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IDIOM INTERVENTION FOR CHILDREN WITH AUTISM

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Abstract

Typically developing children learn idioms and other figurative language during childhood and adolescence. However, most children with autism fall behind in their idiom comprehension, and never fully reach adult levels. The current study measured the effectiveness of an idiom intervention for 11 children, age 7 to 12, with autism spectrum disorders. The results of the intervention showed large gains for the idioms included in teaching activities during the two week intervention program. In addition, relationships were found between children's performance on idiom comprehension tasks and their current theory of mind abilities and vocabulary levels. Autistic children's comprehension of idioms is likely related to their ability to understand the intentions and feelings of others, as measured by theory of mind tasks. Future interventions to facilitate figurative language skills in children with autism or Asperger's Syndrome could build on this initial intervention study by increasing the scope of the intervention.

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Introduction

Figurative language is defined as having both a literal and non-literal meaning. The literal meaning of a sentence can be described as the meaning of the words without context, or when there is a match between both what the speaker says and what the speaker implies (Winner, 1988). The non-literal (figurative) meaning requires that what the speaker implies does not explicitly match what the speaker says. Idioms are one example of figurative language. Idioms can usually convey more than one meaning, dependent on the linguistic context in which they are presented (Spector, 1996). An idiom such as "kick the bucket" may be interpreted either as someone literally performing that action (e.g., All the water spilled out when John kicked the bucket), or the figurative meaning to convey that something or someone died (e.g., Mary cried for weeks when her rabbit kicked the bucket). However, idioms vary on how much a literal interpretation makes sense (eg. It was raining cats and dogs), and the figurative meaning is often used more than the literal meaning in context. An important aspect of idioms is that the phrase as a whole conveys a non-literal meaning that is different from that suggested by the individual words (Titone & Connine, 1994). Idiomatic expressions are also defined as occurring frequently in the language (Nippold, Moran, & Schwartz, 2001).

Idioms and other figurative expressions: Typically developing children

Children in elementary school are able to interpret some idioms, and idiom comprehension increases throughout childhood and adolescence. In Ackerman (1982), children as young as six were able to interpret a small percentage of idioms when they were presented in a context biased towards the figurative meaning, however the percentage of idioms correctly interpreted increased significantly with age for 8 and 10-year old children, with none of these age groups reaching adult comprehension levels. Children age six produced the figurative meaning 30 percent of the

time in a figurative context, whereas children age eight produced the figurative meaning 70 percent of the time, and children age ten produced the figurative meaning 79 percent of the time.

The tasks used to measure idiom comprehension seem to have some effect on the number of correct responses provided, especially for young children. Children generally perform better on multiple-choice tasks than definition tasks (Ackerman, 1982; Kerbel & Grunwell, 1998a; Norbury, 2004; Spector 1996). However, multiple-choice tasks may not always be preferable for measuring comprehension due to the problems involved with choosing suitable foil pictures. Depending on the types of foils chosen, the tasks can become either too simplistic or too confusing, and definition tasks may provide more sensitive results than multiple-choice tasks (Norbury, 2004).

In addition, Tittone and Connine (1994) highlight how properties of the idioms themselves vary between items, and thus may influence comprehension. Familiarity relates to how commonly that phrase occurs in language, and how well known it is. Another factor related to comprehension is compositionality, where idioms may vary on how much the individual words contribute to the idiom's meaning. A third influential factor is literality. Idioms may vary on how much they can be interpreted literally ("raining cats and dogs" makes little sense if used literally, versus "kick the bucket" which has a stronger literal meaning). Since these factors are known to influence comprehension, it will be important to control for these factors as much as possible when picking stimuli for comprehension tests and intervention items.

Figurative language is relatively common in children's literature and in mainstream classrooms (Colston & Kuiper, 2002; Kerbel 1997; Lazar, Warr-Leeper, Nicholson, & Johnson, 1989). Lazar et al. (1989) found that idioms were used relatively frequently by teachers in the classroom, and that idiom use in the classroom increased in frequency across grades one through

eight. Kerbel (1997) found that teachers of children with language impairments used idioms in the classroom at a rate of 1.73 idioms per minute, which did not significantly differ from teachers of mainstream classrooms, who had a rate of 2.04 idioms per minute in the classroom. Considering that idioms are common in classroom environments, it may be important for children with difficulty in understanding figurative language to receive additional instruction with this type of linguistic material to help aid them in understanding the language being used in classroom instruction.

The development of figurative language is a difficult process for children, which involves various complex linguistic and cognitive skills (Levorato, 1993). The role of context has been highlighted for both typically developing and disordered children. Vosniadou (1987) suggests that both linguistic and contextual information is used to understand the meaning of metaphors, especially in young children. Children are more likely to provide figurative interpretations for idioms when they are presented in a context biased towards the figurative meaning (Ackerman, 1982). Children have a more difficult time interpreting unfamiliar idioms, and may rely more on context for interpreting unfamiliar idioms than familiar idioms (Nippold, 1985; Nippold & Taylor, 2002). Levorato and Cacciari (1992) found that typically developing children, ages 6 to 12, are more likely to choose the figurative meaning of idioms when the idioms are presented in context biased more towards the idiomatic meaning than when presented in a literally biased context or presented without a context. In a multiple-choice task, children age seven chose the idiomatic meaning 50 percent of the time for familiar idioms presented in a figurative context, and 34 percent of the time for familiar idioms in a literal context (Levorato & Cacciari, 1992). In this same task, children age nine chose the figurative meaning 64 percent of the time for familiar idioms in the figurative context, and 46 percent of the time in the literal context. The results from

Ackerman (1982) show a similar trend, where children in third grade gave an idiomatic explanation 70 percent of the time in an idiomatic context, 27 percent of the time in a neutral context, and 8 percent of the time in a literal context. Even for children age 14 through 17, context aids the interpretation of idioms (Nippold & Martin, 1989). Idioms may require more interpretation of context for children than for adults since children have less knowledge of the conventional interpretations of idioms (Ackerman, 1982).

In line with the above observations for idiom development, metaphor, simile, irony, and other forms of figurative expressions develop relatively late in typically developing children (Dews et al., 1996; Malgady, 1977; Winner, Rosenstiel, & Gardner, 1976). That is, compared to mastery of the basics of grammar and vocabulary by age seven, figurative language development occurs at a slower pace in the preschool years, and shows gradual increases through primary and secondary school years. Understanding of complex figurative language without supportive nonverbal context is usually not achieved until adolescence. For example, Dews et al. (1996) found that children age 8 and 9 were better able to understand verbal irony better than children age 5 and 6, but that children age 9 were still not yet reaching adult levels of comprehension.

Idioms and other figurative expressions: Children with Autism and language delays

While understanding figurative language may be difficult for all young children, it is significantly more difficult for children with autism or language disorders (Bernstein, 1987; Dennis, Lazenby, & Lockyer, 2001; Happe, 1995; Kerbel & Grunwell, 1998a; Kerbel & Grunwell, 1998b; Lyons & Fitzgerald, 2004; Norbury, 2004). Children with autism or language impairment have difficulty understanding idioms and are more likely to provide literal meanings to idioms than their typically developing peers (Kerbel & Grunwell, 1998b; Norbury, 2004). Norbury (2004) found that children with autism performed significantly worse in an idiom

definition task than typically developing children. Autistic children with language impairment performed even worse than the autistic children without language impairment, showing that language ability is a significant predictor for idiom comprehension ability (Norbury, 2004). Nikolaenko (2004) found that children with Asperger's syndrome (high-functioning autism), ages 10 to 15, provided the correct interpretation for idioms and metaphors only 45 percent of the time, whereas even typically developing children age 7 to 8 performed better than the autistic children for both metaphors and idioms. In the idiom condition alone, typically developing children, age 9 thru 15, performed around 90 percent correct. Children with Asperger's syndrome, age 10 thru 15, were performing below 40 percent in the idiom task (Nikolaenko, 2004).

When assessing idiom comprehension, providing context is desirable since children may use the context to help them determine the meaning of idioms they are not familiar with. However, children with language impairments may benefit less than typically developing children (Qualls, Lantz, Pietrzyk, Blood, & Hammer, 2004; Norbury, 2004). Qualls et al. (2004) suggest that the ability to make use of context may rely on linguistic processing resources which are reduced in language disabled individuals. Norbury (2004) found that while autistic children with language impairments may not benefit from the use of context, autistic children without structural language impairments may be able to use context to aid their interpretation of idioms.

Relationship between Theory of Mind and figurative language

Acquiring the meaning of figurative language involves not only the ability to understand the individual words, but the ability to abstract and use information from the social context in which the figurative language is presented. Being able to understand these more pragmatic aspects of language has been linked with the ability to understand the mental states and beliefs of others

(Dennis, Lazenby, & Lockyer, 2001). Children with high-functioning autism may fail to understand pragmatic aspects of communication even if they have fluent language abilities in non-figurative domains. The intentionality of the utterance may be more difficult for autistic children to understand than the ambiguity of word meanings (Dennis, Lazenby, & Lockyer, 2001). Hale and Tager-Flusberg (2005) found that discourse skills in children with autism are related to theory of mind abilities, beyond the contribution made by basic language skills. Theory of mind is defined as a person's ability to understand and the beliefs and mental states of others, and being able to use that information to predict and explain the other person's behavior (Leslie, 1987). False belief tasks are a common measure of theory of mind. Typically developing children increase in performance on false belief tasks between age three and five, and perform above chance by age five (Wellman, Cross, & Watson, 2001). Autistic children have deficits in developing their theory of mind, where even if they are able to pass these easier false belief tests, they are delayed in their acquisition of this ability and often fail other measures of theory of mind that are considered to be more challenging (Baron-Cohen, 2001).

Happe (1993) suggests that figurative language requires the listener to have some understanding of the intentions of the speaker. Thus, deficits in understanding the complex aspects of speaker intent in figurative language may be related to deficits in theory of mind (Happe, 1993). Martin and McDonald (2004) found that theory of mind reasoning was related to figurative language comprehension for children with Asperger's syndrome. The ability for children with autism to pass advanced theory of mind tasks was significantly related to their understanding of irony (Martin & McDonald, 2004). Norbury (2004) found that while theory of mind and idiom comprehension were correlated with each other, once language ability had been controlled for, theory of mind did not contribute significantly to idiom comprehension. However,

Norbury (2004) suggests that since theory of mind in this experiment was measured by answering questions about false belief in the context of short stories, the linguistic load may have contributed to the lack of relationship once language had been controlled for. Using theory of mind tasks that have a reduced reliance on more complex aspects of language comprehension may help clarify the relationship between theory of mind and figurative language. For children with language impairment, tasks involving recognizing and defining idioms were both correlated to theory of mind performance (Sahlen & Reuterskiold-Wagner, 1999). Sahlen and Reuterskiold-Wagner (1999) used a "droodles" false-belief task to evaluate theory of mind, which has less of a linguistic load than the measure used by Norbury (2004). In the "droodles" task, the children were shown whole pictures and then a fragment of the pictures, and asked questions about how a friend may interpret what each picture was when they could only see a fragment of the picture (Sahlen & Reuterskiold-Wagner, 1999).

Tager-Flusburg (2001) describes a distinction between a social-perceptual and a social-cognitive component of theory of mind. The social-cognitive component is typically measured using False-belief tasks. Development of the social-cognitive component of theory of mind may depend on language development. Tager-Flusberg & Joseph (2005) state that some children with autism may be able to pass false belief tasks by using language (and especially knowledge of verbs) to think logically about the answer without having the knowledge about mental states which is used by typically developing children to pass false belief tasks. The social-perceptual component of theory of mind can still be impaired in children who are able to use language to pass false belief tests (Tager-Flusberg & Joseph, 2005). This suggests that measures of the social-perceptual component of theory of mind may give us a better understanding of the relation between understanding the beliefs of others and understanding figurative language. The social-

perceptual component of theory of mind has been measured in children and adults using the "mind in the eyes" task (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001; Baron-Cohen, Wheelright, Sprong, Scahill, & Lawson, 2001). Baron-Cohen, Wheelwright, Sprong, et al. (2001) argue that this task measures more than just emotion recognition because of the use of mental-state terms (such as "making somebody do something"). However, the relationship between recognizing basic emotions and abilities on the "mind in the eyes" task has not been fully explored in children. Tager-Flusberg (2001) states that the development of the social-perceptual component of theory of mind is not likely to be as dependent on language development as the social-cognitive component, but new empirical work is needed for this relationship to be understood. Children with autism score lower on the "mind in the eyes" task than typically developing children, showing that autistic children have a deficit in this aspect of theory of mind development (Baron-Cohen, Wheelwright, Sprong, et al., 2001; Brent, Rios, Happe, & Charman, 2004). Brent et al. (2004) found that the eyes task was significantly correlated with a standardized measure of language abilities, which makes this test promising for examining the link between theory of mind and language, without relying only on false belief tasks in autistic children. However this "mind in the eyes" task has not been used to examine the link between theory of mind and figurative language.

Idiom Intervention Studies

Several intervention studies have been conducted with children to teach them idioms. Abrahamsen and Smith (2000) used computer-based and classroom-based interventions to effectively teach idioms to children with communication disorders. The eight participating elementary school children included a heterogeneous group of children with communication disorders, some of whom had co-morbid diagnoses such as ADHD, cerebral palsy, and

articulation disorder. The intervention lasted for eight weeks, with one idiom presented in the classroom and one idiom presented in the computer intervention, for a total of sixteen idioms. The classroom intervention used role-playing to demonstrate the figurative meaning of the idioms. The computer-based intervention involved presenting the idiom, with the therapist explaining the meaning of the idiom. The students learned better from the classroom intervention than the computer-based intervention, since the classroom group lessons allowed for more interactive and naturalistic dialogue (Abrahamsen & Smith, 2000).

In Ezell and Goldstein (1992), the meaning of idioms were taught to four children, age nine, with mild mental retardation. The idioms were presented in context biased towards the figurative meaning with sets of pictures depicting idiom meanings, and each child learned individually with an adult trainer. Children were taught a total of 12 idioms, with sessions four days a week for several weeks, with up to 20 sessions in the intervention phase. The children learned to discriminate between the literal and figurative meanings of the idioms used in their training sessions, which may be important component to understanding the meaning of idioms (Ezell & Goldstein, 1992). However, neither of these studies included children with autism spectrum disorders. Given the reported deficits in idiom comprehension for children with autism, intervention strategies for autistic children should be explored as ways of refining theoretical accounts and improving intervention effectiveness.

Norbury (2004) suggests that children with language impairments (including autistic children) should be taught how to comprehend idioms with a focus on presenting idioms in context to help this understanding generalize to idiomatic expressions that are unfamiliar to them. Wiig (1989) provides some general instructions for teaching figurative language, such as metaphors. One objective should be for the children to develop strategies for interpreting figurative language,

such as using the context to help interpret the meaning of the phrase and being able to judge whether an expression is meant to be figurative or literal. To do this, Wiig (1989) suggests that questions should be raised about whether the expression describes something that could not possibly be true, or if the expression is "off-topic" where the person speaking tells about something which is different from what they are talking about. Therapists can also aid students in forming multiple hypotheses about the meaning of features in the context and individual words in the expression that may help aid the interpretation of the idiom. Strategies can also be used for recognizing meaning from the prosody of the speaker, to highlight whether an expression's meaning is positive or negative (Wiig 1989). In a case study of figurative language instruction with a typically developing child who was learning English as a second language, Palmer, Shackelford, Miller, & Leclere (2006) found that certain strategies such as explicit instruction, using dialogue in context, and connecting meaning to the real world may help improve the child's understanding of figurative language.

Nippold (1991) suggests that idioms should be taught to children in by presenting the idioms in the context of a short story, which should be read aloud. The children should be asked questions about the story that draw attention to contextual cues supporting the idiom's figurative meaning, and then asked the meaning of the idiom (while providing feedback and discussion of the appropriate answers). The goal of this teaching approach is to emphasize a comprehension strategy based on drawing active attention to the multiple contextual clues, which may be more helpful for the children than simply teaching the meanings of a set of idioms outside of any contextual framing (Nippold, 1991).

The purpose of the current study is to examine the factors influencing idiom comprehension and learning in autistic children during an idiom training intervention designed for children with

autism. To measure the comprehension of idioms, children were given a definitions task, where they were asked to define the idiom based on a short paragraph. For tracking of progress, eight treatment idioms and eight control idioms with low comprehension by the children, were chosen from the pre-test. The current study hypothesizes that autistic children will score better on the treatment items after the intervention is complete than before the intervention. In addition, it is predicted that the autistic children will score better on the treatment items than the untreated control items at post-test. The current study also evaluates the relationship between idiom comprehension at pre-test and theory of mind at pre-test, where it is hypothesized that children who score higher on theory of mind tasks will also perform better on the idiom comprehension tasks.

Methods

Subjects

Participants were 11 autistic children, age 7 to 12, who were enrolled in a summer social skills program for autistic children in Pennsylvania. One of the children was female, while the other 10 were male. During the summer, the social skills program was conducted five days a week, for three hours each day. Signed consent was obtained from the parents of each child, and signed assent was attained from each child prior to participating in this study.

To be enrolled in the social skills program, a child must have a diagnosis of an autism spectrum disorder. As identified by a parent report questionnaire, the children in this study had a primary diagnosis of autism or Asperger's syndrome. Parent report indicated that five of the children also had a secondary diagnosis of Attention Deficit Disorder, two of whom were also diagnosed with mental retardation. Parental report also indicated that one child had a secondary diagnosis of Cornelia De Lang syndrome and mental retardation.

The group of children was fairly heterogeneous, with a wide range of verbal and academic abilities. Most of the children in this social skills program were described by the staff of the program as being higher functioning with relatively good basic language abilities in vocabulary, syntax and reading abilities. However, the staff reported that some of the children in their program have relatively good verbal abilities with low reading abilities, and some children have low verbal and reading abilities overall. In addition, parents reported that four of the 11 children attended speech therapy sessions outside of the program (usually provided by their primary school services during the school year). Although a few children are lower functioning with mental retardation and low verbal abilities, the success of Ezel and Goldstein (1992) with teaching idioms to children with mental retardation suggested that there could be some improvement even for the lower functioning children. Thus, even the autistic children with mental retardation were included in the present idiom intervention study.

Pre-test measures

Language assessments. Each child was administered the Peabody Picture Vocabulary Test – III (PPVT-III) individually by an experimenter (Dunn & Dunn, 1997). The PPVT-III employed here measures vocabulary comprehension. Children are told to match a word spoken by the experimenter to one of four black and white pictures on a page. Children responded by pointing to the picture. There are 204 test items, divided into sets of twelve. The children completed a subset of those items, based on their age and meeting a basal criteria (missing one or fewer items) for identifying the appropriate start item difficulty. The testing is completed when children meet the ceiling criteria of missing eight or more items in a set. The children's final scores are determined by calculating their raw score and their standardized score using the provided set of norms.

Idiom pre-test. Each child was administered an idiom definition pre-test. The 26 idioms used in this study were chosen from Titone and Connine's (1994) list of 171 idiomatic expressions with descriptive norms for adults. Items were chosen to be moderate to highly familiar and meaningful, therefore items were excluded if they had a score of less than 3.4 on a 7 point scale for familiarity or less than 5 on a 7 point scale for meaningfulness. In addition, since the ratings were done by college students, idiom items for this pre-test were restricted to items judged appropriate for children in the intervention setting; that is, for children with low-to-moderate language skills and content suitable for teaching the children.

The 26 idioms were presented in the context of a paragraph biased more towards the figurative meaning of the idiom, since this type of context has been shown to enhance idiom comprehension (Ackerman, 1982). For example, the practice idiom, raining cats and dogs, was presented as: Maria's clothes were wet when she came home from school. She hung her umbrella on the back of the door and took off her coat. She told her mom, 'Wow, it sure is raining cats and dogs outside'. Then, the child was asked, "What does raining cats and dogs mean? The child was provided feedback (correct or incorrect) only provided for the practice item. The twenty six test items were presented in a similar sentence format as the practice item. The child provided a verbal response to each item, which was coded following the classifications used in Abrahamsen and Smith (2000). These classifications are: correct (figurative meaning), related (to figurative meaning), literal, restated, or not related (to the idiom).

Correct figurative responses were scored as one point. Related figurative responses were scored as half a point, as related answers showed that the children were trying to think figuratively about the idiom, but did not yet know the correct figurative answer. Literal, restated, or not related items (including non-responses) were scored as zero. Scores were recorded as total

correct responses, as well as proportion correct (their total score of correct and related items divided by the number of items). Proportion scores are reported for the purposes of analyzing the data for post-test intervention items where children did not attend all days of the intervention, so that the results would not be skewed by differences in attendance.

The results for the individual items of this pre-test were used to determine which idioms to target in the group and intervention phase, and for control-tracking, with the goal of having most of the treatment and control items for any child being items that the child failed at pretest. From the total of 26 idioms, a sub-set of 18 items were chosen based on being incorrectly answered the most often across children in the pre-test. From these 18 idioms, nine were chosen as the group treatment items (which were taught to the children) and an equally difficult group of nine idioms were chosen as the control items (which were not taught to the children). The 26 items on the pre-test are therefore classified as treatment items (taught to the children), matched controls (untaught idioms matched to treatment items), or excluded items (items not included in pretest vs. control analysis). See Appendix A: Idiom Pretest Items.

Equal difficulty for the treatment and control items was assured by pairing treatment and control items based on the number of correct and related responses the children gave, along with number of words in the phrase. The remaining items were excluded from treatment or control items based on more children correctly identifying them on the pre-test, but are included in overall analysis. In addition, idiom treatment/control pairs were matched as closely as possible for ratings of frequency, decompositionality, and literality given by college students reported in the study by Titone and Connine (1994). Since learning of idioms may potentially occur outside of the program, control items were selected to see if the children showed increases in the post-treatment phase for items that were not taught during the intervention. Thus, control items were

necessary to ensure that treatment gains were not likely the cause of exposure to the pre-testing procedures or to exposure outside the program. However, some gains made to non-treatment items could also be expected if children were generalizing their learning strategies to the untreated idiom phrases.

Theory of Mind tasks. During the pre-testing phase, children were administered a false-belief test to measure their first-order Theory of Mind performance. The unexpected contents (Smarties) test was used (Perner, Frith, Leslie, & Leekam, 1989). A crayon box and toy car were used as the stimuli, as these items were familiar to the children in the intervention setting. The experimenter pulled out a crayon box and showed it to the child and asked the child, "what do you think is in here?". With "crayons" being the expected response. When the experimenter opened the box, the child saw that there was an unexpected object (a toy car) instead. The children was shown the car and asked "What is this? What did we really find in the box?" Then, the experimenter put the toy car back in the box. The experimenter asked the false belief question, about the program's director (Betzi), saying that "Betzi hasn't seen what is inside the box before. If Betzi comes in and I show her the box just like this and ask: "Betzi, what do you think is in here?' What will Betzi first think is inside the box?" Where the child responded either "car" or "crayon." Next, the children were also asked about their own false beliefs, "when you first saw the box, what did you first think was inside the box?'. Finally, the experimenter asked, "What is really inside the box?" to make sure the child remembers what was really in the box. A correct response to the false belief task (what will Betzi think is inside the box, or what did you first think was inside the box) is the type of container (crayon box) and not the contents of the box (car). Children can score between zero and two on this task, where a score of two represents correctly identifying both their own and someone else's (Betzi's) false beliefs.

The child version of the "mind in the eyes" test was used as an additional measure of theory of mind (Baron-Cohen, Wheelwright, Sprong, et al., 2001). This test consists of 27 faces from males and females with only the eye-regions of each face showing. Around each set of eyes were four possible answer choices. During the pre-testing phase, children were shown each picture and asked to choose which of the four possible choices best describes the thoughts or feelings of the person in the picture. These choices include words and phrases such as: friendly, worried, kind, thinking about something, not believing, shy, serious, joking, bossy, interested, and ashamed. The word choices were read aloud to each child, to help prevent reading ability from impacting the results. Responses were recorded by the experimenter. Only one of the four choices is considered correct, allowing for a score up to 27 on this test. Higher scores represent better accuracy in judging the thoughts and feelings from information from the eye region of faces.

To ensure that the children's scores in the "mind in the eyes" task were not just based on recognizing basic emotions, but were indeed based on more complex theory of mind skills, an additional test was created that closely mirrored the "mind in the eyes task", using the eye regions of pictures. However, this basic emotion task only included the same four basic emotion words paired with each basic emotion picture (happy, sad, angry, and scared), rather than the full range of terms used in the "mind in the eyes" task. The correct response for each item scored one point, with a total score of up to 16 for the basic emotions task.

Intervention

An idiom intervention was integrated into the curriculum of an after-school social skills program in Central PA. The group of children was introduced to one idiom each session, for a total of up to five idioms per week. A total of nine idioms were presented over two weeks (one

week had only four days of instruction because of a field trip). All intervention sessions were conducted by the staff of the social skills program, following the guidelines designed for this study, and overseen by the experimenter. The staff of the program met periodically with the experimenter to discuss the lesson plans for the idioms.

The social skills program lasts approximately three hours for each session and meets five days a week during the summer, with a different topic covered every few weeks. The staff of the program consists of one staff member for every two children, including one person with a masters degree for every 12 children. Of the staff, the person with the masters degree oversees the conduct of the program, another staff member leads the program's activities for the day, and the other staff members collect data on the children's behavior. The staff members also conduct prompting for behaviors (such as telling them to either stop a bad behavior or to engage in a good behavior).

The program follows the same general structure every session, with 15 minutes allocated for every activity. First, the children engage in free play inside with toys. Next is circle time, where the children sit on the floor gathered around the program's lead staff member. During circle time, the children usually share items they brought from home or share events that happened to them recently. The topic of the day may also be announced and briefly discussed during this time. The third and fourth activities usually consist of lessons, activities, or crafts done at the tables or outside. Children usually have time for freeplay or activities outside once or twice during the day if the weather is nice. About half way through the day, the children have snack time. After snack, there may be another activity at the tables, a game, outside free play, and/or books read aloud to the children by the lead staff member. The day is usually concluded with another session of free-play inside until the children are picked up by their parents.

During the idiom intervention unit, towards the end of circle time, the program's lead staff member asked the children what an idiom is. After the first day of the intervention, the staff member also what the idiom from the last day was. If at least one child did not raise their hand to offer a response, the staff member asked several children directly. If none of the children responded correctly, then the staff member repeated the definition of an idiom, along with the idiom from the previous day. The idiom for the current day was then announced to the children by the staff member. Then, the staff member read a short paragraph to the group which presented the idiom in context. The children answered questions asked by the staff member about the paragraph, including information about the context relevant to the idiom meaning, and then about the figurative meaning of the idiom. The paragraphs were slightly longer in length than the ones used in the pre-and post-tests, and were different from the test items, to reduce the possibility of confounds caused by repeating the same paragraphs.

After they were finished with the paragraph, the children were asked to sit down at the tables, where the children were asked to create hands-on projects related to the idiom for the day. For all idioms, these projects included a worksheet that allowed for the children to be creative in making the idioms meaningful to themselves. These worksheets were designed by the primary investigator in collaboration with the staff of the Social Skills program, based on worksheets that the program has used in the past for other topics. Each worksheet focused on teaching the children the figurative meaning of the idiom, rather than focusing on reinforcing the literal meaning of the idiom. Worksheets for an idiom contained the meaning of the idiom, or a place for the child to write the meaning, a picture related to the figurative meaning that the children could color, and space for the children to either draw a picture of the idiom meaning or to write a sentence containing the idiom. Children with poor writing skills were given assistance by the

staff members for completing any of the sections which they were unable to complete alone. In addition, the staff members discussed the content of these worksheets with each child as they were completing the task, to help make the worksheets an interactive learning tool. See Appendix B: Example Worksheet.

*Post-test measure*s

Immediate post-test. Individual comprehension of the idioms was assessed towards the end of each day for the children. During a free-play session, each child was asked individually by the experimenter to produce the figurative meaning of that day's idiom, after completion of the idiom-related tasks that day. Since the children were playing (and thus might have been distracted) during data collection, if the child didn't respond or said "I don't know," then the child was prompted with a multiple-choice response with two possible answers, and asked to respond verbally with the answer they thought was correct. This helped with assessing whether or not the child remembered what they were just taught earlier in the day. One point was given for spontaneous correct figurative responses based on the coding system used in the pre-test, with half a point given for spontaneous answers related to the figurative meaning, and half a point was given for prompted correct responses on the multiple-choice question. Given the format of this immediate post-test, no data for control items was collected for the immediate post-test. In addition, since some children did not attend all nine days, scores were calculated as proportion correct only for the days they attended (their total score for the days they attended divided by the total number of items corresponding to the days they attended). Using proportion scores will prevent attendance from negatively skewing the results of the analysis for children who missed days of the intervention. Ten children attended at least five of the nine sessions, with

seven children completing at least eight sessions. The one child who attended fewer than five sessions was excluded from subsequent analysis.

Delayed post-test. After the conclusion of the intervention phase, children's comprehension on idioms were assessed using the same idioms with the context paragraphs used in the original pre-test. This post-test were given variably between 10 and 22 days after the conclusion of the intervention phase, since only two or three children can be tested each session during the after school program, and not all children attend all sessions. The idioms were presented in the same order as the pre-test, and scored in the same manner. Since idiom learning was not expected to influence performance gains on the other pretest measures, only the idiom post-test was repeated at conclusion of the intervention phase, to minimize the testing burden on the children.

For the purposes of comparison, scores on the delayed post-test were analyzed similar to those of the pre-test and immediate post-test. Overall scores will be reported as total correct and as proportion correct. For intervention versus control item comparisons, only items that were included for both the pre-test and delayed post-test are the items for the days that the child attended, with between five and nine idioms for each child. These are reported as proportion scores (their total scores on the items for days attended divided by number of items corresponding to days attended). Using proportion scores will prevent attendance from negatively skewing the results of the analysis for children who missed days of the intervention.

Results

Idiom pre-test and post-test results

Pre-test comprehension. Total number of correct responses on the pre-test ranged from 0 to 6, with a mean of 3.1 out of the 26 idioms on the test. The total number of related responses on the pre-test ranged from 0 to 3, with a mean of 4.55 items out of the 26 idioms on the test. For the

idiom pre-test, scores for the 11 children were also calculated based on proportion scores, with their total score for correct and related figurative responses divided by the total number of items (26). Overall proportion scores on the idiom pre-test ranged between 0 and 0.61, with an average proportion of 0.261. These results show that most of the children did not know the meanings of the majority of idioms on the pre-test prior to intervention.

Pre-test versus immediate post-test: Immediate idiom post-test scores were compared to pre-test scores for the intervention items using paired t-tests, including pre- test and post-test data for the idioms where the child was present for the intervention. Children showed significant improvement in their definitions of idioms after the immediate post-test, with higher scores on the intervention items at immediate post-test than pre-test, $t(9) = 10.91$, $p<.001$. The mean proportion score at pre-test for the intervention idioms was 0.19, and rose to 0.72 at the immediate post-test, effect size = .76.

Delayed post-test. Figure 1 contains the pre-test and delayed post-test score averages for the intervention and control items. Delayed idiom post-test scores were compared to pre-test scores for the intervention and control items for the days that each child attended, using a 2 (intervention vs. control items) x 2 (pre-test vs. delayed post-test) ANOVA. Children scored significantly higher at the delayed post-test than the pre-test, $F(1, 32) = 5.23$, $p < 0.03$. Children also scored significantly higher on intervention items than control items, $F(1, 32) = 9.01$, $p < .01$. In addition, there was a significant interaction, $F(1,32) = 5.47$, $p <.03$. On the pre-test, there was no significant difference between intervention and control items, $t(8) = 1.38$, $p = .2$. At pre-test, the mean for intervention items was .17, and the mean for control items was .12. On the delayed post-test, children scored significantly higher on the intervention items than the control items, $t(8) = 5.89$, $p < .001$. On the delayed post-test, the mean for intervention items was .51, and the

mean for control items was .12, effect size = .58. This shows that children did not generalize their knowledge to interpreting other idioms on the test, and that the effects for the intervention items is not likely due to learning outside of the program.

Table 1 displays the total number of correct and related figurative responses, along with the incorrect literal and restated/not related responses, for each child on the idiom pre-test and delayed post-test. To examine the overall difference for the pre-test versus delayed post-test, the overall number of correct responses (only) was compared for all 26 idioms. Children correctly identified the figurative meaning of more idioms for the delayed post-test than the pre-test for all items, $t(8) = 3.388$, $p<.001$. The average number of correct items on the pre-test was 3.1, which increased to 7 on the delayed post-test (see figure 2).

However, children scored higher on the intervention items at the immediate post-test than the delayed post-test, $t(8) = 3.61$, $p<.01$. This shows that children may not have retained all the information that they learned in the intervention setting, even though the gains remained significant at the delayed post-test.

As shown in table 1, for the incorrect responses, three children showed shifts in their patterns of responding. Two children (child 8 and 9) produced eight literal responses each at pre-test, and no literal responses at post-test. Child 2, however, increased in the number of literal responses, producing one literal response at pre-test and six literal responses at post-test.

Comparisons with other measures

Theory of Mind. For the theory of mind tasks completed at pre-test, eight of the eleven children scored a two on the unexpected contents false belief task, one of the children scored a one, and two children scored zero. This means that only three of the children did not pass both false belief questions, thus correlational analysis with the false belief task was not possible. It

should be noted, however, that the three children who did not pass the false belief task also scored the lowest on the pre-test idiom comprehension task, showing a trend that is consistent with previous research relating language skills and false belief task performance.

For the "reading the mind in the eyes" task, scores ranged between 5 and 22 out of 28, with an average of 14.25. This means that the average was 50.8% correct items, which is far above chance for a test with four possible answer choices per item, as chance would be 25%.

Figure 2 shows the correlation scatterplot between scores on the "mind in the eyes" task and idiom pre-test scores. There was a significant positive relationship between the autistic children's idiom pre-test scores and performance on the "mind in the eyes" theory of mind task, $r(9) = .789$, $p < .002$. Children who scored higher on the "mind in the eyes" task also scored higher on the idiom pre-test.

While there was a strong relationship between the "mind in the eyes" task and idiom comprehension, there was only a weak correlation between the basic emotion task and idiom comprehension, $r(8) = .35$, $p > .15$. In addition, the relationship between age and the "mind in the eyes" task was not significant, $r(9) = .33$, $p > .10$.

Vocabulary. Ten children completed the PPVT-III (Dunn & Dunn, 1997). Standardized scores on this vocabulary measure ranged between 49 and 121, with an average of 82.7. Four of the 10 children that completed the PPVT-III had a standardized score below an 80 on the measure, indicating moderate to extremely low scores for their age, based on the standardized norms for this measure.

There was a significant relationship between the idiom pre-test scores and the standardized PPVT-III scores, $r(8) = .62$, $p < .03$. This relationship was even stronger between the idiom pre-test and the raw PPVT-III scores, which does not control for age as the standardized scores do,

$r(8) = .783$, $p<.002$. It may be that a child's total vocabulary, regardless of normative considerations, may prepare the child for more rapid learning of idioms and other figurative expressions. There was a significant positive correlation between the "mind in the eyes" task and both the standardized vocabulary scores, $r(8) = .775$, $p<.005$, and the raw vocabulary scores, $r(8) = .870$, $p<.001$.

Degree of intervention gains in relation to pretest skill levels. Some children showed much larger intervention effects than other children. Six children comprised a Higher Impact group, who were the top 5 out of 9 children on the delayed post-test intervention items, on the gain between their pre-test and post-test scores on intervention items, or on both of these indicators. The remaining three children comprised a Lower Impact of intervention group.

Interesting differences between these two groups were observed for the pre-test skills they brought into the learning opportunities during intervention. For the "mind in the eyes" task, the Higher Impact group averaged 15.17 as compared with 7.67 for the Lower Impact children, $t(7) = 2.24$, $p<.03$. In the case of the false belief task, the Higher Impact group averaged 2.0, as compared with 0.33 for the Lower Impact children, $t(7) = 7.64$, $p<.001$. For raw PPVT-III vocabulary scores, the Higher Impact group averaged 121.00 as compared with 73.33 for the Lower Impact children, $t(7) = 2.24$, $p<.03$. These three pre-test differences favoring the High Impact children who learned more idioms during the intervention are in line with the hypothesized positive relations between theory of mind, general language skills, and learning of figurative expressions.

In contrast to the findings immediately above, there were only small and nonsignificant differences between High Impact and Low Impact children for scores on the basic emotion task

(High mean of 7.40, Low mean of 9.33) or on number of days attending the intervention sessions (High mean of 8.00, Low mean of 7.33).

Discussion

Children with autism spectrum disorders readily learned the meaning of multiple idioms during the two weeks of a social skills intervention program that included engaging activities for exploring idioms. Prior to the intervention, scores on idiom comprehension were low for most children in the program. Increases in idiom comprehension were found both immediately after the intervention and in delayed post-testing. Children were better able to explain the meaning of idioms included in the intervention, whereas matched but untreated control idioms showed no gains from pre-test to post-test. All children made at least some gains in understanding the meaning of idioms at the immediate post-test, and the majority of children remembered the meaning of the idioms they had learned when they were tested again up to several weeks after the end of the intervention.

The staff was able to make the idiom learning process fun and engaging for the children. The multiple interactive teaching tools (stories and worksheets) used by the program's staff were enjoyable activities that called attention to the idiomatic meanings and also tried to hold the children's social-emotional and cognitive engagement. The stories that were used, along with asking questions drawn towards the meaning of the idiom, were designed to follow the recommendations of Nippold (1991). In this kind of group setting, the stories served as a good introduction to the idiomatic phrase, and allowed for the group to discuss what they thought the meaning of the idiom was. The question and answer component of the paragraph reading session allowed the children to talk about the contextual cues that were useful for figuring out the idiom's meaning. Nippold (1991) also suggested that opportunities should be allowed to use the

new expressions that they had learned. The worksheets designed for the current study were very engaging for most of the children, who were able to draw pictures or write sentences with examples of the idiom's idiomatic meaning. For example, when the idiom for the day was "fish out of water," one of the children drew a picture of a boy wearing a pink dress who was sad because the other boys (who were wearing pants) was laughing at him. Thus, the worksheets allowed the children to be actively involved and creative, where they were allowed to come up with examples of the idiom in contexts that were meaningful to them.

Control item comparisons revealed both that the autism spectrum children were quite low in idiom comprehension before intervention and that passage of time and learning opportunities outside the idiom intervention procedures led to no improvement on idiom abilities. Each child was exposed to many idioms during intervention that they had not mastered before. This kind of focused concentration on multiple language challenges for each child, together with a mix of socially-engaging ways of presenting those challenges so that they are more likely to be processed and learned, has been empirically tested in a rich variety of language-intervention studies. Nelson and his colleagues have used a dynamic systems theoretical perspective in the design and the interpretation of interventions shown to have high impact on learning by autistic children of new reading and new oral language skills (Nelson, 2001; Nelson, Heimann, & Tjus, 1997; Nelson, Welsh, Camarata, Tjus, & Heimman, 2001), but not previously addressing the figurative language expressions employed in the present study. More broadly, for many language domains and many varieties of language learners, the same dynamic systems stress can be seen on individual challenges in language along with treatment protocol variations that dynamically pattern into social discourse high attention, emotional positivity, learner initiatives, and scaffolding language sequences so that they occur in close temporal proximity to each

presented challenge. Studies that are thus similar to the present treatment study have included syntax facilitation in language-delayed and language-typical children (Camarata & Nelson, 2006; Fey, Cleave, Long & Hughes, 1993; Nelson, 2001), vocabulary learning acceleration in language-typical children (Nelson & Bonvillian, 1978; Nelson & Arkenberg, 2008), and reading and sign language facilitation in deaf children (Nelson, Loncke, and Camarata, 1993; Nelson, Craven, Xuan & Arkenberg, 2004).

Abrahamsen and Smith (2000) found that classroom-based idiom interventions were effective for teaching idioms to eight children with communication disorders. The classroom settings allowed for naturalistic dialogue between the teacher and the children, as well as interactive activities. For example, in Abrahamsen and Smith (2000), activities for explaining the difference between the literal and figurative meanings of idioms involved activities such as dumping a bucket of stuffed animal's on someone's head to show that the literal meaning of "raining cats and dogs" was not what the expression meant, and then exposing the children to stations with water-related activities (such as spray bottles) emphasized the correct meaning of the phrase. In the current study, the stories and worksheets were still effective in teaching and engaging the students, as they allowed for students to explore contexts related to the meaning of the idioms, and allowed the adults to interact with the children as a group and on an individual basis that supported the children's learning. Abrahamsen and Smith (2001) found that these classroom sessions were better than computer-based instruction for teaching idioms to the children, since the computer sessions were not as interactive, although children were able to learn idioms in both settings.

Learning figurative language is a complex process for children with autism and language disorders. The autistic and Asperger's syndrome children in the current study were between the

ages of seven and 12. Ackerman (1982) found that typically developing children age eight were able to explain the correct meaning of the idiomatic phrases 70 percent of the time, however not even the 12-year old autistic children and Asperger's syndrome children in the current study showed that high of a level of performance – at pre-test, of the 26 presented idioms, the highest scores were only 6 correct explanations (23%). Thus, it is likely that most children with autism spectrum disorders, even if they have literal language abilities that score close to or within normal ranges, can benefit from having the meaning of idioms taught to them. The long term goal for idiom intervention should be to teach multiple long-term strategies for idiom comprehension along with a more extensive set of specific idioms, which may require intervening on the other skills that are related to the typical learning of idioms, such as theory of mind. If children in more extensive training are able to build up a sizeable vocabulary of idioms, along with an increased awareness of strategies for recognizing and figuring out idiomatic expressions, then they may be able to generalize these skills to independently learn idioms and other figurative phrases in new learning contexts beyond intervention. However, the current study was not long enough to find generalization to idioms outside of the treatment items. While it is possible that children in the current study may have used simple memorization to perform well on the idiom post-tests for items they were taught, shifts in patterns of responding for three children in their error responses (either increases or decreases for responding literally to unknown items) provides possible evidence for other developmental shifts that may be occuring for some children. Although, the low overall number of children providing literal responses in either pre-test or post-test conditions makes this hard to interpret, these shifts in response patterns should be explored more in future studies of the developmental processes involved in childrens' idiom learning.

When examining the relationship between idiom comprehension and associated abilities, one of the strongest relationship**s** found in the current study was between the idiom pre-test and the children's "mind in the eyes" task designed by Baron-Cohen, Wheelwright, Sprong, et al. (2001). Since there was no relationship between the understanding of basic emotions and the idiom pre-test scores, the relationship with the "mind in the eyes" task is most likely due to understanding others' mental states, rather than simply the understanding of basic emotion expression from the eye regions (even though words such as happy and sad do appear on the children's version of the "mind in the eyes" task). There may have been something about the social-perceptual theory of mind that is still related to both literal and figurative language, even though these relationships go against the proposed distinction by Tager-Flusberg (2001). The social-perceptual component of theory of mind is proposed to relate to "the online immediate judgment of a person's mental state, based on information available in faces, voices, and body posture movement." A distinction between the social-perceptual and social-cognitive theory of mind tasks is likely still warranted, even if the social-perceptual component still relates to language development. Other studies have found that the children's "mind in the eyes" task did not correlate with other tasks that were thought to tap into social-cognitive theory of mind in autistic children (Brent et al., 2004; Kaland, Callesen, Moller-Nielsen, Mortensen, & Smith, 2008). While it may be possible to disassociate the social-cognitive and social-perceptual aspects of theory of mind, both aspects of theory of mind development may play an important role in figurative language development. When developing understanding of figurative language, it is important for the child to be able to determine the immediate mental states and intentions of the speaker (Happe, 1993; Happe 1995). Happe (1995) suggests that understanding figurative language including idioms, metaphors and

any other language expressions that are not literal, requires the listener to have the ability to understand the intentions and motivations of the speaker.

An additional consideration is that only three of the children in this study failed the false-belief task, whereas all the other children were able to correctly identify that someone would believe there were crayons in the crayon box, even if there was instead a toy car inside the crayon box, and that they held this false belief before they saw the contents. While the three children who failed the false belief task were also the three children who scored lowest on the idiom pre-test, the false belief task was not sufficiently complex enough to capture all the variation in theory of mind abilities of these children. Nevertheless, when High Impact children who learned the most from intervention were contrasted with the Low Impact children, there was a significant advantage at pre-test in their false belief performance. The "mind in the eyes" task similarly yielded scores at pre-test that were higher for the High Impact, high learners as compared with the scores for the Low Impact children. Moreover, the "mind in the eyes" test showed much larger variation in this sample, with a range of scores between 6 and 22, which measured an aspect of Theory of Mind that was also highly correlated with the children's pre-test ability to produce the meaning of idiomatic phrases. False belief tasks and other social-cognitive theory of mind tests have been primarily used in the past to examine the relationship between theory of mind and figurative language, but the present finding indicate that the "mind in the eyes" test is well worth measuring and discussing in this domain. Higher vocabulary scores, in line with many prior observations in the literature, proved also to be significantly associated with higher pre-test idiom comprehension levels and with membership into the post-hoc group of children with the greatest idiom gains from intervention.

One of the limitations of the current study is that the sample size was small, due to only being able to observe the intervention in one after school program. Larger sample sizes would help with understanding the complex relationship between theory of mind, age, and language abilities in autistic children. Unfortunately, the nature of this intervention study prevented having a large enough sample size for more complex analyses from being run with these variables, as the focus of this study was primarily on the intervention. In respect to the small sample size, the present study is similar to the majority of published studies on intervention with children with autism spectrum disorders. In addition, typically developing children should be run on these measures in the future, to see if there is a relationship between the "mind and the eyes" task and the idiom comprehension task in typically developing children.

Figurative language learning requires the child to recognize that the speaker is not being literal. It may be possible that figurative language and the social-perceptual theory of mind are related, in that children may use perceptual queues (from the face, voice, etc.) that help identify whether the speaker is being literal or figurative. For example, if someone says "it's raining cats and dogs outside," if the speaker was being literal, one would expect them to be upset or disturbed by the idea of live animals falling from the sky. When a child is asked to "hold your horses," and the child does not actually have any horses, it is the body language and tone of voice that may indicate that the parent wants the child to wait and be patient. A child that does not understand the figurative aspect of idioms will have a hard time understanding what horses they are supposed to hold. To a large degree, for the children in the present study at pre-test, this must be a common experience if we consider that all the children were performing below 25% success in explaining the correct meaning of idioms, and one-third were at success levels below 5%. Despite these low initial levels, it was encouraging to see that a focused, theoretically-

guided intervention led to strong gains on idiom comprehension, even when the intervention activities lasted approximately half an hour each of the nine days.

Future research should be done to see the effectiveness of different strategies for teaching idioms to autistic children. For example, it may be more helpful for some children to learn idioms from individual sessions, similar to the strategies used by Ezel and Goldstein (1992) and also similar to the bulk of the effective studies on boosting language skills in language-delayed children through combining individual challenges with rich emotional-social and conversational supports (eg., Nelson, 2001; Nelson et al., 2004). It may be possible that some of the children learn better when they have more individual attention, and the ability to hear the same idiom on more than one day. Also, the children in the current study only attended between 5 and 9 sessions, which may not have been long enough to learn strategies that would generalize to understanding untrained phrases or to encounter such untrained idioms in new contexts after they have boosted their idiom awareness and knowledge from the intervention.

Abrahamsen and Smith (2000) recommend a direct teaching strategy for children with communication disorders, which this study also supports. However, the time scales of both interventions were relatively short, where children were taught fewer than ten out of the hundreds or thousands of idiomatic phrases that most people learn by adulthood. Teaching hundreds of idioms on an individual basis could be very burdensome and time consuming, so one goal for therapy with figurative language should be to teach strategies that the children can use to figure out the meaning of figurative language on their own or through recognizing when they need to seek support for a puzzling expression by consulting other people, dictionaries, the internet, and so on. Longer term intervention strategies, such as integrating idioms into individualized speech language therapy sessions at school, may be more successful at teaching

long term strategies from abstracting the meaning of idioms from general conversations. While individualized teaching was not evaluated in this study, the results of Ezel and Goldstein (1992) suggests that individualized sessions can be used to teach children the meaning of idioms. Ezel and Goldstein (1992) taught idioms to four children, age 9, with mental retardation using individual sessions. These four children were able to learn 12 new idioms, and were able to generalize the meaning of the majority of these idioms to new settings with new speakers.

In conclusion, the present study demonstrates for the first time the effective teaching of idioms to children with autism spectrum disorders and initial low skills for idioms. This was achieved through a treatment procedure which mixed together challenges for all children and a combination of highly engaging techniques implemented by the staff of a community-based social skills training program. Group social skills programs in many contexts similarly should be able to implement effective strategies for teaching idioms to autistic children.

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Appendix A

Idiom Pretest Items

Treatment Idioms	**Control Idioms**	**Excluded Idioms**
Let the cat out of the bag	Climb on the bandwagon	Face the music
Out of the blue	Out of thin air	Hit the sack
Fit as a fiddle	Keep a level head	Hold your horses
Talking a mile a minute	Take it with a grain of salt	Pull someone's leg
Break the ice	Play it by ear	Under the weather
Skate on thin ice	Tip of the iceberg	Cost an arm and a leg
Go against the grain	Get the picture	In seventh heaven
Fish out of water	In a pickle	With flying colors
Raise the roof	Be on cloud nine	

Appendix B

Example Worksheet

Raise the Roof

Write the meaning of "raise the roof": _____

_____

_____

_____

Draw your own picture:

Table 1.

Total number of correct, related, literal, and restated/not related responses for each child on the idiom pre-test and delayed post-test.

	Pre-test				Post-test			
Child	Correct	Related	Literal	Restated/ Not related	Correct	Related	Literal	Restated/ Not Related
1	3	1	1	21	6	7	3	10
2	0	0	1	25	0	1	6	19
3	1	1	1	23	0	3	0	23
4	6	6	0	14	11	6	0	9
5	4	8	1	13	13	6	2	5
6	6	13	2	5	13	6	0	7
7	6	8	0	12	13	4	0	9
8	1	3	8	14	5	3	0	18
9	1	1	8	16	2	1	0	23
Average	**3.11**	**4.55**	**2.44**	**15.88**	**7**	**4.11**	**1.22**	**13.66**

Figure 1

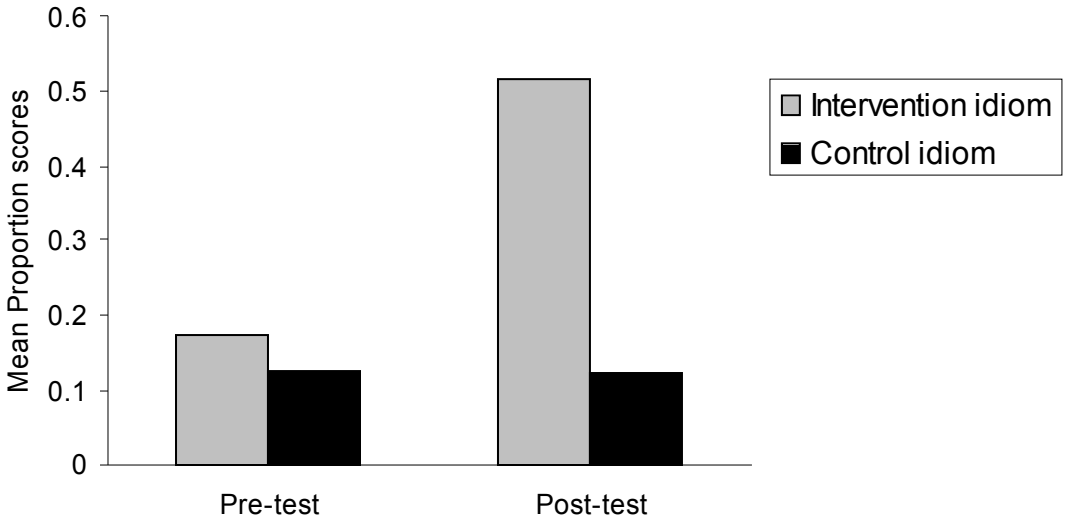

0.6
0.5
0.4
0.3
0.2
0.1
0
Mean Proportion scores
Pre-test
Post-test
Intervention idiom
Control idiom

Figure 2

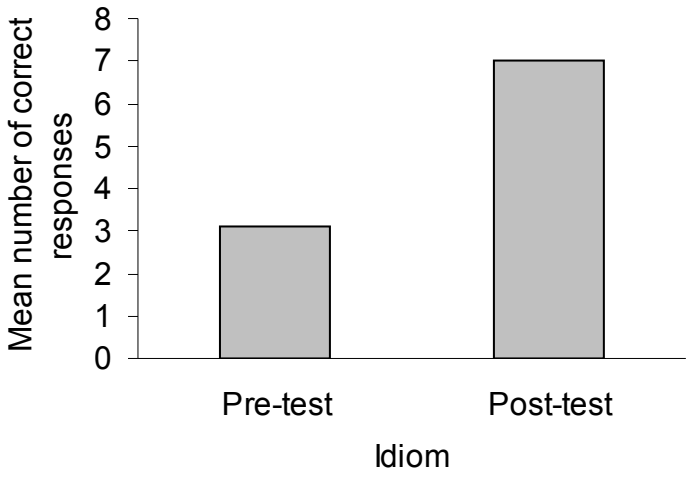
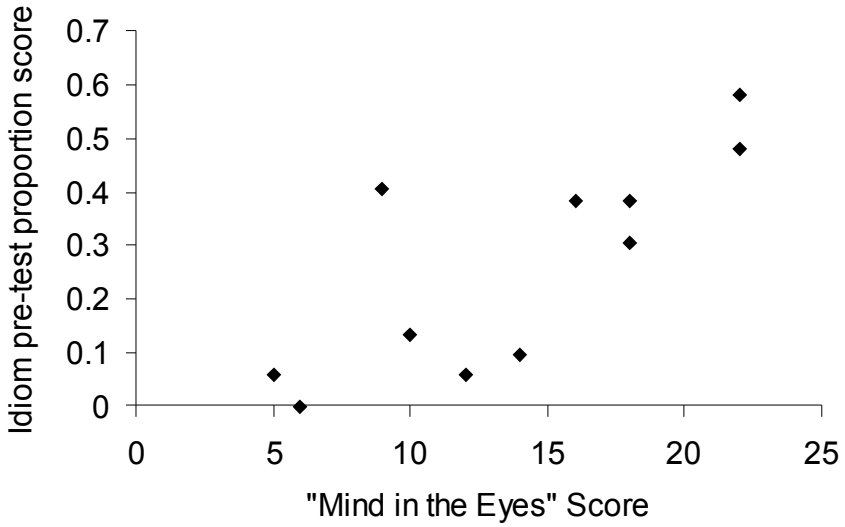

Mean number of correct responses
8
7
6
5
4
3
2
1
0
Pre-test
Post-test
Idiom

Figure 3


Idiom pre-test proportion score
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
"Mind in the Eyes" Score