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ABSTRACT

This paper documents an approach to meeting the training requirements of the Occupational Safety and Health Act (OSHA) and the "reasonable accommodation" requirements of the Americans with Disabilities Act (ADA) for individuals with developmental disabilities. It describes a training program used with three adult workers with mild mental retardation which utilized icons to teach recognition of: (1) protective equipment; (2) hazards; (3) emergency response equipment; (4) the National Fire Protection Association labeling system; (5) target organs (dangers with acute or chronic effects on specific body organs); and (6) routes of entry (such as ingestion or inhalation). Subjects were given four weekly training sessions. Significant differences were found between baseline and post training scores with substantial maintenance on retesting 2 months after the training. Results have implications for training which increases employment opportunities for people with developmental disabilities. (Contains 14 references.) (DB)

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Accommodation in Training

OSHA AND ADA: 'REASONABLE ACCOMMODATION' IN TRAINING PERSONS
WITH DEVELOPMENTAL DISABILITIES

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ABSTRACT

Training in the safe use of hazardous chemicals is essential for employees using these substances. The Occupational Safety and Health Act (OSHA) ensures worker safety and health, but the law makes no accommodation for a person's inability to comprehend the training. The Americans with Disabilities Act (ADA) provides "reasonable accommodation" in the area of training for individuals. The proposed training program provides reasonable accommodation for individuals with mental retardation using icon representations. A significant difference was found between baseline and post training test scores. Implications of these findings were discussed.

OSHA AND ADA: 'REASONABLE ACCOMMODATION' IN TRAINING PERSONS
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Introduction

The Americans with Disabilities Act

In the early 1990's congressional legislation has had an impact on the workforce in the United States. Title I of the Americans with Disabilities Act (ADA) makes it unlawful to discriminate against qualified individuals with a disability in the area of employment. The law requires that the employer make "reasonable accommodation" for workers when such an accommodation would not impose "undue hardship" upon the employer. Reasonable accommodation refers to any adjustment in the work environment that permits a qualified employee with a disability to perform the essential functions of a job. Specified in Title I is job training which may include actual training materials.

OSHA and "Reasonable Accommodation"

The OSHA Hazard Communication Standard was designed to empower

employees by providing a "Right To Know" of what risks and hazards are associated with the chemicals that are used on the job. Despite the progress in safety awareness resulting from the OSHA legislation no concessions, or accommodations are made for an individual's inability to comprehend the training that is offered. Currently, there is no systematic, comprehensive program available which offers "reasonable accommodation" for individuals with developmentally disabilities who use potentially hazardous chemicals at the work site.

Safety Training

In recent years, the interest in safety training has increased dramatically since the Occupational Safety and Health Administration (OSHA) issued a ruling in 1983 entitled "Hazard Communication Standard". This standard, commonly referred to as the "Right To Know" law, was designed to ensure that both employers and employees know what hazards are associated with the chemicals that are being used on work sites and the proper methods of protection against such hazards.

Aspects of training specifically detailed in the standard included information regarding physical and health hazards that are associated with chemical exposure, the proper use of personal protective equipment, and how to read and interpret the information on labels and material safety data sheets (MSDS) which includes treatment of exposures and prevention. There has been a problem experienced by workers in the field with regard to the grasping of details on labeling and understanding the technical material in the

MSDS reports (Occupational Safety & Health Reporter, 1983). One measure designed to counter this problem has been the development of a system of safety symbols.

Safety Symbols

Although the majority of research in symbol recognition has been developed with highway signs, the use of symbols with regard to safety issues has been limited. In industrial settings, there are certain advantages for the development of symbols. The effectiveness of symbols, when chosen appropriately, has demonstrated greater effectiveness than mere words. Symbol recognition can occur more rapidly (Janda & Volk, 1934) more accurately (Walker, Nicolay & Stearns, 1965) especially when under distracting conditions (King, 1975; Ells & Dewar, 1979).

The standardization of symbols and colors denoting specific hazards and warnings was published in 1972 by the United States Department of Labor and OSHA prior to the 1983 "Right To Know" law. Although the initial intention of using safety symbols may have been to increase the effectiveness of safety communication, a report by the National Institute for Occupational Safety and Health (NIOSH) indicated that certain industrial symbols were "frequently misidentified" (Occupational Safety & Health Reporter, 1983).

Easterby and Hakiel (1977) performed extensive assessments on symbols used on product labels. Several attributes of the symbols were assessed in the study which included image content, color coding, and shape coding. Easterby and Hakiel concluded that the single factor affecting recognition was image content.

In a similar study Collins, Lerner, and Pierman (1982) assessed the effectiveness of both symbol surround shape and the color of the hazard symbol and concluded that neither had an impact on the percentage of correct responses. Collins et al also reported a relatively poor rate of recognition of several symbols which had been in wide use at industrial settings and which industrial personnel were expected to have been familiar. Furthermore, it was indicated that an informal training format which presented the symbol along with a word label would not be effective with certain symbols. The general conclusion from the study suggested that in training pictorials should include a person and the hazard, or the action and protective gear to be most effective.

Training Persons with Developmental Disabilities

Research literature on safety training for individuals with developmental disabilities has been both scarce and limited in scope. Most of the safety research involving persons with mental retardation has included home safety training (Tymchuk, Hamada, Andron, & Anderson, 1990) and teaching persons to react to fires (Bertsh, Fox, & Kwiecinski, 1984). However, adults with mental retardation can work independently with the proper training (McLeod, 1985).

In recent years the utilization of pictures has been a common practice in the training of individuals with mental retardation (Wacker, 1985; Morrow & Bates, 1987; Martin, 1992). Many sheltered workshops and vocational training centers offer referent pictures

to increase worker skill levels. A thorough training program is essential in preparing workers for steady employment.

Purpose of the Study

Before a training program is able to offer "reasonable accommodation", research studies must explore what methods and materials are best suited for the special needs of a population of workers. The purpose of this pilot study is to examine the following areas:

1) To what degree are the icons, or pictographs, currently being used in industrial labeling readily recognizable by individuals with developmental disabilities? How much will training increase the correct identification of each of the categories of icons used in the study?

2) What type of additional symbols can be developed which refer to label information currently not used in graphic format and can be easily identified by individuals with developmental disabilities? How much will the training increase the accurate recognition of these symbols?

3) To what degree will the icons be recognized two months after the training has been completed?

Method

Subjects

The sample for this study included three women who reside in

a community-based setting in northern Delaware. The women were selected for the study due to previous safety concerns at work. The ages of the women at the time of testing were 33, 36, and 51. Prior to the study the participants were assessed to be functioning in the mild range of mental retardation with comparable reading skills on the third grade level. All of the subjects are employed; two, at a large industrial chemical plant and the third in the food services industry.

Instrument

A testing instrument was developed for the study which included a series of copyrighted icons developed by Lab Safety Supply of Janesville, Wisconsin. The icons were in the following categories; protective equipment, hazards and emergency equipment. Additional icons used in the study included the National Fire Protection Association (NFPA) labeling system, target organ symbols and route of entry icons. Although the later two categories were developed specifically for the study, the other icon categories are utilized in various work settings where hazardous chemicals are used. The form in which these icons were presented were in black and white images without any textual identification in the following categories:

- (1) Protective Equipment
- (2) Hazard Icons
- (3) Emergency Response Equipment
- (4) NFPA Labeling System

(5) Target Organs

(6) Routes of Entry

Protective_Equipment This series of symbols include graphic images of safety glasses, splash goggles, face shield, face shield with goggles, hard hat, boots, apron, splash suit, full suit, dust respirator, vapor respirator, dust and vapor respirator, airline hood, or mask and hearing protection. In the actual training the vapor respirator was presented along with the dust and vapor respirator, but was not included in the testing portion due to the graphic similarity and redundancy of functioning.

Hazard_Icons These pictographs include emblems which represent the following dangers; flammable, explosive, oxidizer, corrosive, water reactive, carcinogenic, poison, radioactive, and biohazard. Although these symbols are depicted in various colors, the training and testing portions included only black and white pictures.

Emergency_Response These pictures refer to the four types of fire extinguishers; Types A, B, C, and D. The letters refer to different types of fire which include ordinary combustibles such as wood and paper (Type A), flammable liquids (Type B), electrical fires (Type C), and flammable metals (Type D). Other emergency response equipment symbols included spill clean up, eye wash station, safety shower, first aid kit, and ventilation fan.

NFPA_Label_System The NFPA labeling system is used as a method of rating specific types of hazards. The presenting format includes a diagonal four box square which is called the "square on point" label. This label includes a white square on the bottom which is used to designate special hazards by either a graphic display, or words and letters. The symbols used in the white square are the water-reactive and radioactive icons. Other hazards are represented in the following manner: "OX" for oxidizer, "ALK" for alkali, "COR" for corrosive, and "ACID".

The other squares are blue, red, and yellow and are positioned to the left, top, and right, respectively. While the blue square indicates the magnitude of the health hazard, the red square signifies the flammability hazard. The yellow square denotes the level of stability and reactivity of the chemical. The magnitude of the hazard in each of the colored squares is designated by a numbered rating scale which is delineated in the following manner; 0 = minimal, 1 = slight, 2 = moderate, 3 = serious, and 4 = extreme.

Target_Organs These symbols designate whether the hazard is acute (i.e., short term symptoms) or chronic (i.e., long term symptoms) in affecting specific areas of the body referred to as target organs.

The icon for acute hazard is designed with a clock face display with a second, minute, and hour hands within an arrowhead pattern. The explanation of the design is that when one is exposed to a hazardous chemical, then the symptoms will be readily apparent

within seconds, minutes, or hours. The chronic hazard icon displays a full arrow with a magnifying lens detailing the years of exposure on the feathers. The explanation of the design is that the effects of exposure are generally not noticed for years.

Specific target organs in the acute category are eyes, mucous membranes, skin, and stomach. Chronic hazards affect the following target areas and conditions: kidneys, liver, previous medical conditions, and the reproductive system. Target organs which fall in both the acute and chronic hazard categories include heart, blood, brain, and lungs. The final icon in this category provides a reference toward the location of the area affected on the human body. This symbol may include an arrow which is drawn by the trainer which connects the specific target organ icon to the corresponding area on the human figure inside of the bull's eye target, thus the term, target organ.

Routes of Entry These images illustrate the manner in which the chemical enters the body. There are four basic routes of entry; ingestion, inhalation, absorption through the eyes, and absorption through the skin.

Procedure

The duration of four training sessions ranged from 60 to 75 minutes. The classes were held 1 day a week and the topics included the following; (1) general overview of training and the OSHA law, (2) protective equipment and routes of entry icons, (3) target organ and hazard icons, and (4) emergency response equipment

symbols and the NFPA label system.

A total of three complete testings were included in the study; (1) an initial pretest prior to training to determine a baseline score, (2) sections of the test were presented which corresponded to the icons that were introduced in the training session each respective week, and (3) the entire test given 2 months after the training had been completed.

The manner of presentation for the testing included a format similar to the Peabody Picture Vocabulary Test (PPVT), which includes a four box grid with a different icon in each of the panels. Subjects were asked to point to the icon of a specifically named object, or to point to the picture in response to the question asked by the trainer. The duration of the entire test was 20 minutes. The test was divided into six separate categories with the corresponding number of questions in each category; protective equipment (42), hazards (18), routes of entry (8), target organs (14), emergency response equipment (14) and NFPA labeling (14).

The method of training included the following manner: (1) presentation of the icon, (2) a brief description as to what object the icon corresponds, (3) comments by the trainer which help to differentiate one icon from another by shape, design, and image content, and (4) active learning involvement with verbal responses by the subjects indicating what was the meaning of each of the symbols. The method of presentation for the protective equipment included the previous steps, but also contained the simultaneous display of a picture of the protective equipment, a person modeling the equipment and the corresponding icon. If at any time the

subject provided an incorrect response when presented an icon by the presenter, the following procedure was used: (1) The trainer would repeat the correct response and (2) ask the subject to give the correct response.

Results

The first question of the study asked to what degree are the icons, or pictographs, which are currently being used in industrial labeling, readily recognizable by individuals with mild mental retardation? Diagrams 1, 2, and 3 provide graphic representations of the percentages for all three subjects. The three diagrams display how much the training increased the correct identification of the icons. The subjects improved scores by 18.18%, 18.18%, and 10.91% respectively.

The second question was with regard to what type of additional symbols could be developed which refer to label information currently not used in graphic format and can be easily identified by individuals with developmental disabilities. Symbols for the routes of entry and the target organs were developed for this study. Based on the results from the baseline scores for all three subjects, the percentage of correct responses in the respective categories were; Routes of Entry (91.67%) and Target Organs (61.9%). While the training failed to increase the accurate recognition of the Routes of Entry symbols, there was a slight increase in Target Organs by nearly 10 percent to a total of 71.43%.

The final questioned focussed on icon recognition 2 months after the training had been completed. The overall total decrease of correct responses for the three subjects was 3.63%, 9.09%, and 8.09% respectively.

Discussion

The special training for safety icon recognition outlined in this study may offer hope to many Americans with developmental disabilities in attaining employment in working with chemicals and understanding information pertinent to health and safety. In addition, this population of American workers are ensured of the protection guaranteed by the same OSHA laws as are other workers.

While the method of presentation was similar for all of the icon categories, the format of presenting the icons for protective equipment differed slightly in that there was a simultaneous display of the protective equipment device, a person modeling, and the corresponding icon. Although the manner of this presentation may differ slightly from the format as reported by Collins et al. (1982), the suggested method of including the icon could hold some promise in the area of future research with this population of workers. All of the icon categories attained a 90% correct response rate in the initial posttraining test with the notable exceptions of hazard icons and target organ icons.

Collins et al. (1982) elaborated on a manner of presentation for hazards which was not used in the current study. The suggested method of presentation included the person and the action, or consequences of the hazard. Perhaps, if the icon of the specific hazard were to be added to this manner of presentation, then

greater retention of the icon would be attained. Responses of the trainees indicate confusion between specific pairs of hazard icons; oxidizer with flammability, explosive with flammability, and biohazard with carcinogenic. Although the images may have some similarity with regard to shape, the black and white presentation may have prevented the trainees cuing on color. In future studies, the effect of color may be explored with these specific pairs of hazard icons.

Collins et al. (1982) cautioned against the use of specific images which are very similar and may promote confusion. Since each of the target organ icons was presented in the format of the PPVT during the testing portion, some of the learning may have been lost due to the entire label being used in the training portion. The manner of presentation was primary through verbal communication with the trainer pointing to the icon and the corresponding area on the human figure located in the bull's eye target. In future training, intermediate steps could be offered which could include the following;

- (1) the trainer circles a specific target organ icon (e. g. eyes);
- (2) the trainer draws a line from the circled icon to the corresponding area located on the human figure in the bull's eye;
- (3) the trainer asks the trainee to point to the corresponding body area as indicated on the label (in this case the trainee's eyes);
- and (4) to point to the circled icon and verbalize what body part is affected. Although this method of teaching is very repetitive in nature, the manner of the training may promote improved icon recognition. Finally, the addition of a written text or word

labels indicating a name for each icon may provide an additional measure of recognition for those trainees who have the capability to read.

It would appear that subsequent training sessions would be warranted since the number of correct responses dropped 2 months after the training was completed. This subsequent training could be a standard part of safety meetings in which key safety concerns are reviewed. If the workers are limited to one or two hazardous substances, then the training could be confined to the information pertaining to those substances exclusively. However, as the job entails additional chemical substances, then the workers could be trained with the labels and icons of those products.

Results of this study indicate that training through safety icon recognition can be of benefit to individuals with developmental disabilities. Although this study was limited by the small number of subjects, it nevertheless demonstrated in practical terms that making reasonable accommodation in training for special populations can be done successfully. Such training has the potential to offer hope to many of American workers if given a chance.

Safety concerns are still present within many businesses, and these concerns pose an employment barrier for individuals with cognitive limitations. Safety training is a valuable means of addressing this barrier and opening up employment opportunities for workers with mental retardation. Correct recognition of the symbols in work safety icons does not necessarily promote worker safety. Systematic skills training is needed for the proper

identification of risk situation in conjunction with instruction on how one is to respond appropriately.

With any progressive legislation, there is some resistance to change. The Americans with Disabilities Act declares it unlawful to discriminate against qualified individuals in the area of employment. The ADA ensures that bold steps are taken in the direction of helping many Americans attain proper training in order to perform the essential functions of a job.

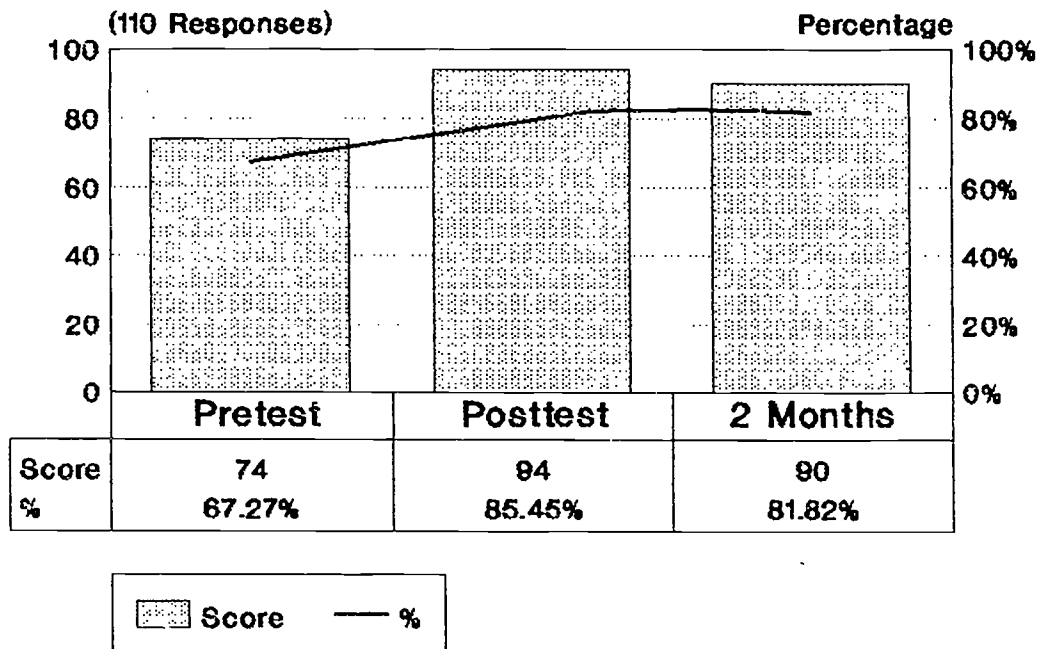
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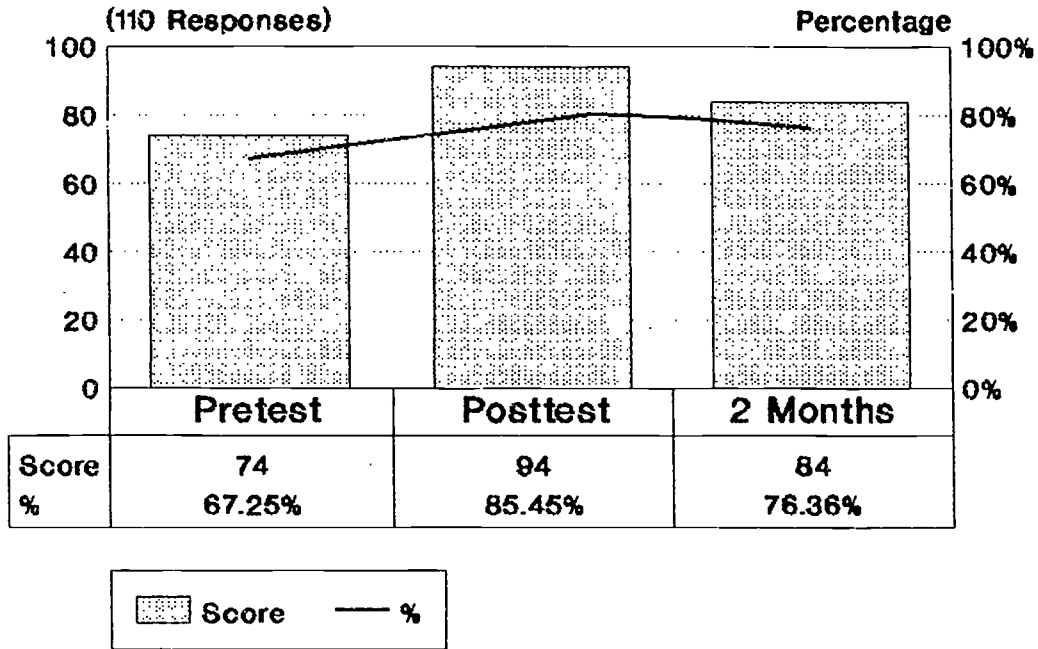
SUBJECT #1

Correct Responses for Icon Recognition



SUBJECT #2

Correct Responses for Icon Recognition



SUBJECT #3

Correct Responses for Icon Recognition

