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Easy access to the internet allows adolescents to share humor, such as memes, via social media. This quasi-experimental study investigated whether there was a difference in the number of memes comprehended on an assessment test among adolescents who were typically developing, adolescents who were deaf or hard of hearing, and adolescents with language disorders. It also sought to determine if the meme's picture, whether related to the text or unrelated, contributed to adolescents' comprehension. Participants were given a short reading screening and a multiple-choice test of meme comprehension. Adolescents who were typically developing out-performed adolescents who were deaf or hard of hearing or who had language disorders. Supporting pictures did not appear to aid in meme comprehension. Findings from this study suggest the need for professionals to include direct instruction of humor when working with adolescents who are deaf or hard of hearing or who have language disorders.

Keywords: deaf, humor, meme, learning disabilities, comprehension

Adolescents encounter humor on a daily basis, and the internet has become one of the main modalities by which humor is shared (Harvey & Palese, 2018; Shifman, 2007). A 2012 national survey showed 74% of teenage participants accessed the internet at least occasionally via a smart phone, and 95% of teenage participants had regular access to the internet (Madden et al., 2013). With frequent, easy access to technology, the types of humor adolescents encounter have shifted from "old humor" which includes jokes, videos, and cartoons to new web-based humor (Shifman, 2007). The elements of new humor are still comprised of figurative language and ambiguous words, as was old humor, but the delivery of new humor has changed (Shifman, 2013; Spector, 1990). New humor is often propagated from one internet user to another via funny, captioned photos known as memes (Shifman, 2013; Spector, 1990). Shifman (2013) explained memes can best be thought of as cultural information passed on from person to person which is gradually shaped into a shared social phenomenon.

The ability to respond to the non-literal language used in humor is essential for socialization and challenge in this area can result in poor social-interactions for children starting at a young age (Jackson et al., 2021). Given that the majority of adolescents, including those with disabilities, have regular access to the internet and that memes are popular and rapidly transmitted amongst this population, understanding humor comprehension though memes for this population is needed.

Internet Humor

Shifman (2007) reviewed websites to determine the types of humor used on the internet. He explained internet humor made a shift from traditional humor, such as jokes, one-liners, short stories, home videos capturing a person's embarrassing moment, commercials, comic lists, and cartoons, to new humor. An example of new internet humor is photos that created humorous situation, for example, a computer mouse on top of a Mars® candy bar captioned, "The first mouse on Mars." Shifman noted while old humor relied strongly on text, new internet humor relied on images or images and text combined to create comical media.

Memes

The term meme comes from the Ancient Greek *mimeme*, meaning to imitate. According to the Oxford Dictionary, the definition of meme contains two parts: (a) an image, video, piece

of text, etc., typically humorous in nature, that is copied and spread rapidly by internet users, often with slight variations and (b) an element of a culture or system of behavior passed from one individual to another by imitation or other nongenetic means. Knobel and Lankshear (2005) define memes as "… contagious patterns of cultural information that are passed from mind to mind and that directly shape and generate key actions and mindsets of a social group" (p. 1). While internet memes may take several forms, a common type (and the one focused on in the current study is image macros. Image macro memes consist of text superimposed on top of a picture. The text delivers humor in various forms and the picture most often supports the text in some manner, either explicitly or explicitly (Harvey & Palese, 2018).

Forms of abstract language including sarcasm, irony, metaphors and idioms are vital to humor comprehension. Reyes et al. (2011) described the types of language used in internet humor. Researchers collected humorous materials from websites and analyzed the types of humor they encountered. Consistent with Honig (1988), Reyes et al. also found humor difficult to measure and noted humorous materials needed an element of challenge for an individual to find it funny. Researchers noted the lexical features of internet humor relied on phonological changes, such as, "What do you use to talk to an elephant? An elly-phone." There were also forms of internet humor that relied on lexical ambiguity, such as, "Jesus saves, and at today's prices, that's a miracle." Finally, Reyes et al. noted an individual must have the ability to read humorous lines in the correct tone in order to correctly interpret the humor.

Humor Development and Comprehension in Typically Developing Children

Despite the prominent role that humor plays in our lives, surprisingly little research has focused on humor development in children. The research that has been done has focused primarily on the cognitive processes involved, specifically theory of mind (Aykan & Nalçaci, 2018) and executive functioning (Bishara, 2016), rather than the linguistic aspects.

Spector (1992) explained the linguistic elements essential for comprehending humor: world knowledge, receptive vocabulary, metalinguistic skills, and understanding of figurative language. Her previous research (Spector, 1990) focused on phonological humor, morphological humor, and ambiguous wording humor, as she noted these elements were often included in figurative language used in humorous situations. Phonological humor involved changes in one

sound of a word (e.g., “Indies,” becoming “undies”) or changing of the stress within a word (e.g., “**re**cess,” vs. re**cess**”). Morphological humor was defined as humor in which a homophone word’s spelling changed, thus changing the word’s meaning (e.g.., “heard” and “herd.”). Finally, ambiguous wording humor involved words with multiple meanings (e.g., “stable”). Spector (1996) later conducted research showing the importance of world knowledge in humor and figurative language comprehension. Spector administered a test of idiom comprehension to children, some of who received previous exposure to the idiom content, and some who did not. Children who previously were exposed to content required to comprehend idioms on a test performed better on the items of idiom comprehension than children who had no previous exposure, which led Spector to conclude world knowledge was important for humor and figurative language comprehension.

Honig (1988) reviewed the available literature related to humor development in children, dated 1954-1988. Honig found the comprehension and appreciation of humor difficult to define and measure, which Honig attributed to the subjective nature of humor, and the fact that smiles or laughter are not always signs of humor comprehension. Regardless of the complexity of measuring humor, Honig found a consistent pattern of humor development in children. Honig found humor development began in infancy, when babies learned to laugh in response to a violation of their expectations. Humor continued to develop from this basic idea of what was funny, and toddlers created simple jokes based on violations of semantic relationships, such as, “Doggie meows.” In preschool, children began to develop phonological awareness, which allowed them to create more complex jokes by using rhyme and nonsense words. At this age, preschool children found the sound changes to words, such as “Little Bo Peep has lost her *steeple*,” funny, but they did not understand that changing the meaning of words also contributed to humor. Honig (1988) noted when children reached Piaget’s concrete operational period, from about ages five to seven and up to ages nine to eleven, they were able to understand words had multiple meanings, allowing more complex humor such as knock-knock jokes and puns. At this stage of humor development, children were able to think in a more abstract way, which allowed them to think logically about inconsistencies, and see humor in these situations.

Honig (1988) also reviewed literature related to the linguistic aspects of humor, including morphology, semantics, and pragmatics. Linguistically, Honig found humor was based on incongruity and resolution. Incongruity referred to the idea that something unexpected happened in a joke which served to arouse, surprise, or mystify the listener. The concept of resolution referred to the notion that the incongruity could be explained or made sensible. Incongruity of humor could be rooted in morphological rules, such as, "What is the key to a good dinner? A turkey!" In addition to recognizing morphological violations, Honig found humor comprehension could depend on a child's ability to recognize semantic violations. The ability to understand humor and realize the resolution to the incongruity was dependent on the ability to detect the meaning of the lexically ambiguous word. Honig also noted lexical ambiguities became easier for children to comprehend after age 10 or 11. In order to understand the ambiguous language of riddles and jokes, children had to have at least a basic understanding of how the world worked. This basic world knowledge included understanding of animals, objects, relative size, and distance. Honig's (1988) review of literature explained children as young as six should be able to identify language rule violations, at least with familiar words, but complex riddles remained difficult for children to understand as late as fifth grade. An example of a complex riddle was, "How is a goose like an icicle? They both grow down." It was important to consider complexity when considering whether or not a child would find something humorous. Honig found when children's cognitive abilities matched the complexity of humor they encountered, they had the most appreciation, but if the humorous stimuli were either too easy or too challenging, children were not likely to find it funny. Honig's (1988) literature review concluded by explaining humor could also depend on violations of pragmatic rules. For example, lying was considered socially unacceptable, but a playful lie could be taken as a joke and, therefore, become socially acceptable. Children as young as six years old appeared to realize humor could be used as an acceptable way to become socially powerful.

Sanford and Eder (1984) explored humor used with peers among adolescents. Consistent with Honig (1988), Sanford and Eder found adolescents tended to use humor to help them achieve social acceptance. For example, adolescents appeared to have high regard for peers who discussed topics typically prohibited in schools, which may be why adolescent humor

includes foul language and dirty jokes (Sanford & Eder, 1984). Sanford and Eder (1984) found adolescents created their own humor by telling funny stories, playing practical jokes, and engaging in humorous behavior, such as dancing in a silly way. Adolescents tended to turn to humor in situations where it was unclear what to talk about otherwise, and often used humor to deal indirectly with sensitive topics and issues. These authors concluded humor was an indirect and complex form of communication; adolescents first needed to learn how to use and interpret it in order to interact with their peers. One thing is clear, children's ability to comprehend humor becomes increasingly dependent on their facility with abstract language, including verbal manipulation (Semrud-Clikeman & Glass, 2008).

Humor Comprehension in Adolescents with Language Disorders

Spector (1990) developed a test of humorous idioms and administered it to adolescents with language disorders and adolescents with typical language development. Spector asked adolescents to select the humorous element of a phrase and explain its meaning. She found adolescents with language disorders performed poorer than their peers with typical language development on tasks of humorous item identification. Specifically, Spector found adolescents with language disorders often failed to distinguish between literal and figurative meanings in words. When adolescents with language disorders were able to identify an ambiguous element in figurative language, they were unable to explain the dual meanings of the word or phrase. Spector noted the combination of these difficulties made it difficult for adolescents with language disorders to comprehend humor.

Qualls et al. (2004) presented idioms in two contexts to adolescents with language disorders and age, gender, and reading-ability matched peers who were typically developing. The first context involved the idiom embedded into a story, and the second was a verification task where adolescents read an idiom and a definition, and then selected whether or not the definition matched the idiom. Overall, adolescents with language disorders performed less well than their peers who were typically developing. Adolescents with language disorders performed better on the verification task than the story task, which led Qualls et al. to believe context was not helpful for adolescents with language disorders when deciphering idiom meanings. Adolescents from both populations performed similarly on idiom comprehension

tasks when they were familiar with the idioms presented, which led Qualls et al. to conclude, concurrent with Spector (1996), that world knowledge was an important aspect of figurative language comprehension.

Humor Comprehension in Children who are Deaf or Hard of Hearing

Research specific to students who are deaf or hard of hearing (DHH) is limited. Sanders (1986) examined humor appreciation with a group of students aged seven to 14 years at a residential school for the deaf; however, Sander's conclusions focused on the role of sign language complexity in the students' perception of "funniness" rather than humor comprehension. Luckner and Yarger (1997) compared appreciation of text-free cartoons in adolescents who were DHH to adolescents with typical hearing and found no significant difference in humor comprehension between the two populations. Nwokah et al. (2013) focused on humor creation in children who were DHH. Nwokah et al. asked children aged five to eight years, who were DHH, and age-matched peers to tell a joke, make up a funny story, and tell about a funny movie or cartoon they had watched. Although their linguistic skills were similar to their age-matched peers, based on informal language sampling, children with hearing loss had difficulty creating humor and did not tell jokes that were funny to the researchers. They had not mastered the non-literal and ambiguous language needed for jokes. Researchers also noted children who were DHH did not use as much "defiance humor," such as "potty jokes," as children who were typically developing, and concluded this may be due to language instruction that was serious, formal, and taught by adults, rather than incidentally learned from peers.

While research on humor comprehension in adolescents who are DHH is thin, the necessary components required for humor comprehension: world knowledge, receptive vocabulary, metalinguistic skills, and understanding of figurative language (Spector, 1992) are well documented as potential deficit areas for students who are DHH (Andrews & Mason, 1991; Convertino et al., 2014; Erickson, 1987; Marschark et al., 2004). Goberis et al. (2012) explored pragmatic language development in children aged two to seven years who were DHH and age-matched peers who were typically developing with normal hearing. Children who were typically developing mastered 44% of the checklist items by three years of age and 95.5% of the items by

four years of age, and by age six years old, had mastered 100% of the items. In contrast, Goberis et al. (2012) found children who were DHH mastered only 6.6% of items with complex pragmatic language by six years of age, and only 69% by age seven. Researchers noted children who were typically developing learned pragmatic language skills incidentally, while children with a significant hearing loss often required specific instruction to understand the importance of these skills and to learn the content knowledge. Goberis et al. (2012) concluded the difference in pragmatic development put children who were DHH at a disadvantage socially.

Trezek et al. (2010) reviewed literature describing the importance of phonology in reading development for students who are DHH. It was well-documented that upon graduation from high school, many students with severe to profound hearing impairment did not have the same reading abilities as their peers who were typically developing. The average 18 to 19 year-old with severe to profound hearing loss had a reading level comparable to the average nine to ten year-old with typical hearing. One explanation for this difference was students who were DHH did not have knowledge of the components of English required for adequate reading skills, including phonology, syntax, and semantics. In a similar literature review, Williams (2012) noted, while phonological awareness skills were believed to be predictive of a child's ease in learning to read, the most important area of linguistic growth during the school-age years was pragmatics. Consistent with Nwokah et al. (2013) and Goberis et al. (2012), Williams (2012) explained many children who are DHH lack basic pragmatic awareness because their hearing loss precludes them from picking up the subtleties and nuances of language use. Williams further explained appropriate pragmatic skills incline others to view one's communication in a favorable light. Conversely, without adequate pragmatic skills, children who are DHH may not be seen favorably by their peers.

During adolescence, verbal interactions heavily rely on an individual's ability to use and comprehend slang, idioms, jokes, puns, and sarcastic comments, so failure to comprehend these elements of communication may result in an adolescent having social difficulties during interactions with peers (Spector, 1990). Since adolescent humor encompasses many of the same elements required for general verbal interaction, adolescents with language disorders and adolescents who are DHH are likely to experience difficulties with comprehending humor

(Luckner & Yarger, 1997; Spector, 1990). Further, adolescents who struggle with humor may experience difficulties in academic settings, because humor is used in literature, by peers, and by teachers in the classroom setting (Spector, 1990). Further, the quality of an adolescent's home interactions also may be reduced as a result of humor difficulties if the adolescent struggled to understand the humor used by his or her parents, siblings, or extended family members (Spector, 1990).

Using Visuals to Teach Non-literal Language

There is a modest literature base regarding the use of visuals to teach the non-literal language of humor in the field of English Language Learners, much of it at the post-secondary level (e.g., Neissari et al., 2017; Salazar, 2016). Similarly, research exist regarding teaching forms of figurative language to K-12 students using visuals; however, this research mainly focuses on literacy and not specifically humor comprehension. For example, the use of graphic novels and comic book characters has been successfully used to improve the understanding of figurative language concepts (Basal, 2016; Williams, 2014).

When it comes to students with disabilities, teaching strategies that incorporate visual supports are considered best-practice and are specifically recommended for populations that may experience particular challenges with language, such as students who are DHH, students with language learning disabilities and students with autism spectrum disorders (Luckner et al., 2001). Yet, research specifically investigating the use of visuals to teach comprehension of non-literal language is scarce. In two older studies (Ezell & Goldstein, 1992; Abrahamsen & Smith, 2000), researchers successfully used pictures to teach idioms to elementary students with intellectual disabilities and those with communication disorders. Whyte et al. (2011) used a picture supported intervention to teach elementary students with autism to learn and retain idiom meanings. Kaye (2018) found that students with specific language impairments performed better in their comprehension and retention of figurative language when provided with explicit instruction and picture supports than did the control group who did not receive picture support.

The Current Study

Humor is often a component of memes, and difficulty with the use and/or comprehension of humor may lead to difficulties with peer relationships, as adolescents frequently use humor during their social interactions (Sanford & Eder, 1984). No study has compared humor comprehension in both populations of adolescents with language disorders and adolescents who are DHH to a control group of their peers nor has a study examined comprehension of captioned graphics, a typical form of memes. This is significant because, while humor is shown to be a prevalent aspect of adolescents' successful social interactions across settings and relationships, these special populations are at risk for poor humor comprehension skills due to the potential impact of the disabilities on language skills.

Research on humor comprehension in adolescents with language disorders and adolescents who are DHH (Luckner & Yarger, 1997; Spector, 1990) was conducted before memes became an internet phenomenon. There is a need to explore how adolescents from these populations comprehend humor in memes and if their comprehension is similar or different to the comprehension of humor in memes demonstrated by typically developing adolescents. Describing this information may be helpful in planning intervention for comprehension of linguistic humor. The purpose of this exploratory study was to examine how adolescents who are a) typically developing, b) who have a language disorder, and c) who are DHH comprehended the humor in internet memes. The specific research question posed was, "How do three groups of adolescents, those who are typically developing, those with a language disorder, and those who are DHH comprehend the humor contained in internet memes?"

Method

Participants

Convenience sampling was used to recruit participants, who included eight adolescents with a language disorder, seven adolescents who were DHH, and a control group of ten adolescents who were typically developing, all between the ages of 12 to 18 years. Participants in the language disorder group were receiving special education services through an Individualized Education Program (IEP) for receptive and/or expressive language disorder, and

those in the DHH group were receiving special education services through an IEP for areas related to hearing loss. Adolescents who were typically developing had no IEP and had no history of receiving language or special education services; however, two adolescents in the typically developing group had received brief speech services for articulation in early childhood.

Materials

Instrument Development

Phase 1. Memes were collected from the internet and divided into three groups: those with ambiguous wording, those with phonological humor, and those with humor dependent on world knowledge. The first two categories were further subdivided into those in which the picture contributed to the meaning and those in which the picture was unrelated to the text. For the world knowledge memes, only those in which the picture contributed to the meaning were used; thus, five types of funny memes were included. A sixth category of not-funny memes was developed which contained a cliché text phrase and a standard, not funny picture. Reading levels for this pool of memes were calculated using an online readability score calculator, readability-score.com. The meme pool was narrowed to a total of 102 memes with an average reading level of 3.5, or a mid-third grade level.

Phase 2. A panel of seven graduate students rated these 102 memes using a rating scale of 1, 2, and 3, in which 1 meant the meme was "not funny," 2 meant the meme was, "somewhat funny," and 3 meant the meme was "funny." Memes consistently rated as "not funny," earning an average score of 2.43 or lower, were discarded.

Phase 3. Sixty-eight remaining memes were screened by two separate groups of adolescents (n=13) using the same rating scale as the graduate students. Forty memes consistently rated as funny, earning a score of 2.38 or higher, were used to create a paper-based, multiple-choice assessment. In addition, eight memes consistently rated as not funny, earning a score of 1.38 or lower, with no adolescents scoring it as a "3," were included as not-funny memes. Each assessment item used the carrier question, "Why is this funny?" The following options were available as multiple-choice answers:

1. It's not funny.
2. It's funny because the words have multiple meanings.

3. It's funny because the words sound like other words.
4. It's funny because the picture is funny, but the words aren't funny.
5. It's funny because I could imagine this happening or I have done something similar.

Phase 4. The assessment was piloted with five graduate students in speech-language pathology with the length of time taking each graduate student to complete the assessment ranging from 10 to18 minutes. The assessment was revised to only have eight memes per each of the six categories, yielding a 48-question assessment.

Phase 5. This 48-question version was piloted with three adolescents, two males and one female, ages 12, 15, and 16 years. Following completion of the pilot, two randomized versions of the assessment were developed, each containing eight questions in each of the six meme categories:

1. Ambiguous wording with contributing picture;
2. Ambiguous wording without contributing picture;
3. Phonological humor with contributing picture;
4. Phonological humor without contributing picture;
5. Humor dependent on world knowledge; and
6. Not-funny memes

The final version of the assessment was printed single-sided in full color on standard 8 ½ x 11" paper with two-to-three memes per page. See Appendix for examples of the six meme categories.

Procedures

In order to control for reading ability being a variable in meme comprehension, participants were screened to comprehend written language at a third-grade reading level using a reading passage and related questions from *Qualitative Reading Inventory—5* (Leslie & Caldwell, 2011) prior to participation in the study. Only participants whose screening results indicated a written language comprehension level at or above third-grade were included in the study. While it is acknowledged that certain demographic characteristics of both special population groups could influence each participant's humor comprehension, a limitation of this study is that the only variable controlled for was reading comprehension. While factors such as

age of onset of hearing loss, age of intervention, degree of hearing loss, and communication modality may influence a child's performance, the main influence is relative to language skills and by extension, reading comprehension.

The assessment was administered to participants either individually or in small groups of two to six students in a quiet and familiar setting. The purpose of the study was explained to participants prior to test administration and informed student assent and parental consent documentation was obtained. The principal investigator provided instructions verbally and in writing on a plain white piece of paper. An example test item was provided along with the instructions to ensure the participant understood the test directions. Assessments took approximately 20 to 30 minutes for participants to complete. Test responses were entered into an Excel document. Identifying information was removed, and each assessment was marked by a confidential identification number. Descriptive statistics were used to analyze the raw data and represent it through percentages for each of the three adolescent populations.

Results

Total Test

For the total test, adolescents who were typically developing selected the correct answer 68% of the time, while those with a language disorder and those who were DHH received similar total test scores at 28% and 26% respectively. Table 1 shows the percentage correct for each group of participants on the meme comprehension instrument. Adolescents from each population were best able to identify "not funny" memes. Adolescents who were typically developing out-performed their peers with language disorders or peers who were DHH in all categories.

Adolescents who were DHH performed slightly better than adolescents who had a language disorder on phonological related memes, while the reverse was true for world knowledge memes. Both the DHH and the language disorder groups performed similarly on multiple meaning related memes.

Error Analysis

An informal error analysis was conducted in order to examine the types of errors made by each population for each of the meme types. While the small sample did not allow for

sophisticated analysis, some general patterns were noticed. The one error in which the three populations performed most similarly was missing the world knowledge humor and explaining it as "only the picture was funny". Adolescents with a language disorder tended to answer "it isn't funny" for their incorrect answers, while adolescents who were DHH most often defaulted to "only the picture is funny, but the words aren't funny" as errors. Other than the world knowledge memes, no specific meme type(s) appeared to be more or less difficult for the adolescents in this study. Contrary to expectations, memes with supporting pictures did not appear to be better understood by any of the groups.

Table 1

Percentage of Memes Correct by Type for all Groups.

Meme Type	Typically Developing N=10	Language Disorder N=8	Deaf/Hard of Hearing N=7
Total Test	68%	28%	26%
World Knowledge	56%	34%	20%
Multiple Meaning + Related Picture	65%	19%	21%
Multiple Meaning + Unrelated Picture	68%	19%	20%
Phonological + Related Picture	63%	20%	27%
Phonological + Unelated Picture	55%	17%	23%
Not Funny	100%	55%	48%

Informal observations. The impressions of the participants were not formally probed during this study; however, two anecdotes are worth mentioning as they may support future research directions. One adolescent who was hard of hearing was laughing hysterically while taking the assessment. When asked, "What's so funny?", he pointed to the meme and responded, "I am afraid of dogs, but this dog has his mouth open, so he looks funny." This student's explanation may support the theory that adolescents who are DHH have a tendency to focus on the funny pictures in memes, rather than the text. Another adolescent with a language disorder was observed to reason through the memes aloud. For example, he read the meme, "Does anyone need an ark built? I Noah guy." He looked to the researcher and said, "What is 'Noah?' Is he a guy in the Bible? I have a friend named Noah… It sounds like 'know-

ah…'" The student eventually decided he would mark, "Not funny" for his answer. Although he recognized the potentially humorous element, he was unable to determine the correct answer.

Discussion

Adolescents with language disorders and who were DHH had more difficulty identifying humorous elements in memes than their peers who were typically developing. Results from the present study were consistent with those of Spector (1990), which showed adolescents who were typically developing were better able to identify humorous elements of figurative language than adolescents with language disorders. Anecdotal evidence in which the student recognized the humorous element, but was unable to determine why it was humorous, was also consistent with research by Spector. Spector (1990) found even when adolescents with language disorders were able to recognize a humorous element, they were often unable to explain *why* it was humorous. Honig (1988) explained humor requires an element of challenge—an individual will not appreciate humor that is too challenging. Comprehension of world knowledge was similarly consistent with other studies. Adolescents who were DHH performed poorer than their peers with language disorders in world knowledge memes. This was consistent with Trezek et al., (2010), who said individuals who are DHH have limited experience with mainstream world knowledge due to lack of incidental learning opportunities.

Luckner and Yarger (1997) suggested all people are born with a sense of humor and appreciate humor in some form. While no adolescent received a perfect score on the assessment, no adolescent received a score of zero either, which showed all participants comprehended some of the memes in the assessment. The adolescents often smiled, laughed, or talked with one another, and most of them were able to point to one meme they found to be their favorite. Although they may not have comprehended all of the humor in the memes, all adolescents in this study were able to appreciate the humor in some of the memes.

The authors of the present study hypothesized memes with a picture related to the text would be easier for adolescents to comprehend than memes with a picture unrelated to the text. Spector (1990), suggested contextualizing figurative elements would aid adolescents' comprehension. Her suggestion stood in contrast to research by Qualls et al. (2004), who suggested context was not important for helping adolescents to decipher the meaning of

figurative language. Results from the present study aligned with those of Qualls et al., as there was no significant difference between adolescents' performance on memes with pictures related to the meaning and memes with unrelated pictures. This lack of contrast held true for all three groups of participants; visual support did not improve comprehension of humor.

Speech-language pathologists and teachers of students who are DHH often use additional context as scaffolding and support when teaching a new skill to students; however, results from the present study suggested context did not aid adolescents' comprehension of humor in memes. Adolescents who were DHH often selected the answer, "The picture is funny, but the words aren't funny," which may have meant they were so focused on the picture, they ignored the text of the meme when choosing their answer. Adolescents with language disorders often selected "It is not funny," for memes. Spector (1992) suggested frustration is one result of not understanding humor. Perhaps these adolescents were focused on trying to comprehend the text, and they did not use all of the clues to comprehend it, or conversely, the picture added one more element to try to comprehend, and, therefore, was not helpful.

Intervention Implications

Results from this study showed adolescents with language disorders and adolescents who are DHH had a deficit in comprehending humor when compared to their typically developing peers. Examples of phonological, multiple meaning, and world knowledge humor can easily be found on the Internet and used with students to develop their understanding of these types of humor. Spector (1992) suggested, first, teaching adolescents to recognize the element of incongruity in humorous statements, and then how to find the statement of resolution. She also suggested screening adolescents' humor knowledge by presenting a variety of humorous statements, those containing world knowledge, multiple meaning, or phonological humor, to determine which element the adolescent struggled with most, and, therefore, which humorous elements to target first. As previously discussed, internet humor has shifted away from these forms of humor to the meme (Shifman, 2007). Memes may, therefore, be an appropriate therapy tool speech-language pathologists and teachers of students who are DHH may use to teach humor.

Direct instruction in the area of humor may help adolescents with language disorders and who are DHH to use humor appropriately when interacting with their peers who are typically developing (Spector, 1990, 1992; Williams, 2012). Adolescents who were DHH and adolescents with language disorders struggled to identify memes that were not funny in addition to the elements of humorous memes; therefore, they may also need direct, explicit, authentic instruction in recognizing what is *not* funny. It is important to note, as no student received a perfect score on the assessment, adolescents who are typically developing may also benefit from direct instruction in the elements of humor.

Limitations and Directions for Future Study

The small sample size of participants limited the rigor of this study's data analysis. A second group of limitations applied specifically to students who were DHH. First, participants' degree of hearing loss varied from mild to severe, which made the sample diverse, but limited the ability to draw conclusions about the influence of hearing loss severity on comprehension of the memes. Secondly, some participants who were DHH attended a residential school, while others were in a public-school setting. Students who were DHH in inclusive settings may have had more exposure to the humor used by their typically developing peers than those who attended the residential school. A third limitation was due to the nature of humor. As noted by Honig (1988), humor has a subjective element. Just because a participant found a meme, "not funny," even if the meme was intended to be humorous, did not mean he or she was wrong. It may have meant the meme did not fall within his or her level of cognitive challenge (Honig, 1988), or it simply may not have appealed to the adolescent's sense of humor.

While this study explored whether students were able to comprehend the humor in memes, it did not examine why the adolescents suggested the answer they did. Future research may involve administration of the test in a one-on-one setting in which the researcher asks the participant to explain his or her choice. Future research also may include the use of captioned videos, known as "gifs," which are another form of meme, or text message conversations which include memes, to see if adolescents are able to comprehend the meaning of the entire conversation. The present study did not include a comparison of adolescents' reading levels to their performance on the memes comprehension test. Future research may consider the effect

reading level plays in an adolescents' ability to comprehend the humor of memes. Finally, future research may focus on effective methods of teaching humor to adolescents through memes. Evidence-based instructional strategies related to the components of humor including figurative language, background knowledge and phonological humor, could be systematically examined to determine the impact of this direct instruction on student comprehension of humor found in internet memes.

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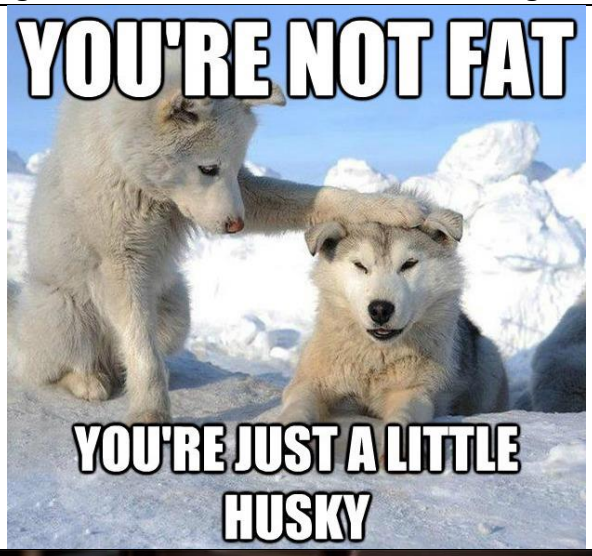
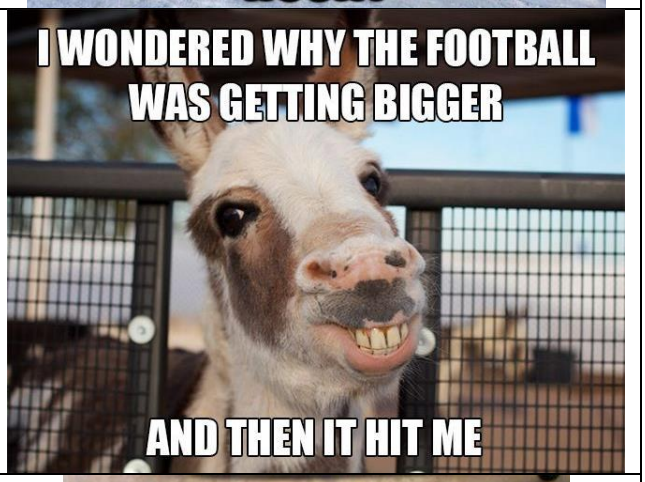
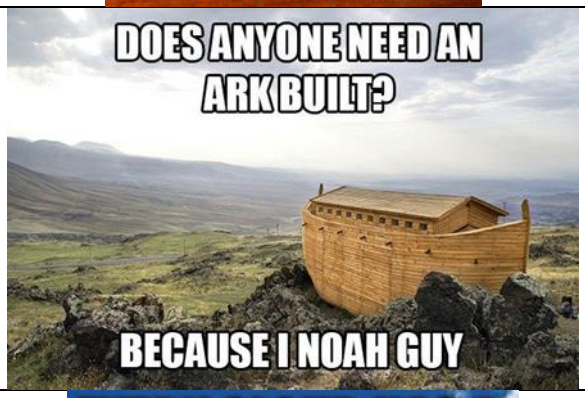
Appendix: Instrument Sample Containing One Meme from Each of the Six Categories

Ambiguous wording with contributing picture.	
Ambiguous wording without contributing picture.	
Phonological humor with contributing picture.	

Phonological humor without contributing picture.	
Humor dependent on world knowledge.	
Not-funny.