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DO ILLUSTRATIONS INFLUENCE READING COMPREHENSION IN ADULTS WITH
INTELLECTUAL OR DEVELOPMENTAL DISABILITIES?

by

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A thesis submitted in partial fulfillment of the requirements
for graduation with Honors in the Speech Pathology and Audiology

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INFLUENCE OF ILLUSTRATIONS ON READING COMPREHENSION

Do Illustrations Influence Reading Comprehension
in Adults with Intellectual or Developmental Disabilities?

Kiara Rivera

Dr. Meredith Saletta

Departmental Honors Thesis

University of Iowa

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Abstract

Much of the education provided to individuals with intellectual or disabilities (IDD) focuses on living skills rather than teaching how to read and write at an age-appropriate level. Little is known about appropriate reading materials and instruction to assist adults with IDD. This population needs more systematic and structured methods of teaching literacy, as for example, by integrating illustrations into literacy education to facilitate comprehension. Our study focuses on whether illustrations influence reading comprehension, and if so, which types of illustrations are best. Fifty adults with IDD were presented with a reading passage and comprehension questions, along with one of three types of illustrations portraying the content of the story: color photographs, black and white line drawings, or control images consisting of random swirling patterns. The results indicated that individual reading skills predicted reading comprehension; however, they revealed no effect of condition. We therefore performed a second sequence of data collection in which we fine-tuned our original paradigm. In this second iteration, there were also no effects for the condition. These findings indicate that further research is required in order to fully understand which kinds of materials would be best for facilitating reading comprehension in adults with IDD.

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In each aspect of education with a focus on reading and written language, research has suggested that adolescence and adulthood may be the most suitable time to teach individuals with intellectual disabilities. Several studies have shown that literacy skills progress into adulthood. Individuals with IDD can achieve levels of literacy that were once believed to be impossible for this population. It appears that, in general, individuals with IDD can improve and continue to develop their language and literacy skills with the appropriate education and educational goals. Adolescent and adult learning is now viewed as an option whereas before it did not seem very plausible. Literacy skills allow individuals with IDD more vocational opportunities, more independence, and improved self-esteem. Literacy is a highly desirable trait for this population; however, little is known about appropriate reading materials and instruction to help the population gain better literacy (Young, Moni, Jobling, & Kraayenord, 2007). Few studies have been done to look at what materials actually assist individuals in this population in gaining literacy. For example, it is not clear whether or not illustrations influence reading comprehension. The effect of illustrations on reading comprehension in individuals with developmental disabilities will be analyzed in this research.

Population

US data on individuals with IDD are inadequate. Although there are a small number of studies on individual disabilities, data investigating the entire span of individuals with developmental disabilities are not available. Developmental disabilities were parent-reported in approximately 1 in 6 children in the United States between 2006-2008 (Boyle et al., 2011). It is believed that the population of individuals with developmental disabilities like attention deficit disorder (ADD), autism spectrum disorder (ASD), and other delays has grown and consequently there is a demand for more health and educational assistance. Boys are twice as likely to have

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any developmental disability. There is an even higher prevalence for boys for developmental disabilities such as ADHD, autism, learning disabilities, stuttering, and a number of other developmental delays. Some of these developmental delays can include intellectual or developmental disorders, also known as IDD.

The term intellectual or developmental disorders was developed in order to replace the terms “mental retardation” (Boyle et al., 2011). Individuals with IDD may have varying degrees of deficits in terms of functioning and impairment through the course of their lives. These individuals are also often misdiagnosed, and are found to have inadequate access to education and health care services. As a result, IDD is largely ignored in the mental health sector in terms of research and specific services and consequently, training for services providers of individuals with IDD is limited to a few high income Western countries (Carulla et al., 2011). Therefore, it is crucial for further research to be done on this population.

Individuals with IDD experience poorer health, lifespans that are more brief, and inadequate health care and educational services in comparison to those who do not have the condition. The reason for such disparities may be the lack of access to primary care, inadequate education, the failure to educate or implement programs for this population with regards to public health, and poor access to preventive measures (Anderson, Humphries, McDermott, Marks, Sisirak, & Larson, 2013). In general, individuals with intellectual disabilities have more difficulty finding health care providers due the limited amount of providers trained to deal with this population, social stigma, and issues with insurance. Health care providers may have been inadequately trained due to medical and nursing schools providing limited curricular content for the population. The health needs of this population may not be met due to providers possibly overlooking their health issues. Sometimes healthcare providers may attribute some of the

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symptoms of illness to an individual's intellectual disability which could result in negative consequences (Roll & Bowers, 2017).

Disability in the Classroom

Students with developmental disabilities often have to deal with a number of challenges as they progress in their education. A number of individuals with IDD show a wide range of skills in literacy, and the capacity to read and write are primary educational goals for students with IDD (Ratz & Lenhard, 2013). Many schools fall short of these goals and the needs of students in this population especially when transitioning between high school and adulthood. Many of the programs for this population focus on social, vocational, and living skills and not literacy. Many parents of young individuals with IDD as well as the individuals themselves must be their own advocates for supports and resources after high school.

The Individuals with Disabilities Education Act (IDEA) requires the U.S. Department of Education to help with facilitating the transition from youth to adulthood for these individuals with disabilities. However, a number of schools still manage to not meet the needs of these individuals with IDD, especially in areas of employment, postsecondary education, and self-sufficient living arrangements. Individuals with IDD are considered to have successful transitions to adulthood when they complete certain developmental tasks, like finishing school, gaining employment, or beginning a family (Henninger & Taylor, 2014). It is important for researchers to acquire comprehensive knowledge in regards to the literacy skills of those with IDD in order to create instructional plans, help foster proper learning environments, carry out adequate educational policies, obtain funding, and assist in identifying any future fields of research (Ratz & Lenhard, 2013).

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Reading and Learning Materials

It has been difficult to find appropriate reading materials for adults with IDD. The utilization of materials considered 'easy-to-read' for individuals with disabilities has become common but usefulness has hardly been assessed (Fajardo et al., 2014). There is a gap between the content; the reading material is either too immature, or the reading level is too high. Leveled books are books that have appropriate content and are also accessible at an appropriate reading level (Cunningham et al., 2005). In order for students to be able to master and generalize reading strategies, they must have texts that deliver the right amount of both assistance and challenge. In other words, the text should present enough of a challenge for the student to do reading work, but should be manageable enough to help the student develop confidence and assist with his or her reading comprehension.

There are a number of factors that influence the difficulty of these texts for readers (Rog & Burton, 2001). It is also important to consider the needs of the population and the variability within the population when selecting appropriate materials to ensure that they get the most out of their reading instruction. The IDD population is very heterogeneous and some individuals are more severe in their disabilities in comparison to others.

Variability of Literacy Abilities

In addition, there has been inadequate research in regards to the differences in reading ability for individuals with intellectual disabilities (Ratz & Lenhard, 2013). The use of appropriate reading materials was found to be an important factor in a study conducted by Morgan (2005). Researchers discovered that matching reading texts to the interests of the learners helped activate prior knowledge, heightened motivation, and helped with using and applying reading comprehension tactics. Some important elements that need to be considered

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when selecting suitable reading material for individuals with IDD include the type of reading material (narrative or expository), the difficulty of the text and the type of vocabulary, the length of the text, and its purpose (Morgan & Moni, 2008). Instruction of reading for individuals with IDD has mainly focused on word decoding under the expectation that higher-order literacy skills are not achievable for this population. Studies have demonstrated that individuals with intellectual disabilities need systematic and more structured methods of teaching for reading comprehension, similar to all other readers (Lundberg & Reichenberg, 2013).

Illustrations

Illustrations can have a number of effects on the reader such as increasing interest, affecting their attitude, provoking emotional responses, and even facilitating reading comprehension (Levie & Lantz, 1982). Levie & Lantz (1982) reviewed a number of experimental comparisons of the effects of illustration on text information on learning and the effects of non-illustrated text on learning. Researchers concluded that illustrations promote learning of information in written texts especially when the illustrations depict what is in the text. Learning information was better in illustrated text than text alone in 98% of all comparisons and in 85% of these differentiations the difference was statistically significant (Levie & Lantz., 1982).

In contrast, other researchers believe that pictures in texts, specifically education text, can impede learning because readers do not pay adequate attention to the information being presented in the text (Peeck, 1993). However, many individuals who work in the field of education or educational psychology believe that pictures in texts or instructional textbooks have the potential to make significant contributions in learning (Peeck, 1993). Illustrations can be used to invite learning, provide further clarification on difficult subjects, and elaborate on written text.

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There is a lack of literature regarding the Retention of information in texts that contain illustrations (Peeck, 1993).

Illustrations and Comprehension

It is evident that the use of illustrations does play a role in making sense of a text. Knowledge can be presented verbally and nonverbally in what is known as a dual-coding system. Nonverbal systems use imagery and verbal representations and are used to represent main ideas, events, or concepts. Research has demonstrated that the use of visual material can assist low-ability readers, like some of the individuals found in the IDD population, and can help support comprehension (Hibbing & Rankin-Erikson, 2003). Rusted and Colheart (1979) found that low-skilled readers move from text to illustrations and back to the text in order to understand what is being read (Hibbing & Rankin-Erikson, 2003). A number of studies have also shown that illustrations help with remembering specific information from reading materials; however, more studies on the influence of illustrations on reading comprehension need to be completed.

It is important to examine how illustrations impact other elements of comprehension, like working memory, inference making, and mental model building. Working memory is the part of short-term memory that aids with temporarily storing information during processing. Inference making, the building of connections between relevant information to build a complete understanding, involves a strong working memory component. Readers with better skills are more efficient at activating relevant information and building connections within this information to better understanding of texts (Pike, Barnes, & Barron, 2010).

In addition, inferences contribute to the construction of an individual's mental model. Mental model building is the construction of a cognitive model embodying spatial, temporal, motivation, and person/object related information. This mental model is formed by memory

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nodes that contain and form connections between previously comprehended and new incoming information. The mental model or representation use these connections. These are all elements of comprehension found in cognitive models and have been found to serve important functions in how individuals form clear representations of a text (Pike, Barnes, & Barron, 2010).

Effects of Types of Illustrations

Research has shown that line drawings facilitate reading comprehension better than photographs, especially for individuals with low literacy skills. Simple drawings, such as line drawings, may be effective because they diminish distractions. Studies have shown that individuals with lower reading skills are more likely to pay attention to irrelevant details in illustrations than individuals with more developed reading skills. Research suggests that simpler drawings, such as line drawings, are best for facilitating comprehension (Houts, Doaks, Doaks, & Loscalzo, 2006). Moll (1982) examined effects of different types of pictures in comprehension and found that cartoon illustrations correlated with the highest comprehension scores. Line drawings correlated with the second highest comprehension scores (Houts, Doaks, Doaks, & Loscalzo, 2006).

For our current study, our main question is: Do illustrations influence reading comprehension? If so, do photos or line drawings differentially affect reading comprehension?

We have three different hypotheses:

(1) Adding pictures will facilitate comprehension. We anticipate that adding pictures along with text will strengthen reading comprehension because research has shown that illustrations may enhance comprehension by providing a context for understand content (Levie & Lantz, 1982).

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(2) Black and white line drawings will facilitate comprehension better than color photos. We believe black and white line drawings will help with facilitating comprehension better than color photos because research has indicated that line drawings facilitate reading comprehension, especially for individuals with low literacy skills. Simple drawings, such as line drawings, may be effective because they diminish distractions (Houts, Doaks, Doaks, Loscalzo, 2006).

(3) Adults with better reading skills will also perform better on the comprehension measures. We anticipate that individuals with better reading skills are better at activating relevant information and building connections within this information to gain a better understanding of the text (Pike, Barron, & Barron, 2010).

For the following experiments, 50 individuals with IDD were recruited from the University of Iowa Realizing Educational and Career Hopes Program (UI REACH, 2017). The UI REACH program is a program a transition program for students with developmental, cognitive, and learning disabilities. This program empowers individuals with disabilities to become independent and involved in the community. Students take courses and receive career preparation services that assist these individuals in achieving their full potential. The program's mission is to allow young adults with intellectual and developmental disabilities to have a Big Ten University experience and allow them to gain more independence through involvement on campus, the curriculum, development in terms of employment, and living in on-campus housing (UI REACH, 2017).

Study 1: Methods

Participants

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Approval for this study was granted by the University of Iowa Institutional Review Board. Participants included 50 students with intellectual and developmental disabilities from the UI REACH program.

Materials

Three conditions were presented in this study. The first condition included colored photos, the second condition included black and white line drawings, and the third condition included control images. The photos in the first condition were actual photos illustrating the contents of the story. The line drawings consisted only of lines. The control image consisted of random swirling patterns. Random images were used to control for factors of color and consistent visual input. The story was written at the third grade level using curriculum-based measurements. The story was about a girl named Apple who made a cake for a bake-off. The judges of the bake-off did not like her cake and she realized it did not taste good. The girl went home and questioned her baking abilities. However, her dad eventually showed her she mixed up the ingredients in her cake and it was inferred that she used salt instead of sugar. The story was then followed up by eighteen reading comprehension questions. The participants circled the answer they believed to be correct out of three options, A, B, or C.

Procedures and Session Structure First Iteration

Participants were randomly assigned to one of the three conditions. Each student participated in one session of approximately 30 minutes. The experimenter read the following directions: “This packet has three pictures. We are going to spend one minute looking at each picture. When I say begin, please turn the page and begin looking at the picture 1. Do not look at the other pictures until I tell you to do so.” The experimenter would then ask, “Are there any questions?” The experimenter would then answer any questions and set a timer for one minute

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and say “begin.” When the timer went off, the experimenter would say “Turn the page and look at picture 2.” When the timer went off again he or she would say, “Turn the page and look at picture 3.” When the timer went off a third time the experimenter would say, “Thank you for your attention.” The experimenter would then instruct students to place the student response packet in front of them and turn the page to the passage. They would then give students the remainder of the class time (30 minutes) to read the passage and answer the comprehension questions. The students also participated in standardized reading testing via the Woodcock Reading Mastery Test.

Study 1: Results

Analytic issues

There were a few analytic issues encountered. For example, there were missing data. There was one instance of a participant skipping two questions and another instance of a participant skipping one question. Another participant missed an entire page and there was one instance of a participant who answered none of the questions. Our alpha value was set to .05.

Comprehension accuracy

A one-way ANOVA revealed that there was no effect of condition, $F(2, 47) = .36, p = .70$.

Relationships between reading comprehension and correct answers

Results of a linear regression indicated that reading skill predicted reading comprehension, $F(1, 43) = 24.75, R^2 = .37, p < .001$, in that students with higher reading skills also performed better on our comprehension measures.

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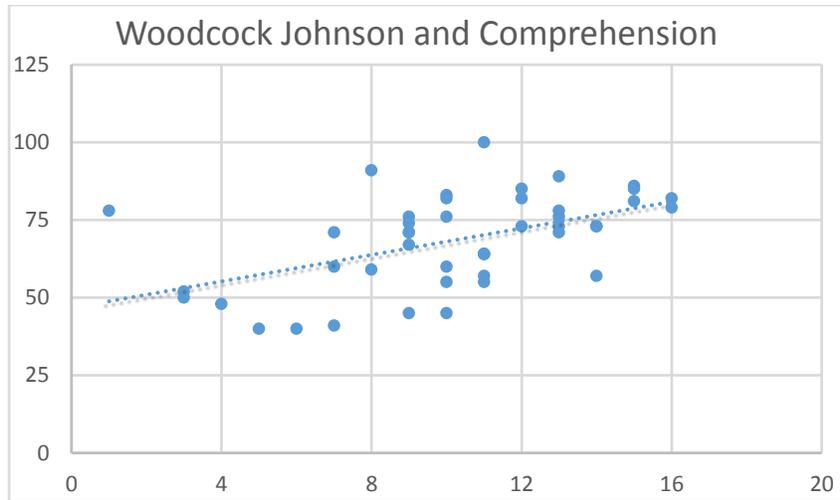


Figure 1: Relationship between Woodcock Reading Mastery Test and comprehension.

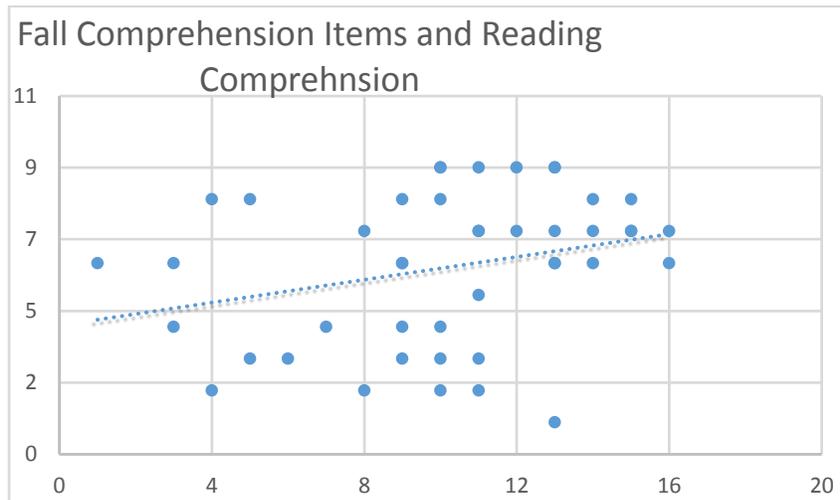


Figure 2: Relationship between total correct comprehension items and Fall Comprehension Items.

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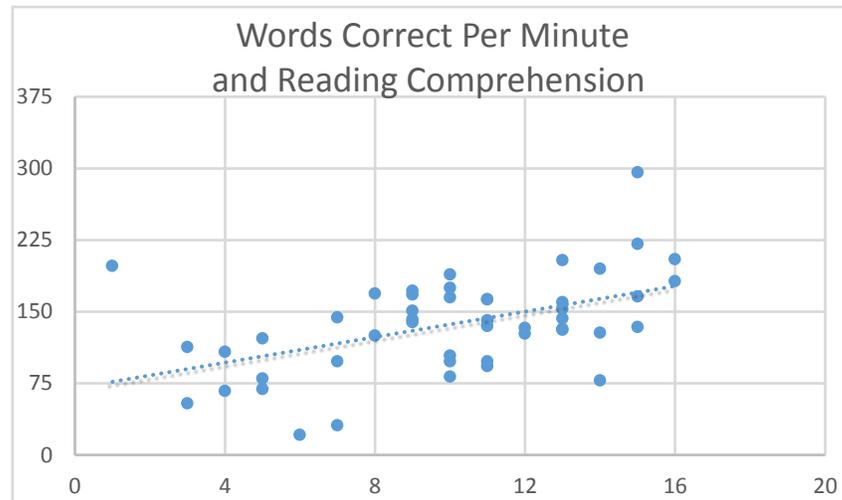


Figure 3: Relationship between total correct comprehension items and measure of words correct per minute.

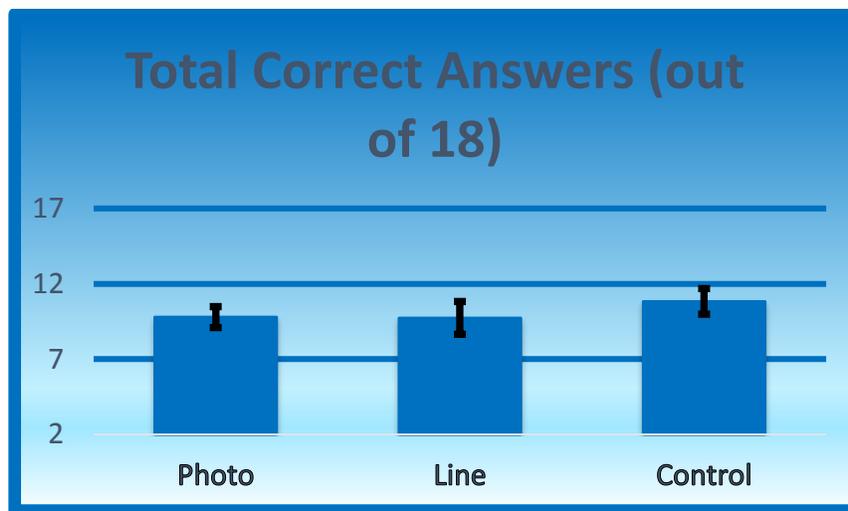


Figure 4: There was no effect of condition.

Study 2: Methods

Participants

Approval for this study was granted by the University of Iowa Institutional Review Board. Participants included 50 students with intellectual and developmental disabilities from the UI REACH program.

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Materials

Two conditions were presented in this study for each of the participants. The first condition included colored photos and the second condition included control images. The photos in the first condition were actual photos illustrating the contents of the story. As in Study 1 above, the control image consisted of random swirling patterns. The story was written at the third grade level using curriculum-based measurements. The story was about a young girl named Chrissy, who found a cat in her backyard. She noticed the cat was injured and she decided to take the cat inside with her mother to help take care of the cat. While she was taking care of the cat, Chrissy asked her mother if they could keep it and her mother said they would need to discuss it with her father the following day. However, the cat's owner called to claim it. When the owner arrived to pick up the cat, he realized that maybe the cat was better off with Chrissy and as a result, it was inferred she was allowed to keep the cat permanently.

Procedures and Session Structure

Participants were assigned at random one of the two conditions. As distinct from the first iteration, each reader looked at each picture 45 seconds vs one minute. Other than that, everything was consistent with the methods in Study 1 above.

Results

A t-test indicated that there was no effect of condition, $t(1, 48) = -.26, p = .80..$

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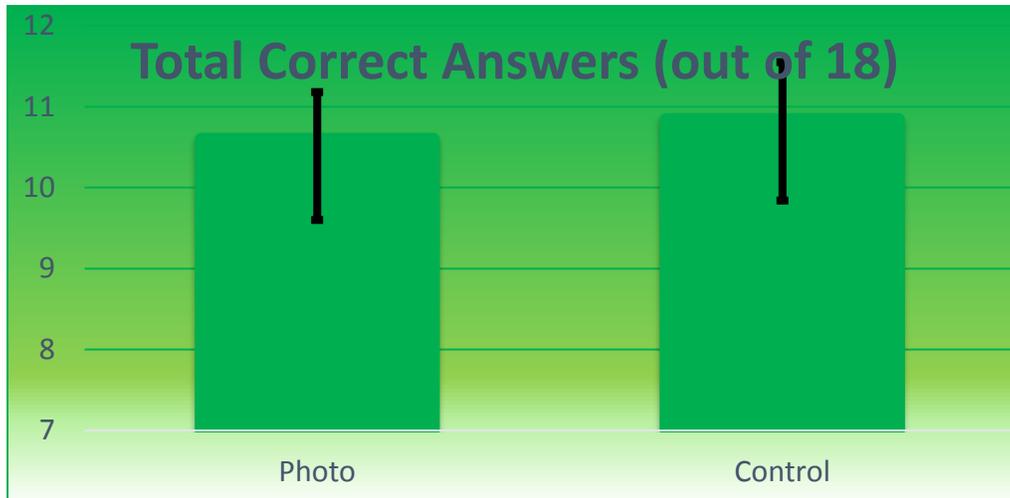


Figure 1: T-test: there was no effect of condition.

Discussion

Many of the educational materials for individuals with intellectual or developmental disabilities focus more on living skills rather than teaching this population how to read and write at a level that is age-appropriate. Most existing literacy materials which are accessible to adults with IDD are only relevant for audiences that are much younger. Therefore, it is important to adapt materials to make them both appropriate and accessible. Better instruction and reading materials are necessary to help with facilitating reading comprehension for adults with IDD. Some important elements that need to be considered for reading materials for adults with include the type of reading materials, the difficulty of the text and the type of vocabulary, the length of the text, and the purpose of the text. Specific to this study, the effects of text modifications, specifically illustrations, should be further explored when creating reading materials for this population.

Research has indicated that adding illustrations to reading materials helps facilitate a better understanding of the materials. Illustrations can have a number of effects on the reader. These effects include increasing interest, changing the attitude of the reader, provoking

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emotional responses, supporting of retention of specific details from texts, and facilitating the recollection of specific information. Our results indicate that further research is required in order to fully understand which kinds of materials and which types of illustrations would be best at facilitating comprehension in adults with IDD.

Clinical applications

Clinical implications of this study include an emphasis on the ways in which gaining reading skills can contribute to improved educational and employment opportunities, higher self-esteem, and access to a traditional college curriculum. Better literacy skills can help this population gain more independence. It can also help adults with IDD gain access to the college curriculum, give them more opportunities to gain a postsecondary education, and help them explore content that is more applicable in the college setting. However, without further research, it is unclear which modifications would be most appropriate and beneficial for this population.

Future Directions

Future directions of this work may include the creation of interactive displays in which the learner can click on an image and receive comprehension support in the form of an animation, auditory cue, extra picture, etc. These interactive displays would be similar to interactive storybooks or CD-ROM storybooks that contain material filled with interactive elements and illustrations that might help increase the interest of readers and help clarify or elaborate on written texts. Additionally, we are interested in taking a look at texts that include concepts which are familiar and relevant for adults with IDD. In addition, familiarity of content in texts could also assist with mental model building which in turn could help with activating relevant information and building connections within this information to better understanding of texts.

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This study investigated the effects of illustrations on reading comprehension for adults with IDD. We found that future research is necessary to draw conclusions on the influence of illustrations as well as other text modifications that can facilitate comprehension in adults with IDD. Conclusive findings in regards to literacy materials for this population could lead to an improvement in educational materials. This could improve the lives of individuals with IDD by enabling them to access more vocational and educational opportunities.

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