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ARTICLES

Enhancing Empathy and Theory of Mind

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Social cognitive skills such as empathy and theory of mind are crucial for everyday interactions, cooperation, and cultural learning, and deficits in these skills have been implicated in pathologies such as autism spectrum disorder, sociopathy, and nonverbal learning disorders. Little research has examined how these skills develop after early childhood and how they may be trained. We tested the hypothesis that experience in acting, an activity in which one must step into the shoes of others, leads to growth in both empathy and theory of mind. In two studies, we followed children (elementary school aged) and adolescents (high school freshmen) receiving 1 year of either acting or other arts training (visual arts, music) and assessed empathy and theory of mind before and after training. In both studies, those receiving acting (but not other arts) training showed significant gains in empathy scores; in Study 2, adolescents receiving acting training also showed significant gains on a naturalistic measure of theory of mind, the Empathic Accuracy Paradigm. These findings demonstrate plasticity in empathy and theory of mind long past the watershed age of 3 to 4 years and suggest that both capacities are enhanced by role-playing.

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Social cognitive skills such as empathy (matching the emotional state of another) and theory of mind (understanding others' mental states) are crucial for everyday interactions, cooperation, and cultural learning. Although we know a great deal about the most basic forms of these abilities in preschoolers (e.g., Eisenberg & Strayer, 1987; Wellman, Cross, & Watson, 2001), we know little about the later forms of these abilities and the experiences that may enhance these skills in late childhood and adolescence. In a shift from the traditional focus on the normative emergence of these skills in very young children, we examined whether differential levels of these skills in older children and adolescents are associated with acting training.

Acting is a peculiarly human activity in which we realistically pretend to be another person without any intent to deceive. There is both theoretical and empirical support for the possibility that acting training may increase empathy and theory of mind. Theatre theorists have argued that acting fosters empathy (Levy, 1997; Metcalf, 1931; Verducci, 2000) because actors take on roles in which they must feel and portray the feelings of their characters (Hayman, 1969; Hull, 1985; Stanislavsky, 1950). Actors must carefully analyze the beliefs, desires, and motivations of their characters (Hull, 1985; Stanislavsky, 1950)—activities that psychologists would classify as requiring sophisticated theory of mind. Developmental psychologists have shown that role-playing and pretense, both acting-like activities, predict performance on early theory-of-mind tasks (e.g., Taylor & Carlson, 1997), and that imitation, the embodiment of an actual person (like the embodiment of an imagined person in acting), is critical for the emergence of empathy and theory of mind (Jackson, Brunet, Meltzoff, & Decety, 2006; Meltzoff & Decety, 2003).

Correlational studies have investigated the relationship between acting training and both empathy and theory of mind. With respect to empathy, results are inconsistent. One study showed actors to be higher in empathy than nonactors (Nettle, 2006), while another found actors' empathy equivalent to nonactors in adolescence but lower than nonactors in adulthood (Goldstein, Wu, & Winner, 2009–2010). One (related) experimental study demonstrated that children receiving a year of acting lessons improved in adaptive social skills, but empathy was not measured (Schellenberg, 2004).

The findings with respect to acting (or acting-like activities) and theory of mind are more consistent. Two experimental studies showed that role-playing exercises enhanced perspective-taking skills (related to theory-of-mind skills) in delinquent adolescent boys (Chandler, 1973; Chandler, Greenspan, & Barenboim, 1974), and another showed that theory of mind could be trained via feedback about the correct interpretation of others' thoughts and feelings (Marangoni, Garcia, Ickes, Teng, 1995)—feedback training that actors are likely to receive in rehearsal. Three correlational

studies showed actors to be superior to nonactors in theory of mind (Goldstein & Winner, 2010–2011; Goldstein et al., 2009–2010), and several correlational studies have demonstrated heightened theory-of-mind ability in individuals who, like actors, think extensively about mental states: psychologists (Dziobek et al., 2006), fiction readers (Mar, Oatley, Hirsh, dela Paz, & Peterson, 2006), and dysphoric adolescents (Harkness, Sabbagh, Jacobson, Chowdrey, & Chen, 2005). Considering these findings, there is promising evidence that leads us to hypothesize that training in acting leads to growth in both empathy and theory of mind. A demonstration that acting trains empathy and theory of mind has implications for our understanding of how these skills develop and could provide support for the conclusion that at least one means by which these skills grow is through role-play.

The Current Studies

The aim of the current studies was twofold. First, we investigated whether acting training is causally implicated in fostering empathy and theory-of-mind skills in middle childhood and adolescence. Second, we investigated the ways in which acting is taught so that we could understand how acting training may foster these skills.

Ideally, of course, a training study should randomly assign participants to a treatment and a treated control group. But random assignment in educational settings is extremely difficult to carry out. Unless a school is willing to randomly assign students to groups, or unless parents are willing to allow their children to be randomly assigned to certain kinds of after-school activities, researchers must rely on quasi-experimental designs and make every effort to match groups on relevant variables. To compensate, we matched our treatment and treated control groups at baseline and on a variety of control measures such as age, vocabulary level, socioeconomic status (SES), and amount of time spent on the activity.

Participants were tested on their empathy and theory-of-mind skills before and after 10 months of acting training. Those receiving acting training were compared to a treated control group receiving other kinds of arts training: either visual arts or music. We did not include a no-treatment control group because a finding of a greater effect of acting training over a no-treatment control group might be due to the stimulating effect of any kind of structured extracurricular or arts activities.

If an effect of acting training is found, it would be important to link outcomes to the kind of training received in acting classes. Therefore, we also conducted an ethnographic analysis of the acting classes given in both age groups by videotaping a sample of the acting classes from the schools from which participants for the longitudinal study were drawn. We coded

the kinds of skills the teachers were attempting to teach (following the method used by Hetland, Winner, Veenema, & Sheridan, 2007). Our goal was to identify and describe all instances of instruction in empathy and theory of mind so that we could understand any findings showing gains in these skills following acting training.

In Study 1, we tested 9-year-olds; in Study 2, we tested 14-year olds. These two age groups were selected because we know that the perspective-taking skills underlying both empathy and theory of mind continue to develop throughout middle childhood and early adolescence (Blakemore & Choudhury, 2006; Gogtay et al., 2004; Lenroot et al., 2007). Thus, these are the ages at which training is most likely to have an effect. By including both children and adolescents, we sought to determine whether there are developmental differences in the extent to which acting training can enhance theory of mind and empathy.

STUDY 1

Method

Participants

Participants were 35 elementary school children (ages 7;6–10;11; $M_{\text{Age}} = 9;2$; 14 males, 21 females) enrolled in after-school acting classes and 40 children (ages 8;0–10;5; $M_{\text{Age}} = 8;10$; 19 males, 21 females) enrolled in after-school visual arts classes. Classes met once a week for 90 minutes. Participants included students who had already signed up for classes, as well as those recruited explicitly for participation in the study. Unfortunately, we were only able to recruit a small number of participants (10 art and 4 acting), and therefore, comparisons between those recruited for the study and those who had a preexisting interest in their art form could not be made. Students were given free tuition in return for participation.

Procedure

Elementary school students were seen individually at their school or in our laboratory, once at the beginning of the school year and again 10 months later. Order of administration of measures was randomized for each participant.

Materials

Theory of mind. Participants completed two cognitive and one perceptual measure of theory of mind. The *Faux Pas* (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999) is a cognitive measure of theory of mind that

assesses the ability to recognize unintentional insults. Children were read nine brief vignettes in which one character commits a faux pas (i.e., a woman accidentally calls a little boy a girl). Children are then asked if "someone said something they should not have said," and if so, what they said. Success on this test requires that one understand the difference between intention and behavior, with scores ranging from 0 to 9.

The *Strange Stories* Test (Happé, 1994) is another cognitive measure of theory of mind, which assesses the ability to recognize speakers' meanings underlying a nonliteral utterance. Children were read 15 brief vignettes ending with a nonliteral or false utterance (e.g., metaphor, sarcasm, double bluff, or lie) and were asked if the utterance is "true" and what it meant. Success on this test requires that one infer a speaker's unstated intentions and beliefs, with scores ranging from 0 to 15.

The *Reading the Mind in the Eyes* Test for children (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) is a perceptual measure of theory of mind that assesses the ability to recognize mental states from static images of a person's eyes. Children were shown 28 photos of faces with only the eyes showing and were asked to choose from among four mental or emotion state terms (e.g., friendly, sad, surprised, worried) which one best describes what the eyes show. This measure is widely used as a task of theory of mind because participants are asked to recognize the cognitive and emotional states of the target, rather than feel the emotions shown in the target's eyes (which would be empathy). Possible scores on this task range from 0 to 28.

Empathy. Empathy was measured via the *Index of Empathy for Children* (Bryant, 1982), which assesses the extent to which children have a concurrent emotional reaction to another's emotional situation. There are 22 total statements (with total scores ranging from 0 to 22) on which participants classify themselves (with a yes/no answer). Sample items include: "Even when I don't know why someone is laughing, I laugh too." And, "I really like to watch people open presents, even when I don't get a present myself." This measure has been shown to have a high alpha (.68) for elementary school children and is considered a standard measure of dispositional empathy (Zhou, Valiente, & Eisenberg, 2003).

The *Fiction Emotion-Matching task*, created for this study, presented participants with four 30-second fictional film clips in which the main character was either feeling sad or scared. The clips came from the movies *Charlie and the Chocolate Factory* and *Willy Wonka and the Chocolate Factory* and were chosen because the age of the protagonists in each clip was close to the age of the participants, the protagonist was clearly sad, and the sadness was clearly conveyed by facial expression and tone of voice.

Participants were asked to identify the feelings of the character (''What is the main emotion felt by the boy in this movie?'') and to identify their own feelings (''What was your emotion as you watched this movie?''). All participants correctly identified the emotion of the protagonist of the clips as either sad or scared. Responses were scored (by two independent coders, with a third to resolve discrepancies) as *matches* when the participant's emotion matched the emotion they inferred in the character. Scores could be 0.0 (never matching), 0.25 (one match), 0.5 (two matches), 0.75 (three matches), or 1.0 (always matching).

Control measures. Parents completed a questionnaire specifying how much previous experience their child had with acting and/or the visual arts. We also asked parents for their highest level of education to calculate SES using the following scale: some high school (1 point); high school degree (2 points); some college (3 points); bachelor's of arts, science, or fine arts (4 points); master's of arts, science, fine arts, business administration, or public health (5 points); and doctorate, medical degree, or juris doctor (6 points; Norton et al., 2005).

The children completed the Wechsler Intelligence Scale Fourth Edition (WISC-IV; Wechsler, 2003) Vocabulary subtest. This allowed us to control for potential differences in verbal intelligence between groups.

Results

Descriptive statistics are provided in Table 1. The acting and control groups did not differ in SES or age, and previous experience with any art form did

TABLE 1
Descriptive Statistics for Elementary School Students

	Actors		*Nonactors*	
Characteristic/Test	*Time 1*	*Time 2*	*Time 1*	*Time 2*
N	35	31	40	37
Age	9;2	10;0	8;10	9;8
SES	4.16	4.16	4.35	4.35
Vocabulary	28.51	31.74	31.05	36.77
Faux Pas	7.66 (2.9)	9.66 (2.5)	8.43 (2.7)	9.70 (2.9)
Strange Stories	4.52 (1.7)	6.45 (1.6)	4.62 (1.7)	6.89 (1.3)
Reading the Mind in the Eyes	8.64 (1.5)	8.74 (2.1)	8.97 (1.7)	8.83 (1.9)
Index of Empathy	13.38 (2.9)	15.16 (2.6)	12.75 (3.4)	12.83 (3.6)
Fiction Emotion-Match	0.62 (0.46)	0.54 (0.53)	0.25 (0.43)	0.33 (0.46)

not predict any outcome measure. In all subsequent analyses, we included verbal ability as a covariate. We also included sex as a factor because it has been shown that females have an advantage in empathy and theory of mind in childhood (Bryant, 1982; Eisenberg & Strayer, 1987; Jolliffe, & Farrington, 2006).

Pretest

To determine whether there were preexisting differences between those who took acting lessons versus arts lessons, we conducted univariate analyses of variance (ANOVAs; with sex as a factor, controlling for verbal IQ) on each of our outcome measures. There were no differences between groups on the Faux Pas, Strange Stories, or Reading the Mind in the Eyes Tests ($ps > .29$) or on the Index of Empathy ($p > .30$). However, the actors scored higher on the Fiction Emotion-Matching measure, $F(1, 74) = 7.87$, $p = .006$.

Posttest

We examined each outcome measure at posttest using individual group $\times$ time repeated-measures ANOVAS (with sex as a factor, controlling for verbal IQ) on each outcome measure at posttest to determine whether performance on these measures was affected by 10 months of acting training. The actors gained significantly more on the Index of Empathy scores than did their controls, as shown by a group $\times$ time interaction, $F(1, 64) = 4.26$, $p = .043$, $d = 0.53$, but they did not show more theory-of-mind gains than their controls did on any of the three measures.

The one difference found between groups at pretest was not affected by training. On the Fiction Emotion-Matching task, a three-way ANOVA (sex $\times$ group $\times$ time) showed no interaction of group $\times$ time. However, there was a main effect of group: The actors matched the perceived emotions of fictional characters in movies more often than did nonactors, $F(1, 64) = 7.39$, $p = .008$, $d = 1.23$.

Analysis of Acting Classes

Videotapes of seven classes were analyzed to determine the kind of instruction students received in empathy and/or theory of mind. Tapes were transcribed, and four coders judged each comment made by the teacher in terms of what the teacher was attempting to teach. Interrater reliability was 95.3% for all videos across all four coders, across all chunks of teacher comments. To ensure there was a sufficiently high level of agreement, we conducted Spearman-Brown nonparametric correlations across coders for each of the seven classes separately to determine the mean intraclass correlation.

Responses for each class were highly correlated, all *Spearman's rho* > .300, all *ps* < .001.

The classes involved a variety of improvisation games at the beginning of the year and a few scene study sessions at the end of the year. Games included character-driven improvisations (e.g., making one member of the class guess the character that other members of the class were enacting); physical exercises (e.g., trying to get the entire class into one small square of space); verbal games (e.g., quickly passing along verbal sounds and gestures); observational exercises (e.g., having students observe each other, look away and change two physical characteristics such as untying their shoes, and turn back and guess what had changed); and group-building improvisations (e.g., having the students build a machine piece by piece with their bodies, followed by a discussion of the function of the machine).

Coders were asked to categorize each time the teacher made a comment or reacted to a comment made by a student. Definitions and examples of each code are provided in the Appendix. Categories provided to the coders, along with definitions and examples, were: theory of mind, empathy, emotion regulation, imagination, physicality, listening, language, class management, motivation, professionalism, and pacing. These categories capture the kinds of abilities acting theorists describe as necessary for the development of acting skill (Hayman, 1969; Hull, 1985; Stanislavsky, 1950).

Table 3 shows the frequency of explicit instructional moments focusing on each of the 11 kinds of habits of mind we saw being taught. Explicit empathy instruction was almost never seen (0.35% of teacher comments). There was only a moderate amount of explicit instruction in theory of mind (9.73% of teacher comments). Instead, teacher comments focused on physicality (16.65%) and motivating the students (20.55%).

Discussion

We found that 10 months of acting training for elementary school students is associated with increases in self-rated dispositional empathy but not with theory of mind. During the course of 10 months of acting (but not visual arts) training, children rated themselves as becoming more empathic despite receiving no explicit training in empathy. Spending a year stepping into the shoes of others and learning to pay close attention to those around them may have increased empathy in these children.

The children enrolled in acting classes were also more likely at both pretest and posttest to match the emotion of a fictional character compared with the children enrolled in visual arts. This tendency to feel the same emotion as that perceived in a fictional character might be a proclivity that draws young people to study acting and might indicate the ability to become

readily absorbed in fiction and hence drawn into the world of acting (Goldstein & Winner, 2009).

Why did theory of mind not increase for these actors? Possibly, the theory-of-mind measures administered to this group were not true to life or sensitive enough. The measures participants received did not combine dynamic visual and auditory cues but instead required inferences be derived from stories or static visual cues. Another possibility is that the theory-of-mind tasks used in this study were weighted toward representing beliefs rather than emotions. Both the *Faux Pas* and the *Strange Stories* tasks are measures of belief and knowledge states, which both groups of children understood at the same level. And the *Reading the Mind in the Eyes* task is a measure that includes both emotion and knowledge states. In Study 2, we therefore included a theory-of-mind task that is both more true to life and tests participants' ability to recognize emotions as well as belief states.

STUDY 2

Method

Participants

Participants were 28 high school students (ages 13;0–16;0; $M_{\text{Age}} = 14;4$; 9 males, 19 females) majoring in acting at one of two high schools for the arts. The students were all beginning their freshman year at these schools. Students had some previous experience in acting, but none had received the high intensity (9 hours per week plus productions) of training they received at their new schools. Twenty-five high school students (ages 13;0–16;0; $M_{\text{Age}} = 14;4$; 8 males, 17 females) majoring in the visual arts or music at the same high schools formed the control group. Students are admitted to these high schools either through audition (acting and music) or portfolio (visual arts). The actors and the nonactor arts control students received the same level of intensity of training. All participants were already enrolled in their freshman year before recruitment for this study took place.

Procedure

Students were seen in small groups of five to eight at their schools. All were seen once at the beginning of the school year and again 10 months later. Order of administration of measures was randomized for each small group.

Materials

Theory of mind. Two measures were used to assess advanced theory of mind. We used the adult version of the *Reading the Mind in the Eyes* Test

used in Study 1. The adult version contains 36 questions, with scores ranging from 0 to 36 (Baron-Cohen et al., 2001).

The second measure used was an *Empathic Accuracy Paradigm* (Ickes, 2001). This is a measure of theory of mind (despite the name). The Empathic Accuracy Paradigm assesses the ability to infer a person's mental states from moment to moment as that person interacts with another, and it does not measure or require the matching of emotions to be successful. Following standard procedure for the creation of this test, we filmed a woman in discussion with her husband for 15 minutes, with only the woman's face and upper body shown but both voices heard. We then replayed the tape to the woman and asked her to stop it at every moment when she recalled having a specific thought or feeling at that point in the conversation and to note that thought or feeling. Participants viewed each of the 15 moments the woman had identified and were asked, "What was she thinking or feeling underneath what she said?" Target thoughts and emotions ranged in valence and arousal. Responses were scored as accurate if they matched the woman's reported thoughts and feelings (on a 3-point scale); thus, scores could range from 0 to 15. Participants received a 0 for a complete mismatch, a 0.5 if the valence was correct but the type of thought/emotion expressed was not a match, and a 1 if both the valence and type of thought/emotion were matched. Unlike the *Reading the Mind in the Eyes* Test, this measure assesses the ability to process true dynamic cues and is therefore a more ecologically valid and naturalistic measure of theory of mind. Both of these measures require the ability to read subtle and complex mental and emotional states from perceptual cues and thus represent a natural progression from the theory-of-mind measures used in Study 1. Validity of our version of this measure is discussed in the Results section below.

Empathy. Dispositional empathy was measured via the *Basic Empathy Scale* for adolescents (Jolliffe & Farrington, 2006). The 11 questions on which participants must classify themselves (on a 5-point Likert scale, with mean scores created for each individual ranging from 0 to 4) include, "My friend's emotions don't affect me much," and "After being with a friend who is sad about something, I usually feel sad." The *Fiction Emotion-Matching task* (described in Study 1) was also administered, with videos appropriate for this older age group, taken from *Love Story, Dawson's Creek, Kramer v. Kramer*, and *The Laramie Project*. These clips had previously been rated by adults as very sad (Goldstein, 2009), and all participants correctly identified the protagonists as sad.

Control measures. Parents again completed a questionnaire specifying how much previous experience their child had had with acting, the visual

arts, and/or music. We also assessed SES using the same scale as in Study 1. Finally, participants completed the *WAIS* (Wechsler, 2003) Vocabulary subtest.

Results

Descriptive statistics are provided in Table 2. The acting and control groups did not differ in SES or age, and parent-rated previous experience with any art form did not predict any of the outcome measures. In all subsequent analyses, we included verbal ability as a covariate. We again included sex as a factor. There were no differences between the visual arts and music control groups at either pretest or posttest, and we therefore combined them into one control group.

Measure Validation

The version of the Empathic Accuracy Paradigm used in this study was created by us, as there is no standard version of this measure and each researcher must create his/her own (e.g., Hall & Schmid-Mast, 2007; Ickes, 2001; Zaki, Bolger, & Ochsner, 2008). To validate our version, we correlated scores with the other more widely used and standardized measures of theory of mind and empathy used in this study. At pretest, scores on the Empathic Accuracy Paradigm were significantly correlated with the Basic Empathy Scale, $r(50) = .33$, $p = .017$, and were marginally correlated with the Reading the Mind in the Eyes Test, $r(50) = .25$, $p = .07$. At posttest, scores on the Empathic Accuracy Paradigm were significantly correlated with both the Reading the Mind in the Eyes Test, $r(47) = .35$, $p = .015$, and the Basic Empathy Scale, $r(47) = .41$, $p = .004$. Given the consistency of the

TABLE 2
Descriptive Statistics for High School Students

	Actors		*Nonactors*	
Characteristic/Test	*Time 1*	*Time 2*	*Time 1*	*Time 2*
N	27	26	25	22
Mean Age	14;4	15;2	14;4	15;2
Mean SES	3.2	3.2	4.0	4.0
Vocabulary	28.08 (12.2)	28.84 (10.3)	28.85 (13.9)	33.75 (16.4)
Reading the Mind in the Eyes	11.90 (3.2)	11.96 (3.2)	10.86 (3.8)	11.05 (3.4)
Empathic Accuracy	3.98 (2.4)	9.32 (4.4)	3.54 (2.2)	8.07 (3.6)
Basic Empathy Scale	3.42 (0.43)	3.51 (0.45)	3.56 (0.54)	3.33 (0.70)
Fiction Emotion-Match	0.71 (0.53)	0.72 (0.45)	0.45 (0.53)	0.57 (0.43)

correlations across time and the fact that the Empathic Accuracy Paradigm correlated with both a standard measure of theory of mind and a standard measure of empathy, we were satisfied with its validity.

Pretest

To determine whether there were preexisting differences between those who took acting lessons versus other arts lessons, we again conducted univariate ANOVAs (with sex as a factor, controlling for verbal IQ) on each of our outcome measures. We found a significant effect of group on the Reading the Mind in the Eyes task, $F(1, 48) = 3.84$, $p = .05$, with actors scoring higher. However, there was no effect of group on the Empathic Accuracy Paradigm ($p > .8$). We also found a trend effect of group in favor of the actors on the Fiction Emotion-Matching task, $F(1, 49) = 3.18$, $p = .08$, but no effect of group on the Basic Empathy Scale ($p > .9$).

Posttest

We conducted individual group × time repeated-measures ANOVAs (with sex as a factor, controlling for verbal IQ) on each outcome measure at posttest to determine whether performance on these measures was affected by 10 months of acting training. Actors gained marginally more in dispositional empathy scores than did controls, as shown by a group × time interaction, $F(1, 43) = 3.69$, $p = .06$, $d = 0.56$. Actors also gained significantly more in Empathic Accuracy Paradigm scores than did controls, as shown by a group × time interaction, $F(1, 41) = 5.37$, $p = .026$, $d = 0.84$.

Some differences between groups were found at pretest and were not affected by training. On the Fiction Emotion-Matching task, a three-way ANOVA (sex × group × time) showed no interaction of group × time. However, there was a marginal main effect of group: The actors matched the perceived emotions of fictional characters in movies marginally more often than did nonactors, $F(1, 42) = 3.55$, $p = .067$, $d = 0.55$. For the Reading the Mind in the Eyes Test, a three-way ANOVA (group × time × sex) showed no interaction of group × time, but a main effect of group, with actors scoring higher than nonactors, $F(1, 41) = 4.69$, $p = .036$, $d = 0.73$.

Analysis of Acting Classes

Videotapes of six classes of the high school actors were again analyzed to determine the kind of instruction students received in empathy and/or theory of mind. Codes and coders were the same as those used for analyzing the elementary school classes. Interrater reliability was 75.10% for all videos across all four coders, across all chunks. We believe interrater reliability was

TABLE 3
Percentage of Teaching Statements for Each Group in Acting Videos

Code	*Elementary school group*	*High school group*
Empathy	0.35%	2.48%
Theory of Mind	9.73%	25.01%
Classroom Management	40.16%	27.05%
Motivation/Trust Yourself	20.55%	17.90%
Physical	16.65%	13.96%
Paying Attention	7.78%	2.36%
Language	3.62%	4.78%
Imagination	3.30%	1.80%
Emotion Regulation	1.52%	2.93%
Timing/Pacing	1.62%	0.59%
Professionalism	0.10%	1.13%

lower here than in Experiment 1 because unlike in the younger classes, the teachers for the older classes often included two or three codable concepts each time they made a statement. We coded reliability based on agreement on every single code for each statement, but often coders agreed on only two out of three codes for a statement. To ensure that that interrater reliability was sufficiently high, we conducted Spearman-Brown nonparametric correlations across coders for each of the six classes separately to determine the mean intraclass correlation. *Spearman's rho* ranged from .171 to .651, with corresponding p values from .042 to $1.3 \times E^{-66}$, and therefore, we were satisfied with the level of interrater agreement.

The classes for the high school students focused on character study and character analysis. These classes also included a variety of improvisations, scene studies, and physical activities. Exercises included improvisations in which students created scenes based on physical postures and relationships, character-driven improvisations similar to younger classes, and analysis of scenes both written by students and from classic plays.

Table 3 reports the frequency of explicit instructional moments focusing on each of the 11 kinds of habits of mind we saw being taught. Explicit empathy instruction was again almost never seen (2.48% of teacher comments). In contrast, there was a large amount of explicit instruction in theory of mind (25.01% of teacher comments).

Discussion

High school students receiving acting training rated themselves as having marginally significant higher levels of dispositional empathy than those in the nonactor group. During the course of 10 months of acting (but not other

arts) training, students rated themselves as becoming marginally more empathic despite receiving no explicit training in empathy. In addition, the actors gained in theory-of-mind acuity on a naturalistic and true-to-life task over and above other arts students by becoming more adept at detecting real mental states in others from dynamic visual and auditory cues. Despite the small mean group changes over time, the effect sizes were medium to large (Rosenthal & Rosnow, 1991). Prior to the acting intervention, these actors also showed a higher tendency to match the emotions of a fictional character and a superior ability on the Reading the Mind in the Eyes task prior to the intervention—a task in which they had to read mental states in static, posed photographs.

It should be noted that the other arts control group also gained in empathic accuracy during the course of the year, although not at the same rate as the actor group. There are several possible factors that could explain the control group's increase. First, we used the same videos at both pretest and after 10 months of training, and thus, both groups could have benefited from a practice effect. Second, it is possible that other forms of arts training also help students develop theory-of-mind skills. And finally, students in both groups may have improved on the Empathic Accuracy Paradigm simply as a function of age and of having completed 1 year of high school, with its accompanying social demands. However, our findings suggest that the acting training received by the older group also contributed to the rise in Empathic Accuracy scores because the actors improved significantly more than did the control group.

GENERAL DISCUSSION

This study is the first to show that an arts intervention—training in acting—may lead to growth in the social cognitive skills of empathy and theory of mind and is one of a few studies (along with Schellenberg, 2004) demonstrating possible transfer of learning from an art form. As mentioned, random assignment of participants to training groups was not feasible. As in many intervention studies (cf. Hyde et al., 2009), we had to rely on a quasi-experimental design in which we followed children who chose (or whose parents chose for them) to study acting versus other art forms. We were able to select two groups matched in SES and age and in which participants' previous training in each of the art forms proved unrelated to our outcome measures. In addition, we controlled for gender distribution and verbal ability. On self-reported dispositional empathy and naturalistic theory of mind, we found no differences at pretest. Thus we believe that the significant interactions of group $\times$ time that we report allow us to support the possibility that these two outcomes were fostered by acting training.

However, there are other possibilities that could explain the gains we found over time. First, because our groups of actors in both studies were more (or marginally more) likely to become absorbed in fiction (as shown by our measure of empathy for fictional characters), it is possible they were also more likely to experience changes in our outcome measures during the course of a year of acting training. The tendency to become absorbed by fictional characters and feel their emotions may make it more likely that experience in acting will lead to enhanced empathy off stage. Additionally, the preexisting difference between the acting and other arts group in Study 2 on the Reading the Mind in the Eyes Test could predict a different developmental trajectory. That is, the actors' initial advantage in recognizing beliefs and emotions from static pictures could be a precursor to their later ability to recognize the beliefs and emotions in dynamic cues.

The fact that the high school but not the elementary school actors showed significant gains in theory of mind also suggests that only the older participants may have received a sufficiently strong "acting dose." The elementary school students received only 90 minutes a week, while the high school students received a more intense "dose" of 5 to 9 hours per week. The threshold for developing theory of mind via acting training may be higher than the amount of training received by the elementary school group but lower than the amount received by the high school group.

The present findings demonstrate continued plasticity of self-reported empathy as well as theory of mind through middle childhood and adolescence and show that these skills may be enhanced through imagining and enacting oneself as an imaginary other. Actors learn to mirror others' emotions (empathy) and reflect on what others are thinking and feeling (theory of mind). Role-playing beyond early childhood may be a route by which humans come to develop enhanced empathy and gain greater insight into others' beliefs and emotions.

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APPENDIX

Video Coding Guide and Examples

Code	*Example*
Theory of Mind: instructing students to think about another person's mental or emotional state. This can include thinking about beliefs, intentions, relationships, emotional states, motivations for a behavior, or simulating the mental states of a character.	Teacher: "But in this scene, what do you want from him in that moment, what are you seeking, what is the desired result for you here?" Student: "For me or for him?" Teacher: "Well, both of you. But for you, let's be real. Let's make it about you. Where do you want him to wind up? That's about you?" Student: "A good place. I want him to . . ." Teacher: "What good place?" Student: "Um, I don't want him to get fired."
Empathy: instructing students to feel the feelings of another person, either because their character would feel that emotion, or because they have a moment from their own life that could inform the character's emotional state.	"You know what, let's do it silently. OK, so you are just really sad, OK. I want to see you visually crying . . . so this is going to be hard for you as you are one of the smiliest people I have ever met in my life so I need to really see you sad, OK?"
Emotion Regulation: instructing students to create an emotion. This can occur either for a particular situation, or more generally, when thinking about how to create and control emotional states.	Teacher: "Um, ladies, don't make crying your goal. Because it is not." Student: "Oh, no, no, no, I, it just happened." Teacher: "OK, alright, if it just happens, that is wonderful."
Imagination: instructing students to imagine what the environment is like in a particular situation: what it smells like, sounds like, and looks like.	[In response to a fantasy machine made of children's bodies and noises] "What do you think you were making? . . . Well, audience, what do you think they were making?"
Pure Physicality: instructing students how to position their body or change themselves physically. This can involve teaching students to think about how their bodies would look and/or feel if they were their character, instructing students to space themselves at a proper distance from the other actors and scenery around them, instructing students to pay attention to their own physicality, think about how their body feels, relax part of their body, etc., or instructing students in vocal projection.	"Awesome, remember that you want to stay in control of your body when you're doing it, and it should move around the circle so fast that we can follow it with our eyes [looks around the circle] steady, steady, steady, OK?"

Observation of Others: instructing students to listen and pay attention to others in the class.	"If you are not responding or listening or paying attention to your scene partner, you got two people up there doing their own thing. And that scene that you and [student] did was not working because he was not listening to you."
Language/Definitions: instructing students to use and understand language precisely.	Student: "And indirect is like, if there's a chair there, and you're walking, and walk around it, and then you sit down." Teacher: [demonstrating] "Kind of walk, and look at the chair for a minute, and sneak up on the chair, maybe, that might be indirect."
Classroom Management: instructing students in self-control and managing day-to-day activities in the classroom.	"Shhhhh, hold on, listen. Hold on, I'm waiting . . . Can you say that again?"
Motivation: instructing students in perseverance and confidence, to keep at their activities and trust their first impulses.	"Jack, great job, you're so expressive, you're really, now that you are knowing the lines better. Go even further; when the narrative says bold as brass, I want to see you gathering your courage to go up to the door."
Professionalism: instructing students to take their art seriously, leaving socializing for after class.	". . . when you walk into this space, it's a time to collect yourself. Not to socialize. You're about to do, many of you are about to do scene work, the rest of you are about to be watching the scene work. You should be going over things you need to go over to be ready to go. Not socializing."
Pacing/Timing: instructing students to slow down their words, or to pick up on other actors' verbal cues more quickly.	"Jump way in, hello is still, you know, circling the periphery, yeah. You want to get right in the bull ring. That's a good analogy, bull ring. Right, there is no time to think about what you should do or say when there is a bull in the ring with you, right. You just have to respond."