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Review

Addressing the Challenge of Verbal Irony: Getting Serious about Sarcasm Training

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Abstract: In verbal irony, the speaker's intended meaning can be counterfactual to the literal meaning of their words. This form of figurative language can help speakers achieve a number of communicative aims, but also presents an interpretive challenge for some listeners. There is debate about the skills that support the acquisition of irony comprehension in typical development, and about why verbal irony presents a challenge for many individuals, including children with a diagnosis of autism spectrum disorders and second-language learners. Researchers have explored teaching verbal irony in a very small number of training studies in disparate fields. We bring together and review this limited research. We argue that a focus on training studies in future research could address a number of theoretical questions about irony comprehension and could help refine interventions for individuals who struggle with this form of social language.

Keywords: verbal irony; sarcasm; language training; pragmatic development; autism spectrum disorders; second-language learning

1. Introduction

Irony is a common form of figurative language, widespread across cultures and languages (Booth 1974). Its use has been documented in conversations between adult friends (Gibbs 2000; Tannen 2005), in family interactions (Pexman et al. 2009; Recchia et al. 2010), in the classroom (Ely and McCabe 1994), and even in communicative contexts devoid of gesture, facial expression or tone of voice information, as in blogs (Whalen et al. 2013) and email (Whalen et al. 2009). Irony comprehension is an important aspect of pragmatic language skills, and one that is challenging for typically developing children (e.g., Capelli et al. 1990; Filippova and Astington 2008; Winner 1988), for many clinical populations (e.g., Dennis et al. 2013; Happé 1993; Langdon et al. 2002) and for second-language learners (e.g., Bouton 1999; Kim 2014). For members of these groups, deficits in irony understanding can have negative social consequences, including social exclusion and misunderstandings (e.g., Kim and Lantolf 2018). The purpose of the present review was to synthesize what is known about verbal irony comprehension and, based on that knowledge, to discuss implications for teaching or training irony comprehension skills. As we will show, the existing literature on training for irony comprehension is very limited and comes from disparate fields: pragmatics training for typically developing children, children with autism, and second-language learners. We will argue that a future focus on training studies could provide important theoretical insights about the development of irony appreciation and could help address how best to help those who struggle with this form of figurative language.

In the present review, we focus on the prototypical counterfactual form of verbal irony that is commonly called *sarcasm*, as when a speaker says "you are so graceful" or "nice going" to someone who has just stumbled. We thus use the term verbal irony more narrowly here than in some previous work (e.g., Gibbs 2000), where the term also referred to related forms such as understatement, jocularity,

hyperbole, and rhetorical questions. The primary communicative purposes of sarcastic irony are to mock or tease, to criticize indirectly, and to be funny (Kreuz et al. 1991; Roberts and Kreuz 1994).

2. Pragmatic Development

Verbal irony comprehension is one aspect of language pragmatics. Understanding pragmatics involves learning that a speaker's intended meaning often extends beyond the semantic meaning of the words the speaker says (e.g., I want some of the candy; Grigoroglou and Papafragou 2017). Research has explored the ways in which an understanding of language beyond the meaning of the words allows children to understand scalar (e.g., I want some of the candy; Noveck 2001; Skordos and Papafragou 2016) and relevance implicatures (e.g., Would you like to go for coffee? There is a Beans Blenz down the street; Bucciarelli et al. 2003; Tribushinina 2012), and forms of figurative language such as indirect requests (e.g., Can you close the door? Elrod 1987), idioms (e.g., Kick the bucket; Caillies and Le Sourn-Bissaoui 2008), metaphors (e.g., He is a hard man; Pouscoulous 2011), and irony. Research on pragmatic development has suggested that these implicatures share reliance on several underlying skills, including the development of joint attention (Tomasello 1995), establishing theory of mind (Wellman et al. 2001; Wimmer and Perner 1983), creating reference (Nadig and Sedivy 2002) and learning word meanings (Diesendruck and Markson 2001). Children learn about the form and function of these kinds of language through extensive feedback and repair (Clark 2014).

The research on pragmatic skills in typically developing children suggests that irony understanding develops over a protracted developmental window. Studies have shown that at around 5 or 6 years of age typically developing children begin to understand or detect that the ironic speaker means something very different (often the opposite) to what they have literally said (Hancock et al. 2000; Harris and Pexman 2003; Keenan and Quigley 1999; Nakassis and Snedeker 2002; Winner and Leekam 1991). There is some evidence for comprehension at younger ages (Loukusa and Leinonen 2008; Recchia et al. 2010), especially if the irony references failed expectations that can be directly perceived (Angeleri and Airenti 2014). Children's understanding of the ironic speaker's intent or purpose seems to emerge somewhat later, around age 7 or 8 (Ackerman 1983; Andrews et al. 1986; Hancock et al. 2000; Loukusa and Leinonen 2008). Children's appreciation tends to be more accurate for more direct forms of verbal irony: ironic criticisms like "you are so graceful" rather than the less direct "you could be an acrobat" (Dews et al. 1996; Hancock et al. 2000; Harris and Pexman 2003; Pexman et al. 2005). Appreciation of verbal irony continues to develop through middle childhood, between about 7 and 10 years of age (Bosco and Bucciarelli 2008; Filippova and Astington 2008, 2010; Glenwright and Pexman 2010), with more sophisticated understanding of the humor and teasing functions (Dews et al. 1996; Pexman et al. 2005) and improved comprehension of less common forms of irony, like ironic compliments (Filippova and Astington 2010; Pexman and Glenwright 2007). Indeed, counterfactual irony can also be used to compliment (Dews et al. 1996; Dews et al. 1995; Pexman and Olineck 2002a), as when a speaker says "you sure are a terrible student" to someone who has just received a perfect score on a test. Further studies show that aspects of irony comprehension are still developing into adolescence (Demorest et al. 1984; Glenwright et al. 2017).

Individuals with a diagnosis of autism spectrum disorder (ASD) show social and communicative impairments that often include difficulties with irony understanding (Kalandadze et al. 2018). Further, children and adults with a traumatic brain injury (TBI) tend to show deficits in irony comprehension (Dennis et al. 2001, 2013; McDonald 1992; McDonald and Pearce 1996). Dennis et al. (2013) argued that these problems with irony understanding will have negative implications for children with TBI, in terms of their participation in the social world. Deficits in irony comprehension have also been reported for children with an Attention Deficit Hyperactivity Disorder (ADHD) diagnosis (Caillies et al. 2014). Verbal irony can also be a particularly challenging form of figurative language for second-language (L2) learners (Bouton 1999; Kim 2014).

3. Cues to Irony

3.1. Contrast

Irony can be signaled by a contrast between the valence of what is literally said and the larger context in which the remark is made (Colson 2002; Ivanko and Pexman 2003; Kreuz and Glucksberg 1989). Irony tends to be more readily cued when statements echo or allude to expectations, social norms, or prior assertions (e.g., Jorgensen et al. 1984; Kreuz and Glucksberg 1989).

As mentioned, irony appreciation emerges relatively slowly in typical development, in contrast to some other aspects of language development which tend to be in place earlier. Many researchers have examined the question of what it is about irony comprehension that children find challenging. Ackerman (1982) argued that in order to understand sarcastic irony, children need to compare the literal meaning of the utterance to available contextual information and detect opposition between the two.

3.2. Speaker Knowledge

Research has also shown that irony is more likely to be detected when the comprehender has insight about the speaker's attitude; this can be cued in many ways, for instance, by knowledge of the speaker's occupation (e.g., comedian vs. scientist, Katz and Pexman 1997; Pexman and Olineck 2002b), or by knowledge that there is a close relationship between speaker and target (Kreuz and Link 2002; Pexman and Zvaigzne 2004; Slugoski and Turnbull 1988). In a recent study Zalla et al. (2014) showed that although adults with a diagnosis of ASD had knowledge of speaker occupation stereotypes, they did not use that knowledge in order to modify their perceptions of irony, whereas for comparison participants without a diagnosis of ASD, stereotype information enhanced irony detection. In addition, irony is detected and processed more readily by individuals who tend to use irony more frequently in their own speech (Ivanko et al. 2004). Processing data show that children's irony detection is facilitated by information about the speaker's personality (mean vs. nice, Pexman et al. 2006) and by knowledge that the speaker and target are siblings (vs. strangers; Whalen et al. 2019). While processing measures suggest that children incorporate cues to speaker attitude to derive interpretations of irony, their overt speaker belief and intent judgments are not always modulated by those cues (Pexman et al. 2005; Whalen et al. 2019). This is likely because processing measures (e.g., reaction time, eye gaze fixation duration) are more sensitive than the binary (correct/incorrect) measures of speaker belief and intent accuracy.

3.3. Tone of Voice

It has also been suggested that tone of voice is important to irony. The ironic tone of voice has been described as more nasal, slower, lower in pitch, and/or with raised amplitude (Cutler 1976; Haiman 1989; Rockwell 2000). While these features are often present for irony (e.g., Bryant 2010), Bryant and Tree (2005) found that there were no prosodic features that were consistently present across all instances of ironic speech. Instead, they argued that irony is signaled by numerous cues, including the relationship of a statement's propositional and non-propositional content to its context.

Several studies have pointed to the conclusion that in early stages of irony development (6 years of age) children rely more on context than intonation to infer ironic intent (Ackerman 1982, 1983; Bryant and Tree 2005), and that intonation becomes more important later in development (8 years of age) (Ackerman 1983; Capelli et al. 1990). In contrast, other studies have found that both younger (6–7 years) and older (8–9 years) children rely on intonation as a cue for some aspects of ironic meanings (e.g., degree of criticism and humor; Dews et al. 1996). We speculate that some of these inconsistent findings are attributable to different stimuli and tasks used and may be related to the finding that there is no singular "ironic" tone of voice (Bryant and Tree 2005).

Several different theories of irony comprehension have been proposed, and these each highlight additional cues to irony. According to both the Echoic Reminder Theory (Kreuz and Glucksberg 1989)

and the Allusional pretense theory, (Kumon-Nakamura et al. 1995), ironic remarks allude to failed expectations, where those expectations are typically derived from previous statements or social norms. Relevance theory (Sperber and Wilson 1986), emphasizes the importance of the comprehender in detecting incompatibility between a speaker's utterance and the context in which it is made. Strong incompatibility signals to the comprehender that the speaker does not literally endorse their statement but rather intends to distance themselves from it.

By the Graded Salience Hypothesis (Giora 2002), the salient meanings of words and phrases are accessed and then their meanings are constrained by context. However, as Creusere (1999) pointed out, these theories were all designed to explain adult irony comprehension, and do not address the development of this skill. Furthermore, Colson (2002) argued that none of these theories can explain all instances of verbal irony. Gibbs and Colston (2012), (also Yus 2000) noted that a fulsome theory of irony comprehension would need to allow for multiple linguistic and nonlinguistic cues and constraints shaping the interpretation process in context-dependent ways. This is the focus of the constraint-satisfaction view (Katz 2004; Pexman 2008), where comprehenders are proposed to consider multiple probabilistic cues to ironic intent, in parallel, to derive an interpretation. The constraint-satisfaction account is broader and more inclusive than previous accounts but is underspecified. In order to test and develop this theory further the field needs more information about how comprehenders weight and integrate the full range of cues to irony. There also needs to be more detailed characterization of the complex social and cognitive processes involved, and an explanation of how irony appreciation develops, in both typical and atypical populations. We would argue that the field could make progress towards that goal by undertaking systematic training studies of irony comprehension. To that end, in the following sections we review what has been learned about the skills that support irony comprehension and describe the limited research that has examined irony training in typical development, in atypical development and clinical populations, and in second-language learning.

4. Underlying Skills

4.1. Theory of Mind

Many authors have argued that children's comprehension of irony depends on second-order theory of mind (TOM) skills; that is, their ability to understand what the speaker intends the listener to believe about their statement (Filippova and Astington 2008; Nilsen et al. 2011; Sullivan et al. 1995; Winner and Leekam 1991). Happé (1993) noted that first-order mindreading skills (understanding what x thinks) would allow a listener to understand a speaker's intent to inform, which could be sufficient for comprehension of many forms of figurative language (e.g., metaphor), but that second-order mindreading skills (understanding what x thinks that y thinks) would be required to understand a speaker's communicative intent for irony. As such, she predicted that irony would be a particularly difficult form of figurative language for children to understand.

To test predictions about the cognitive skills involved in irony comprehension, Happé (1993) measured TOM with false belief tasks: first order false belief tasks assess children's understanding of another person's beliefs about some event, while second order tasks assess children's understanding of another person's beliefs about someone else's beliefs about the event (e.g., Perner and Wimmer 1985). For typically developing children aged 4–5 years, Happé (1993) found that irony comprehension was strongly related to second order TOM skills. While all children tested showed high accuracy at metaphor comprehension, only children with second-order TOM skills were accurate at irony comprehension.

Filippova and Astington (2008) tested the relationship of 5- to 9-year-old children's irony comprehension to their TOM, receptive vocabulary, and memory skills. They found that children's irony comprehension accuracy was related to their second-order TOM skills, vocabulary skills, and short-term memory. Analyses showed that children's vocabulary skills were significantly related to their irony interpretation accuracy, even after variance due to children's age, memory skills, and

second-order TOM had been accounted for. However, second-order TOM skills predicted only a marginally significant amount of variance in children's irony comprehension once variance due to children's age, vocabulary, and memory skills had been accounted for. Nonetheless, the authors argued that advanced TOM and language skills were both independent predictors of children's interpretation of irony. Similarly, Winner et al. (1987) provided evidence that children's irony comprehension difficulties are not due solely to memory demands: children's irony appreciation was not modulated by memory demands in their interpretation task. Instead, Winner et al. pointed to the cognitive demands involved in making judgments of speakers' intentions. In contrast, Bosco and Gabbatore (2017) found no evidence for a relationship between irony understanding and second order TOM in a sample of 120 children aged 3 to 8 years.

Another related aspect of children's development that may be important to irony comprehension is the ability to recognize others' feelings and emotions. Indeed, Nicholson et al. 2013 found that children with stronger empathy skills were able to interpret verbal irony more accurately and more quickly. Empathy and TOM are both required to understand social situations and share a number of component processes, including the self-other distinction (Preckel et al. 2018). Empathy and TOM are related skills in typical development and both show improvement in the early school years (Bensalah et al. 2016), when children's irony appreciation skills are also improving.

Happé (1993) suggested that individuals with an autism spectrum diagnosis struggle with irony appreciation because they cannot represent a speaker's communicative intentions and thus will tend to take the default (literal) interpretation of ironic remarks. Happé (1993) tested first- and second-order false belief understanding in children with autism. Irony comprehension was most accurate in the group of children with autism who demonstrated second-order TOM ability. Children with autism who showed only first-order TOM, or no TOM ability, tended to offer literal interpretations of ironic remarks. Thus, Happé (1993) concluded that second-order TOM is essential to irony comprehension. Second-order TOM involves advanced mind-reading skills that facilitate the metarepresentational inferences involved in understanding ironic intent.

As mentioned, children and adults with a traumatic brain injury (TBI) tend to show deficits in irony comprehension (Dennis et al. 2001). Dennis et al. (2013) reported that children with a TBI had difficulties understanding second-order intentions, providing further evidence for a link between irony comprehension and advanced TOM. Additional evidence for this link comes from studies with adults with prefrontal lesions (particularly the right ventromedial prefrontal cortex). These patients tended to be impaired in their ability to understand irony *and* in their TOM skills (Shamay-Tsoory et al. 2005; Shamay et al. 2002).

Furthermore, children with an ADHD diagnosis were less accurate in a second-order false belief task and in an irony comprehension task than were age-matched controls. In children with ADHD, irony comprehension accuracy (in terms of speaker belief and intent) was related to their second order TOM performance and also to their verbal reasoning skills. Caillies et al. (2014) concluded that irony comprehension delays in children with ADHD should be addressed in clinical interventions with this group.

While many studies of atypical development and acquired disorders provide support for a link between irony appreciation and TOM, as Happé (1993) noted, (see also Scheeren et al. 2013) this relationship is not perfect; not all children who pass the second-order false belief task are able to correctly infer speaker intent for irony. Happé (1993) reported cases of success in TOM tasks coupled with poor irony comprehension, in children with a diagnosis of autism and in typically developing children. Thus, other factors beyond TOM skills must be at play.

4.2. Language Skills

Angeleri and Airenti (2014) argued that irony comprehension does not require advanced TOM skills; instead, children rely on shared common ground, including knowledge of the situation and of the speaker, in order to comprehend verbal irony. They found that children's false belief understanding

was not related to their irony comprehension, once the child's language skills and age were taken into account. They argued that a child's language skills allow them to participate in conversations and interactions and it is this experience that gives children insight about the communicative intentions of the ironic speaker. Further, children's ability to attend to and use contextually relevant information to inform their interpretations of speech acts is developing between ages four and eight (Loukusa et al. 2017) and likely supports irony appreciation.

It has been argued that core language skills (e.g., vocabulary, syntax, semantics) are critical to figurative language comprehension, and that deficits in core language skills best explain difficulties with figurative language understanding in autism (Kalandadze et al. 2018). Kalandadze et al. (2018) noted that since language skills and TOM are strongly related in typically developing children (Milligan et al. 2007), it is difficult to identify their unique contributions to figurative language comprehension. Indeed, individuals with ASD tend to do better on irony tasks that have reduced verbal demands (Glenwright and Agbayewa 2012; Pexman et al. 2011).

The research on irony appreciation in L2 learners suggests that L2 proficiency may be an important pre-requisite for successful irony training (Bouton 1999). Further Shively et al. 2008 noted that increased language experience likely also affords learners with increased social and cultural knowledge that is important to irony comprehension (also Kim 2014). That is, learners need to appreciate the social norms to which irony may allude. They also need knowledge of the particular linguistic or syntactic choices that are associated with irony in a particular language and culture (Shively et al. 2008; Kim 2014)

4.3. Metalinguistic Knowledge

Pexman and Glenwright (2007) argued that second-order mentalizing skills, while important, would not be sufficient to support development of irony understanding. They suggested that social learning was also important to irony development. A child must have a mental category for ironic language in order to detect ironic intent, acquired through experience with sarcastic speech and with people's reactions to it (see also Filippova 2014). Once opposition between statement and context is detected, children need to have sufficient knowledge of irony to know that it might be the inferential solution (Ackerman 1983). Relatedly, it has also been suggested that children's irony comprehension may be supported by their knowledge of the concept of 'opposite', which is well developed by age four (Phillips and Pexman 2015). Similarly, Szücs and Babarczy (2017) hypothesized that children's ability to understand irony may depend on their metapragmatic awareness (Bernicot et al. 2007; Szücs and Babarczy 2017). Metapragmatic awareness is characterized as the ability to consciously reflect on language use (e.g., Wilkinson and Milosky 1987).

It seems likely that parents and families provide children with metalinguistic knowledge about irony through conversation and play experiences. Relationships between parents' use and children's understanding of irony have been tested thus far in only limited ways, but the results suggest there may be a role for this social experience in irony development. One study reported modest associations between parents' self-reported use of sarcasm and their children's detection of irony in laboratory tasks (Hala et al. 2005). For instance, parents who were more likely to report that they used sarcasm in low-inference or "risky" situations (e.g., with a stranger), had children who tended to be more accurate inferring speaker belief for novel ironic criticisms presented in a laboratory task. Hala et al. (2005) suggested that one potential explanation for this association is that parents' speech may challenge children's comprehension abilities, helping them develop more advanced inferencing skills and a more elaborate mental category for ironic speech.

Relatedly, Pexman et al. (2009) studied production of verbal and gestural irony in family conversations, and found that parents who tended to produce verbal irony had children who also tended to produce verbal irony. This co-occurrence could be due to shared conversational tendencies, or to children's sensitivity to mode adoption: the convention of responding to irony with irony (Whalen and Pexman 2010). Pexman et al. (2009) did not assess children's comprehension, but the observed positive

relationship between parent and child irony production suggests that some children have more frequent opportunities to play with ironic speech, by virtue of their family environment. Indeed, Recchia et al. (2010) found strong variability across families in production of verbal irony. While the findings reported in these studies suggest there may be a relationship between social experience and irony comprehension, the data available so far are correlational and thus cause and effect cannot be inferred.

The role of social experience in developing irony comprehension skills (e.g., Hala et al. 2005) may put children with autism at an additional disadvantage, as they may be less likely to participate in the kinds of conversations that provide experience with and explanations for verbal irony. Kalandadze et al. (2018) suggested that clinicians and caregivers should use figurative language with individuals with ASD, and should provide explanations to accompany ironic speech. They suggested, further, that training efforts should focus on core language skills as well as social skills, as they predicted that these skills will support figurative language comprehension.

Thus, the literature offers many different suggestions about the cues that signal irony and the skills and experiences that are important to acquisition of irony comprehension. Some of these mixed findings are likely due to variability in the tasks used, and in the cognitive or linguistic skills emphasized in those tasks, but it also may be the case that irony understanding depends on multiple factors: cognitive, linguistic, and emotional development, and social experience with ironic language. The previous literature has almost exclusively involved correlational and cross-sectional studies. We think there could be value in future studies of typically developing children that adopt a training approach. Training could emphasize different factors that have been identified as important according to different theories of irony comprehension. Training studies could also help identify which underlying skills are most important to development of irony appreciation, in typical development and in atypical development and in second-language learners. Before considering what such training studies should look like, we first review the very small number of irony training studies that have been reported. As this review will show, this research topic is vastly underdeveloped.

5. Existing Training Studies

There is evidence that metapragmatic awareness can be enhanced through explicit training (Robinson and Robinson 1982). Szücs and Babarczy (2017) tested whether explicit training could similarly improve children's irony comprehension. Szücs and Babarczy (2017) presented Hungarian children aged 4–7 with an irony comprehension task. They found that children's responses on this initial irony comprehension task were not related to their TOM, receptive vocabulary, or grammatical skills. Next, half of these children were given three sessions of training in irony-specific metapragmatic awareness, which involved instruction about verbal irony and about the cues and intentions associated with ironic language. This training used three stories much like those featured in the irony comprehension task, but with explanations, leading questions, and feedback from the experimenter. The explicit instruction was faded across the three training sessions. Following training, children in the instruction group again completed the irony comprehension task and showed much higher accuracy than in their pre-training test (71% vs. 18% accuracy), and also in comparison to a control group (18% accuracy). Children's sensitivity to the training was not related to their TOM or language skills. Notably, the metapragmatic training in this study was specific to ironic language, and to the types of stories used in the irony comprehension task. Long-term retention and generalization were not tested. Szücs and Babarczy (2017) argued that "It could thus be the case that the puzzlingly slow development of irony comprehension relative to lexical and syntactic development is simply a matter of insufficient experience with ironic language use." (p. 145).

There is some evidence that social skills training can be effective for children with a diagnosis of ASD, in terms of improved general social competence (Chung et al. 2007; Tse et al. 2007; Williams White et al. 2007). There are now numerous programs that are being used clinically to improve social skills in children with a diagnosis of ASD, and there is also some debate about the

extent to which these are empirically supported and can be considered evidence-based interventions (e.g., Crooke and Winner 2016; Leaf et al. 2016, 2018). However, to our knowledge, very few studies have specifically assessed the efficacy of irony training for individuals with ASD.

In one of the few studies on the topic, Persicke et al. (2013) implemented sarcasm training with three children aged 6–7 years who had been diagnosed with ASD. These children had received prior training in related skills like facial expressions, beliefs, and intentions, but not in sarcasm per se. Training occurred in two phases, in sessions of up to 30 min two to three times per week. In the first phase of training, rules were described (e.g., "When someone says the opposite of what they mean, they are probably being sarcastic", p. 196) and modeled across multiple exemplars, illustrated with video clips. After each clip, the therapist asked the child several questions about the events portrayed and the belief and intent conveyed in the sarcastic and sincere comments. The therapist provided children with feedback about their responses. The first phase of training concluded when the child could correctly answer at least 80% of the questions. The second phase of training involved sessions in which rules were re-stated, and then the therapist or parent made sarcastic comments during conversation with the child, praising for correct responses and providing feedback on incorrect responses. Again, this phase of training continued until the child could correctly respond to at least 80% of novel sarcastic exemplars. Testing conducted post-training suggested that all three children could accurately detect new instances of sarcasm. Thus, the authors concluded that training had been successful. It is important to note, however, that the sample size in this study is smaller than that typically recommended to establish efficacy (e.g., APA Division 12 Task Force on Promoting and Disseminating Psychological Procedures 1995). Furthermore, as in many studies exploring socialization interventions in ASD, no control group was assessed (e.g., Tse et al. 2007).

In contrast, a control condition was included in an intervention designed to improve irony comprehension in adults with ASD (Saban-Bezalel and Mashal 2015). The intervention was conducted with adult speakers of Hebrew who had been diagnosed with ASD. Individuals in the intervention condition were shown short stories, comic strips, and video clips, in small group sessions once a week over a 5-week period. The first training session involved explicit instruction on the nature of verbal irony and the social context of its use. In subsequent sessions participants were asked to analyze video clips and identify cues to irony, and to generate examples of irony from short stories and comic strips. Individuals in the control condition also attended regular sessions where they watched the same video clips and rated them on dimensions that were unrelated to irony. Results showed that irony comprehension in the intervention group was significantly more accurate after training, and was equivalent to accuracy in a non-ASD group. Saban-Bezalel and Mashal (2015) also examined hemispheric processing using a divided visual field paradigm. It has been reported that individuals with ASD do not show the usual right-hemisphere advantage for processing ironic language; instead, verbal irony seems to be processed bilaterally in ASD (Colich et al. 2012), Saban-Bezalel and Mashal (2015) found that the intervention led to hemispheric changes in the ASD group. That is, prior to the intervention the ASD group showed equivalent processing of ironic stimuli in both hemispheres, but post-intervention the ASD group responded faster to ironic stimuli presented in the left visual field (right hemisphere). Thus, the intervention was associated with a change in brain lateralization for irony in the ASD group.

In a longitudinal study with adult second-language learners, Bouton (1999) found that irony comprehension in a second language improved with increased language proficiency and experience with the second language and its culture, but remained the most challenging form of figurative language for L2 learners to understand. In addition, Bouton (1999) found that adult second-language learners of English showed improved irony detection after six weeks of classroom instruction (six hours of explicit instruction plus informal follow up) in understanding implicatures (e.g., indirect criticisms, scalars, irony), using classroom discussion, handouts with examples, and comics. Bouton argued that irony is a type of figurative language that can be taught because it depends on detecting cues that can be explicitly described and practiced.

A recent training study conducted with nine adult Korean speakers who were enrolled as graduate students at an English-language University (Kim and Lantolf 2018) also reported positive training effects. Over 10 weeks, participants received training in detection of sarcastic irony in English speech. This included ten weeks of one-on-one weekly sessions, and two small group sessions. Training involved analysis of videos and also of written material from Amazon product reviews, Twitter, and Facebook. A pre-test, post-test, and delayed (one month later) post-test were administered. Results showed that participants were more accurate in their detection of verbal irony at post-test than they were before training, and that they had improved further at the delayed post-test. As such, this approach showed promise for irony training in second-language learners.

6. Considerations for Future Research

The studies reviewed in the previous section show that there is some emerging evidence for the effectiveness of irony training. The previous studies have provided some evidence, albeit limited, that irony training may be effective in typical development, in atypical development, and in second-language learning. We would argue, however, that these studies have only scratched the surface of the potential for irony training studies. In future research it will be important to conduct well-powered training studies involving control groups and randomized assignment to groups, where possible. Future studies should compare training strategies to determine what is optimal for each population of learners. Key questions include the efficacy of group vs. individualized training, and how best to ensure transfer and generalization. That is, strategies that are effective in laboratory and classroom tasks may not necessarily apply to the appreciation of irony in the complexity of everyday social situations. Thus, it will be important to include training in varied social contexts, in order that appreciation can be generalized across instances. While it is reasonably well documented that training is important for atypically developing children and second-language learners in the realm of irony comprehension, training could also help typically developing children. Typically developing children show a great deal of variability in irony appreciation (Loukusa and Leinonen 2008). Training could help those children who develop irony comprehension skills relatively late, in order to remedy differences in social experience and to foster their full participation in social conversation.

We think that training studies can also address lingering theoretical questions about irony comprehension. To do so, future studies will need to take a more focused approach to training than has been achieved in the studies conducted so far. That is, the first phase of future studies needs to focus training on one type of information in order to make theoretical advances. Training studies could be designed to test different theoretical claims about irony comprehension. For instance, the graded salience hypothesis (Giora 2002) predicts that training that builds up a lexicon of words and phrases that are familiar as ironies should improve comprehension. This prediction could be tested in a training study that focuses on developing an irony lexicon. Similarly, predictions derived from Relevance theory (Sperber and Wilson 1986) could be tested in a future training study. Relevance theory suggests that irony comprehension will be facilitated by knowledge of contextual cues and attention to incongruity of statement and context. Allusional pretense theory (Kumon-Nakamura et al. 1995) predicts that irony comprehension could be improved by increased cultural knowledge about social norms and expectations. Research could compare the efficacy of training that focuses on each of these elements.

Training studies can also help to pinpoint the skills and experiences that support irony development. Previous research has shown that the TOM skills of typically developing preschoolers can improve after two training sessions on the concepts of belief, desire, and perception (Slaughter and Gopnik 1996; for similar results see Melot and Angeard 2003). In order to investigate whether TOM supports irony development, future training studies could examine whether TOM training affords benefits for irony comprehension. Attempts to train TOM skills in children with ASD have also shown some success, albeit with more extensive training (Carolien Gevers et al. 2011; Fisher and Happé 2005). Thus, there is similar potential to test the role of TOM in irony comprehension in ASD.

Relatedly, training studies could also assess whether there is evidence for other underlying skills that have been proposed to be important to irony. For instance, if social experience is critical in irony development (Pexman and Glenwright 2007), then training that provides children with social experience with ironic language should facilitate irony appreciation. If empathy and emotional perspective taking are essential pre-requisites to irony comprehension (Nicholson et al. 2013), then training in those skills should improve children's irony comprehension accuracy. If the research shows that each of these skills are beneficial to irony development, then an important next step in a second phase of training studies will be to evaluate whether the contributions of these social/cognitive/linguistic skills are additive or redundant, by comparing conditions that provide training in more than one of these skills.

In addition, in such training studies post-test materials could be designed to help understand which aspect of irony comprehension is facilitated by the linguistic or social-cognitive process that is the focus of training. For instance, TOM training may facilitate inferences about the ironic speaker's counterfactual belief but perhaps not about the ironic speaker's intent to be funny. Findings like these will help develop theoretical frameworks like the constraint satisfaction approach, that are currently underspecified, by detailing the unique and relative contributions of each social/cognitive/linguistic process to aspects of irony interpretation. Ideally, this would advance the theory to the point where it is specific enough to be implemented and tested as a computational model of irony comprehension, something which has not so far been successful (Wallace 2015). Simulations of such a model could be used to further understand typical development, and to help pinpoint the sources of difficulty for those populations that struggle with irony comprehension.

7. Conclusions

The studies we have reviewed here suggest there is much that we do not yet understand about how irony appreciation is acquired in typical development and about why it is challenging for so many. While irony comprehension is a difficult aspect of pragmatic development, it is one that may be particularly well suited for training. That is, irony appreciation depends on cues and constraints that could be explicitly taught, and on social experiences that could be fostered. We have also reviewed a limited set of studies that show that there may be promise in explicit teaching and training for irony comprehension. The number of these studies is small and we have offered suggestions about how this work could be improved and could lead to theoretical advances in future research on this topic.

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