate his preferences from the previous week. Additionally, such a process is more difficult to schedule, more costly to deliver, and, as mentions, often limits the options to which people with intellectual disabilities are exposed [7].

To address the limitations inherent in these to prevalent means of determining job and career preferences and based on our previous experiences with technology to support people with intellectual disabilities [3–5] we theorized that using a multimedia software program depicting tasks typical of specific careers could provide a better representation of a job to a person with developmental or intellectual disabilities, and thus provide a more accurate means of assessing preferences. To address this hypothesis, we developed a software prototype (*WorkSight*) incorporating live-action video and audio of a variety of work situations. Through this, the amount of information presented to the person with intellectual disability could be increased significantly from drawings or photos. It was possible to demonstrate physical tasks such as bending or reaching, repeated motion, interactions with others, tool use, and other job-related activities. Environmental features of

the work environment, such as lighting or cleanliness, could also be depicted more accurately.

One other feature of a multimedia approach such as that developed and reported in this study is the potential for such universally designed materials to promote self-determination. The *WorkSight* system might promote and enhance self-determination in several ways. By repeated exposure to information about specific job sites and tasks through multimedia, users could explore a wider array of job and career options and narrow down to a more manageable few the number of such sites to visit or learn more about using preference indicators. The multimedia process was designed to be self-directed, thus putting the person in control of the process and, potentially, enhancing self-determination.

1.1. Study purpose

The purpose of this study was to evaluate the effectiveness of utilizing multimedia software presented in a self-directed format to enable persons with intellectual disabilities to independently express their job interests. This analysis addressed these research questions:

- Can a multimedia job matching approach improve the ability of individuals with intellectual disabilities to accurately understand and express their job preferences?
- Can a multimedia approach reduce the amount of direct staff time and agency expense required to make successful community-based placements?
- Can multimedia provide an improved approach for empowering individuals with intellectual disabilities when it comes to choosing between employment options?

2. Method

2.1. Participants

Study participants were adults with intellectual disabilities receiving services from a community-based employment agency or adolescents with intellectual disabilities receiving community-based transition services from a public school system. Although specific age and IQ scores were not available, all persons were eligible for and receiving services (either adult or school-based) under the category of mental retardation and agencies were asked to identify only individuals IQ scores of 70 or lower. All participants were at least 18 years of age. A total of 14 participants with intellectual disabilities completed the *WorkSight* evaluation, and 11 of these completed the *WorkSight* evaluation a second time to provide data on reliability. Participants received a cash stipend for their time in assisting with this project.

2.2. System design

The *WorkSight* system was designed with multimedia features to support people with intellectual disabilities to express their job preferences. This was done by integrating live video clips and recorded digital voice prompts into the software. Existing career assessment tools were reviewed in determining that a forced choice model would be best suited for the *WorkSight* prototype. Twelve job categories were selected by combining the job categories of several existing tools into distinct categories that were determined as appropriate for non-college bound young adults. These 12 categories were reviewed and approved by several teachers and agency staff who were interviewed during the study. The final 12 categories were:

1. Laundry Services
2. Food Services
3. Janitorial/Housekeeping Services
4. Warehouse/Material Handling
5. Clerical/Office Work
6. Personal/Human Services
7. Animal Care
8. Lawn/Outdoor Maintenance
9. Store/Retail Work
10. Automotive Repair/Maintenance
11. Building Trades
12. Hand Labor/Tool Use

Local industries representing each job category were surveyed to determine the most commonly performed tasks in each category. Each job category was represented by five distinct video clips, each showing a person performing the specific task in real world settings. Examples of community work sites where video clips were obtained included a Target department store, a veterinarian's office, a school district business office, a large local hotel, and the United States Air Force Academy, where video clips for a variety of jobs were obtained. The design for the *WorkSight* system is summarized in the following section.

2.2.1. WorkSight design overview

The basic concept for *WorkSight* was to provide a system that provided enough information to allow users with intellectual disabilities to understand and indicate their job preferences in a self-directed manner. The opening screen included two large buttons, one to start the program and one to close it. The start button was distinguished with an icon that showed a "green light" traffic signal, and a computer-generated audio prompt was provided when the screen opened, stating "To start *WorkSight*, select the button with the traffic light on it". Support persons or teachers would then double click on the background area of the screen to display a set of four different video clip sequences. These sequences were created so that different categories were evenly paired in the forced choice format. Test sessions rotated through the four sequences so that categories were paired evenly throughout the testing.

When the user selected the start button, a video viewer display opened. This screen contained the primary interface elements for using *WorkSight*. When the video viewer first opens, two equal sized windows are displayed side-by-side. Each window contains a still picture depicting the video clip that would play when the picture was clicked (or tapped when using a touch screen). The pictures were created by viewing each video clip and capturing the frame that best represented the overall task. A button with a stop sign icon was located in the lower right hand corner to provide a means to exit the program. The only other element on the screen was an status bar across the bottom of the screen. After each forced choice (or trial) is made, the green portion of the status bar increments one unit, so that the status bar would be one half green after the first 15 trials, and would be completely green after all 30 trials were completed. This status bar was provided as a visual cue for non-readers to help them determine their progress in the program relative to beginning and end. Additional information on this screen included the title bar on the top of the screen, which was programmed to display the exact number of the current trial for researchers to check status. Finally, the number of the video clip sequence (1, 2, 3, or 4) currently being used was displayed in a small font at the right end of the green status bar.

When the video viewer screen opened along with the visual display described above, an audio prompt was provided for the user to "Select the picture for job video you would like to watch first". Either the right or left picture could be selected at this point. Once one of the pictures was selected, the other picture was hidden so as not to provide a distraction while the selected video clip played. Each video clip was restricted to 10–15 seconds in length. After the first video clip finished playing, it was in was hidden from the screen and the remaining picture re-appeared along with an audio prompt for the user to "Now select the other picture to watch a different job video". The user then selected the remaining picture to watch a second video clip. After the second video clip finished playing, both pictures re-appeared, and for the first time two buttons with a "thumbs up" icon on them appeared under each picture. At the same time, an audio prompt was provided for the user to "Now select the button for the job you liked best". The user then touched or clicked the button directly under the picture depicting the job they liked the best between the two choices available. At that point, several things happened: 1)the "thumbs up" buttons disappeared; 2) two new pictures depicting the next two video clips appeared in the video windows; 3) the green status bar and trial count number in the title bar incremented upwards by one, and; 4) the system-generated audio prompt of "Select the picture for the job video you would like to watch first" was repeated.

The *WorkSight* system then continued this cycle as described until all 30 trials were completed. This linear design allowed for most test participants to learn to independently operate the system after only one trial. After the user makes his or her last choice, a results screen is displayed and a confirmation message plays stating "Good Work, you have finished your *WorkSight* evaluation. Please select the button with the stop sign to quit the program." The results screen, which included a print button, was generated by a database and provided a description of each of the 30 trials completed by the user. Specifically, it reported which video clip was viewed first in each trial, which one was selected and which one was not selected. This allowed for detailed analysis of choices made for each individual video clip during the pilot study. When the user selects the stop sign button, the program closes.

2.3. Procedure

The effectiveness of the *WorkSight* process was evaluated by comparing its' use with that of a widely-used, static picture process. Prior to the start of each session, teachers and agency support staff were given a brief orientation on two forms they were asked to fill out. On the pre-test form, professionals were asked to use any resources at hand, such as previous career assessment results, previous job history, and their personal

knowledge of test subjects, to predict the results of the *WorkSight* evaluation. This measure was designed to examine the efficacy of the *WorkSight* prototype's effectiveness to predict a good job match. The 12 job categories used in *WorkSight* were listed on the form, and evaluators were asked to rank their predictions of which categories would be chosen by the participant most often (i.e. the top three categories), and which categories would be chosen least frequently (i.e. the bottom three categories).

Additionally, teachers and agency staff could also indicate their "confidence rating" on a scale of 1-5, with one being "Unsure" and 5 being "Very Sure". Teachers and staff were also introduced to the post-test form at this time. The post-test asked evaluators for their professional opinion in rating their current career assessment tool against the *WorkSight* prototype in seven areas, also using a five point Likert scale. A section at the end of the post-test solicited open comments from the evaluators. Evaluators were asked to complete the post-test after passively observing the participant's performance on the *WorkSight* prototype.

Following completion of the pre-test form, the participant was seated in front of a standard computer monitor fitted with a touch screen. This monitor was connected to a Pentium notebook computer with an external speaker. After the participant was seated, the *WorkSight* program was started by the researcher from the Windows desktop. This was done to avoid the need for the participant to have to use the notebook keyboard or to attempt to double-click on the touch screen. Following start-up of the *WorkSight* program, the participant was asked to listen to the speaker and follow the computer's directions, and to ask questions or for help as needed.

2.4. Data collection and analysis

Dependent measures are listed in Table 1 with a description of how each variable was measured. Student's t-test was used to assess mean differences of special educator and agency staff ratings of *WorkSight*'s effectiveness as compared to traditional approaches. In addition, Spearman's rank order correlation statistic was used to determine the relationship between the predicted job preferences and the *WorkSight* results. *WorkSight* results were compared to the job preference predictions of teachers and staff who's job it was to identify and create appropriate job placements for individuals with mental retardation who participated in the study. In making their predictions, these professionals used results of previous career assessment tools, work history and their personal knowledge of study participants. Therefore, their predictions provided a qualified benchmark with which to compare the *WorkSight* results. All data were analyzed using SPSS for Windows. The Spearman correlation coefficients test for rank order data was used to measure the significance of the correlation between the actual *WorkSight* results and experts' predictions of those results.

3. Results

Table 2 presents a summary of Spearman's rank order correlation coefficients for each of the 12 job categories and the corresponding one-tailed significance level. The average correlation for the 12 job categories was $r = 0.35$. In six of the 12 categories there were significant correlations between the *WorkSight* results and evaluator predictions ($p < 0.05$). The t-test for paired samples was used to test for mean differences between expert evaluation of the effectiveness of *WorkSight* compared to the evaluator's existing tool for job matching. Three different existing tools were compared to *WorkSight*; the *Career Decision Maker*, the *UCCS Self-Directed Supported Employment* tool, and the *Reading Free Interest Inventory*. The following rating scale was used: 1 = Poor, 2 = Below Average, 3 = Average/Neutral, 4 = Good, 5 = Very Good. The results of this analysis are presented in Table 3. There were significant differences in the average ratings given by evaluators in all seven areas assessed between the two systems. Overall, evaluators rated *WorkSight* as more effective than the existing job assessment tool.

Test/retest scores ($n = 11$) were also analyzed using the Spearman correlation coefficients to check for reliability across multiple testing sessions using *WorkSight*. Data were also collected from these subjects regarding the average number of requests for help for both the initial test and the retest. Table 4 provides the test/retest results. A total of seven job categories showed correlation at the $p < 0.10$ level between the first test session and the retest. The average correlation for all twelve categories was 0.47. During the initial testing session, the average number or requests for help for each subject was 1.2. The average for the second session dropped to 0.2 per subject. These results are also discussed in the next section.

Table 1
Dependent measures

Dependent variable	Description	Measured by:
Predictability	Efficacy of the tool to suggest a good job match	Pre-trial form completed by educators and agency staff and post-trial form completed by educator and agency staff are currently using another career assessment tool
Efficacy of tool in providing adequate information to help the subject to understand the job tasks	The amount of information about a job the tool itself provides without augmentation from teachers or staff	Post-trial form completed by educators and agency staff who are currently using another career assessment tool
Efficacy of tool in providing opportunity for self-direction	Self-direction is the ability to act as the primary causal agent making choices and decisions free from undue external influence or interference	Post-test form completed by teachers and agency staff who are currently using another career assessment tool
Efficacy of tool to allow for efficient use of staff/educator time	The amount of time required from the staff or educator to conduct the assessment	Post-trial form completed by teachers and agency staff who are currently using another career assessment tool
Reliability	The consistency of results for an individual over multiple assessment sessions	Test/retest results
Help required	The amount of assistance required by the test subject to complete the evaluation	Total number of requests for help from the participants during the task

Table 2
Spearman's rank order correlation coefficients

Job category	Correlation	Significance
A. Laundry Services	0.62	0.000*
B. Food Services	0.24	0.127
C. Housekeeping/Janitorial Services	0.23	0.130
D. Warehouse/Material Handling	0.38	0.031*
E. Office/Clerical Work	0.07	0.367
F. Personal/Human Services	0.53	0.003*
G. Animal Care	0.52	0.004*
H. Outdoor Maint/Horticulture	0.53	0.003*
I. Store/Retail Work	0.09	0.333
J. Automotive Maintenance/Repair	0.56	0.002*
K. Building Trades	0.26	0.107
L. Tool Use/Hand Labor	0.21	0.162

*Significant level ($p < 0.05$).

4. Discussion

The results of this study provide preliminary support for our hypothesis that a self-directed multimedia software approach can be used effectively to assess the vocational preferences and interests of individuals with intellectual disabilities. The integrated multimedia process offered by the *WorkSight* system resulted in an informative and cost efficient way to determine vocational interests for participants. These results must be considered preliminary, however, as the research scope and time available for evaluation was limited.

4.1. Using multimedia to determine job preferences

One of the objectives of this study was to investigate whether a multimedia approach would provide an opportunity for individuals with intellectual disabilities to identify and express job preferences. From our observation, it was clear that participants were independently watching video clips of work tasks being done and then selecting the one, presumably, they preferred. The educators and agency support staff knew each of the participants well (for at least two years). Overall the *WorkSight* system was able to correctly predict job preferences indicated by these external evaluators at a significant level. Anecdotally, most of the evaluators made comments indicating their belief that the *WorkSight* results were probably more correct in cases when they conflicted with their own opinion

The test/retest scores also indicated that participants were able to reliably express their job interests in a self-directed manner across most categorical areas, although there was considerable variability among categories. Three job categories (Human Services, Animal Care, and Automotive Maintenance/Repair) were very reliable. We would attribute lower levels of reliability to the efficacy of the video clips to communicate the job

Table 3
Comparisons of effectiveness of *WorkSight* vs. other tools

Evaluation question	Existing tool	*WorkSight* prototype	Significance
1. How good is this tool likely to be in predicting a good job match?	$X = 3.13$	$X = 4.19$	0.001*
2. How good is this tool in providing adequate information to help the student in understanding the job?	$X = 2.44$	$X = 3.94$	0.000*
3. How good is this tool in providing opportunity for self-direction and independence?	$X = 2.63$	$X = 4.63$	0.000*
4. How would you rate this tool in terms of allowing for efficient use of your time as a teacher/staff?	$X = 2.63$	$X = 4.5$	0.000*
5. How well did the subject enjoy using this tool? (You may ask the subject.)	$X = 3.00$	$X = 4.63$	0.000*
6. How well did this tool encourage confidence and self-esteem in the subject?	$X = 3.06$	$X = 4.31$	0.000*
7. How would you rate this tool in motivating the subject to participate?	$X = 2.75$	$X = 4.69$	0.000*

*Significant level ($p < 0.001$).

Table 4
Test/Retest results

Job category	Correlation	Significance
A. Laundry Services	0.23	0.249
B. Food Services	0.32	0.167
C. Housekeeping/Janitorial Services	0.81	0.001*
D. Warehouse/Material Handling	-0.03	0.461
E. Office/Clerical Work	0.31	0.179
F. Personal/Human Services	0.85	0.000*
G. Animal Care	0.47	0.070*
H. Outdoor Maint/Horticulture	0.42	0.100*
I. Store/Retail Work	0.41	0.103
J. Automotive Maintenance/Repair	0.80	0.001*
K. Building Trades	0.48	0.066*
L. Tool Use/Hand Labor	0.51	0.053*

*Significant level ($p < 0.10$).

tasks. For example, the five video clips representing Animal Care featured work being done with two dogs, a cat, a horse and cage being cleaned, all clearly animal care-type work. However, the Warehouse/Material Handling video clips showed such diverse tasks as loading boxes on a pallet, operating a box crushing machine and driving a forklift. It is likely that through industry-specific research and follow up field testing, it may be determined that some job categories will need to be broken down into more definable categories to account for the diversity of tasks involved. Additionally, further testing on job characteristic preferences may reveal interests beyond the job itself. For instance, it would be easy to code the *WorkSight* software to indicate how many times the user chose video clips where a machine is being used, regardless of the type of work. For some persons with intellectual disabilities, working with machines may be a better predictor of interests and preferences than the type of work or place of work. In another example, several students appeared to consistently select job videos where workers were wearing uniforms.

4.2. Using video to enhance understanding of vocational interest

Educators and agency support staff felt strongly that *WorkSight* was able to provide persons with intellectual disabilities with more information about jobs that, in turn, helped them make better decisions. The efficacy of existing vocational assessment tools to convey enough information to facilitate decision making was rated below average (mean score of 2.4). *WorkSight*'s rating in this area was significantly higher (mean score of 3.9). Both of these scores were the lowest of the evaluation for each tool, respectively. This could underscore the difficulty that people with intellectual disabilities have in attempting to conceptualize what a particular job may be like. Further research into developing video clips to be most representative of their job cate-

gory would also help reduce the need to imagine what a job would be like or what tasks would be performed.

4.3. Computer technology as a platform for self-direction and motivation

One of the most interesting observations during the study was the fact that every one of the participants seemed to thoroughly enjoy operating the *WorkSight* prototype. One teacher wrote, "Regina enjoyed using the computer to answer these questions. I believe she felt great success because she didn't have to use her speech to communicate her likes and dislikes, which can impede her motivation to respond because of her frustration." Additionally, those students who participated in the retest were asked "Was it boring this time?" All 11 of these participants indicated that they enjoyed the second session. It is also worth noting that educators and agency support staff rated the *WorkSight* system high over existing tools in the areas of enjoyment of use (mean scores of 4.6 vs. 3.0), encouraging self-esteem (mean scores of 4.3 vs. 3.1) and in motivation to participate (mean scores of 4.7 vs. 2.8).

The potential for enhancing self-determination was illustrated by the fact that, on average, participants averaged only 1.2 requests for help during the sessions, indicating the degree to which participants were able to self-direct the process. The most frequent request for help came at the beginning of the program, where an audio message prompted the user, "To start *WorkSight*, select the button with the traffic light on it." Some participants mistakenly selected the "close" button, which had a stop sign icon on it. They then asked for help when confronted with the dialog box asking to confirm the request to close the program. A somewhat poignant example of the potential for such a system to promote self-determination through self-directed expression of preferences came from one participant who repeatedly stated during his session that "My dad doesn't want me working at a fast food place, no way, he says they don't pay enough." That same student chose *Food Services* five of five times during his evaluation. Obviously, he felt confident enough while using the system to indicate his own preferences instead of his father's.

4.4. Using multimedia to reduce educator/staff time required to assess vocational interest

Educators and agency staff rated the *WorkSight* prototype significantly higher in allowing for more efficient use of their time. Existing tools received a mean score of 2.6, or slightly less than average, in this area. The *WorkSight* system received a mean score of 4.5, half way between "good" and "very good". A reason given by educators and agency personnel for *WorkSight*'s potential positive impact on their own efficiency was that it could be completed several times over a period of time without another person's physical presence and supervision. They could simply print the assessment results report from the *WorkSight* database and review it when necessary.

A number of issues will need to be addressed in greater detail in further research. For example, some job categories presented in the software prototype demonstrated a much higher degree of correlation with expert prediction than others, indicating that research needs to be done to refine some job categories and the video clips that represent them. Also, a great deal of research needs to be done on what job characteristics (e.g., working inside vs. outside, or noisy vs. quiet environments, etc.) the *WorkSight* program can track to help further determine employment interests. Additionally, there is a need to more systematically measure the impact of the process on self-determination. Overall, however, the results were very encouraging and we suggest support the importance of further inquiry in these areas.

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