PERFORMANCE IN THEATRE AND EVERYDAY LIFE: COGNITIVE, NEURONAL, AND APPLIED ASPECTS OF ACTING

EDITED BY: Corinne Jola and Pil Hansen

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PERFORMANCE IN THEATRE AND EVERYDAY LIFE: COGNITIVE, NEURONAL, AND APPLIED ASPECTS OF ACTING

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Editorial: Performance in Theatre and Everyday Life: Cognitive, Neuronal, and Applied Aspects of Acting

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Editorial on the Research Topic

Performance in Theatre and Everyday Life: Cognitive, Neuronal, and Applied Aspects of Acting

Performing an act involves complex cognitive and emotional processes that are not yet well understood. The aim of this Research Topic was thus to bring together empirical studies that address these within the realms of the many opportunities role-playing and acting provide. Whilst the prototype of acting is known as playing the role of somebody other than oneself for a non-performing audience, we all perform and act in everyday life. We may explicitly impersonate a character when, for example, reading bed-time stories, but we also, and more implicitly, perform a "social role." Furthermore, something as simple as giving directions requires the ability to navigate a remembered scenario and anticipate future actions. If we acknowledge that these processes have performative functions, it is evident that acting and role-playing constitute an important part of human social behaviour. They are also found to develop early: pretend play is rehearsed as soon as a child has the capacity to understand that other people have different perceptions of events and contexts (i.e., theory of mind). Understanding the cognitive processes and underlying neuronal functions of theatrical performance can therefore be of great empirical and applied value to a variety of topics across disciplines.

The submitted works show that theatre offers itself to *interdisciplinary investigations* whilst facing *discipline-specific challenges*. The collection features two theoretical papers (Brown; McDonald et al.) and seven empirical studies (4 experimental and 3 survey-based) which are situated between theatre and the fields of atypical child development (Ioannou et al.), leisure (Pestana et al.) or education (Goldstein et al.; Hansen et al.; Schmidt et al.) and study topics such as perception and affect (Berceanu et al.; Olenina et al.). Considering the predominantly experimental stance of cognition and neuroscience research, one could argue that experimental designs are still underrepresented in studies of theatre. One reason is that studying cognitive and neuronal processes happens within the framework of *scientific reductionism*. As highlighted by Berceanu et al., it is difficult to dissect performance and plays into smaller parts without losing specific characteristics. Comparable issues are present in the field of dance (e.g., Christensen and Jola, 2015; Hansen, 2017), where a focus on quantifiable motion parameters can seemingly alleviate intangible facets. Similarly, elements such as language, gestures and poses seem to offer useful parameters for the study of acting, though examples remain limited. Within this topic, Berceanu et al. employed language as an indirect measure of how theatrical aggression is experienced, and Olenina et al.

engaged participants in distilled theatrical poses to measure affective responses. These studies offer preliminary examples of how scientifically measurable causal relationships may be extracted from complex acting practices.

The study by Berceanu et al. showed that performing repetitive aggressive behaviour impacts participants' cognitive processes more strongly than passively watching performed aggression. Interestingly though, the actors reported more positive affect when performing aggressive acts than when watching them. This result may reflect a *coping mechanism* that involves emotional distancing. It is noteworthy that the survey-based study by Schmidt et al. also report a coping mechanism specific to acting students when comparing their empathic abilities with those of dance and psychology students. While all cohorts showed increased empathy compared to the general population, only acting students showed low levels of personal distress which can be a sign of resilience. Both studies indicate that experience in acting may foster coping mechanisms that separate action from emotion. Olenina's et al. experimental study, however, identified a link between action and affect: The authors examined effects on affect and high perception of expanding and contracting poses distilled from Michael Chekov's acting techniques. Based on their findings, the authors proposed that the two poses produce different affective states, while both forms of affect in turn alters the actors' egocentric spatial perception.

Theatre is an excellent means to study emotional responses and cognition in an ecological and ethically valid manner, and it is noticeable that three manuscripts in our topic have provided measurements in *ecologically-valid contexts* (Berceanu et al.; Hansen et al.; Ioannou et al.). However, these studies also have overlapping limitations: small sample sizes, lack of control group with comparable activity and/or lack of randomised assignment. These limitations reflect the ecological context as actors and performers work in small groups and are selected from a small pool. To advance while maintaining ecological validity, repetition of standardised experiments with multiple groups can increase sample sizes and the ability to arrange controls. As suggested by Hansen et al., mixed methods and analysis of mediating processes can also further query or qualify the statistical findings of small-sample studies.

The two submitted theoretical papers (Brown; McDonald et al.) focus on the *identification and classification of theatrical processes* within the plethora of empirical research. It is clear from these writings that work on building a common language across disciplines remains pertinent. Brown proposes a social "who" system, dealing with mentalising and pretence, in addition to the neuronally and functionally well-established "what," "how," and "where" systems. Social components are also among the focal points of the paper by McDonald et al., who reviewed skills involved in acting within neuroscientific topics such as memory, emotional control, empathy and theory of mind. The authors conclude that future studies should *consider specific performative techniques* as embodying characters physically - or generating

them emotionally - will likely produce different observations. Our topic leans into this objective, as four submissions differentiate between performance techniques (Goldstein et al.; Ioannou et al.; Olenina et al.; Schmidt et al.).

Further, it is of interest to note that two of the survey-based studies focus on *the perceived impacts* of specific activities in theatre play aiming to better understand the mechanisms underlying change through theatre (Goldstein et al.; Pestana et al.). The latter's unique approach was to measure the impact of theatrical interventions as leisure activities on participants' sense of freedom and satisfaction. Group discussions and relaxation techniques were seen as most relevant for mindful self-processing. The former studied cause-and-effects of theatre training in school settings by investigating teachers' believes. Of importance were social interaction, perspective taking games, discussion of characterisations, performance in class and reflection on outcomes, such as empathy. These studies motivate research to determine whether believes match empirical effects.

Empirical insight into theatre and acting is needed to support more specific predictions and to target the application of *theatre exercises for health and learning*. Four studies in our topic address theatre with this aim (Goldstein et al.; Hansen et al.; Ioannou et al.; Schmidt et al.). For example, the experimental study by Ioannou et al. found that children and adults with intellectual functioning autism reported less anxiety and engaged in more group play with novel peers after a peer-mediated theatre intervention than a waitlisted group. Hansen et al. experimentally investigated the effect of systematic approaches to improvisation on executive functions and learning. The authors identified positive effects on inhibition, problem-solving, and cognitive flexibility. Qualitative analysis of participants' daily reports revealed learning challenges and cognitive demands encountered as well as transferable strategies devised to overcome them, such as re-directing attention.

With this topic we aimed to explore the state of empirical theatre research. We asked: (1) What do we know about how theatre works? and (2) What can theatre contribute to the understanding of the human brain and behaviour? The submitted manuscripts emphasise that theatre likely increases individuals' coping mechanisms and empathy and works through group discussions. Furthermore, specific acting exercises are associated with affect and enhance executive functions. Aspects of the self are theoretically pertinent, yet they remain empirically marginal. Methodological solutions are needed to advance beyond this state. In synthesis, the shared aim of the authors is to improve our understanding of the processes involved when controlling responses in social contexts and presenting the self in theatrical performances.

AUTHOR CONTRIBUTIONS

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Embodied Cognition in Performance: The Impact of Michael Chekhov's Acting Exercises on Affect and Height Perception

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Modern embodied approaches to cognitive science overlap with ideas long explored in theater. Performance coaches such as Michael Chekhov have emphasized proprioceptive awareness of movement as a path to attaining psychological states relevant for embodying characters and inhabiting fictional spaces. Yet, the psychology of performance remains scientifically understudied. Experiments, presented in this paper, investigated the effects of three sets of exercises adapted from Chekhov's influential techniques for actors' training. Following a continuous physical demonstration and verbal prompts by the actress Bonnie Eckard, 29 participants enacted neutral, expanding, and contracting gestures and attitudes in space. After each set of exercises, the participants' affect (pleasantness and arousal) and self-perceptions of height were measured. Within the limitations of the study, we measured a significant impact of the exercises on affect: pleasantness increased by 50% after 15 min of expanding exercises and arousal increased by 15% after 15 min of contracting exercises, each relative to the other exercise. Although the exercises produced statistically non-significant changes in the perceived height, there was a significant relation between perceived height and affect, in which perceived height increased with increases in either pleasantness, or arousal. These findings provide a preliminary support for Chekhov's intuition that expanding and contracting physical actions exert opposite effects on the practitioners' psychological experience. Further studies are needed to consider a wider range of factors at work in Chekhov's method and the embodied experience of acting in general.

Keywords: acting, affect, height perception, Michael Chekhov, movement, psychological gesture

INTRODUCTION

Much of the work in modern cognitive philosophy could be considered embodied, situated, or enactive (Thompson and Varela, 2001; Chemero, 2009; Clark, 2011; Varela et al., 2017). Embodiment, in particular, is also rapidly becoming a topic of interest in cognitive science (Wilson and Gibbs, 2007; Van Dantzig et al., 2008; Glenberg, 2010; Sulutvedt et al., 2018). The key assumption underlying these approaches is that the mental processes we associate with cognition are fundamentally linked to bodily processes, such as perception and movement (and, by extension,

to the environment in which the body is situated). The notion that psychological states are simultaneously bodily (or environmental) states is an idea that has been explored separately in theater. Michael Chekhov (1891–1955), an Oscar-nominated Russian-American actor and theater director, left a legacy of actor training techniques and theoretical reflections emphasizing the importance of proprioceptive sensations of movement to embodying a character and inhabiting a fictional space. The roots of Chekhov's techniques lie in Konstantin Stanislavsky's system, which cultivated "a spatial adpositional conceptualization of experience" in the actors, helping them construct "a stable attention field" within which they could interact with each other and the environment during performance (Clare, 2017, p. 43). Initially an actor in Stanislavsky's theater troupe, Chekhov elaborated his own method based on decades of creative work, self-observation, and pedagogical experience. As his approach became widely accepted in acting schools, performance theorists have explored Chekhov's acting techniques through the lens of cognitive neuroscience (Blair, 2007; Kemp, 2012; Lutterbie, 2015). Yet, while these scholars have identified intriguing parallels between Chekhov's insights and current scientific models of the mind, there is not enough empirical data to evaluate the psychological effects of Chekhov's movement exercises. In the present study, then, we tested the effects of expanding and contracting exercises (adapted from Chekhov, 1953, pp. 63–84) on the psychological experiences of perceived height and affect. As our base condition for comparison, we also measured the participants' self-perception of height and affect after neutral poses, which preceded the contracting and expanding exercise sets. These neutral poses were intended to focus the participants' attention on the present moment and signal the beginning of the experimental session.

Poses, Emotions, and Spatial Self-Awareness

The present study proceeds from the premise that proprioceptive sensations of posture and movement are linked to emotional and cognitive processes (Paillard, 2005, pp. 90, 105). From the neurophysiological standpoint, this connection may be explained by the fact that the limbic system of the brain, involved in the emotional experience and expression, projects diffuse reciprocal pathways into the somatosensory and moto-neurons of the locus coeruleus and the nucleus subcoeruleus in the brainstem, enabling access to the spinal cord (Holstege, 1992, p. 78). According to Holstege (1992, p. 78), the "emotional brain has a great impact on the sensory as well as the motor systems." For example, in the state of aggression, the limbic system is capable of changing membrane excitability of the neurons, evoking analgesia, while at the same time setting the motor system on high alert (Holstege, 1992, p. 78). The psychological dimension of the interconnected relationship between kinesthetic sensations, emotional states, and cognitive processes has been examined in multiple recent studies. In an experiment by Rahona et al. (2014), clinically depressed patients exhibited a greater persistence of the sad mood when they shook their heads at the sight of pleasant images, as opposed to those who nodded

when presented with the same images. Likewise, holding "power poses" – socially recognized as dominant – for as little as 2 min has been shown to increase the subjects' reported self-confidence and willingness to take risks, in addition to raising the level of adrenaline and lowering the level of the stress hormone cortisol in the saliva (Carney et al., 2010). A more nuanced study, which took into account the participants' self-evaluation prior to experimental manipulation, found that assuming dominant poses heightened the self-confidence of subjects with preexistent high self-esteem and exacerbated the feeling of low self-worth among those who reported this condition before the experiment (Briñol et al., 2009). While the above studies have focused on the impact of consciously induced gestures and poses on mood, a reverse effect has also been documented: elicited moods influence the character of motor action. In a study by Giraud et al. (2016), involving motion capture and analysis technologies, positive moods were associated with a more impulsive movement signature, and negative moods with tenser, more rigid, and jerkier movement signatures.

Movement has also been shown to influence our perceptions of space. As Paillard (2005, p. 91) explains, motor action frames spatial self-awareness, contributing both to our mental predictions about the outside world and our own, perceived and unconsciously registered, body schema. We process visual stimuli in relation to the concomitant sensations of posture, balance, muscle strain, and fatigue, as well as the experience of our bodily size. For example, the ability to judge distance by sight is influenced by a person's experience of physical effort. In a series of experiments by Proffitt et al. (2003), individuals wearing a heavy backpack estimated distances as longer compared to subjects without backpacks. The experience of walking on a treadmill while blindfolded produced an aftereffect whereby the subjects not only judged distances to be of greater magnitude, but also walked further away from the initial position when asked to "walk in place," compared to people who walked on the treadmill with no interruption of their optical flow. In another study, again using backpacks, Bhalla and Proffitt (1999) reported that wearing a heavy backpack (approximately 20% of body weight) impacted the way in which people judged the steepness of a hill in front of them. Participants in the study who wore backpacks reported steeper hill inclinations, both verbally and visually, than participants without. Findings such as these have been interpreted to signify that spatial awareness is influenced by the costs associated with intended and performed actions (Proffitt, 2006, 2008). Several studies have also reported an increase of visual acuity in subjects carrying weights, although gradually making the load heavier does not produce corresponding incremental changes to vision (Gonzalo-Fonrodona and Porras, 2013; Yonemitsu et al., 2017).

Not only has research concluded that proprioceptive sensations of movement influence mood and spatial perception, but these two psychological experiences have been shown to interact, suggesting a complex mediating effect. In a study by Riener et al. (2011), participants' moods were manipulated before they were asked to estimate geographic slant. The subjects reporting a sad mood were more likely to overestimate the incline of a slope than participants

reporting a happy mood. Similarly, a cross-sectional study by Duguid and Goncalo (2012) suggested that individual power was correlated with perceptions of height. During a multi-part experiment, participants' power was manipulated both experientially and by role-playing. Results suggested that having greater power was associated with smaller estimates of the height of external objects and larger estimates of one's own height.

Michael Chekhov's "Psychological Gesture" Concept

The exercises used in the present experiment were adopted from Michael Chekhov's description of "psychological gesture" exercises in his book *To the Actor* (1953). Chekhov encouraged his students to approach the role they were working on by assuming a pose that, in their view, expressed the gist of the character's affects and attitudes. He believed that starting from such a single large gesture or pose, involving the whole body, was an effective way for the actor to coax his or her imagination, discover additional nuances of the character's mindset, and, in the process, attain an emotional state relevant for the role (Chekhov, 1953, p. 63). This pathway simultaneously allowed for launching a chain of psychophysiological reactions relevant for the role and preventing these processes from spinning out of control (compared, for example, to Konstantin Stanislavsky's and Lee Strasberg's method of emotional recall, where the actor had to dwell on personal memories reminiscent of the situation in the dramatic script). Chekhov described his training technique as learning to manipulate the inner "energy" in tandem with the physical expressions of the body, so as to adopt the character's internal state and render it communicable. What he called "psychological gesture" was a means to "influence, stir, mold and attune your whole inner life to its artistic aims and purposes (Chekhov, 1953, p. 71)."

Like many early 20th-century theorists of performance, Chekhov conceived of human behavior in terms of the dichotomy between willful and subconscious processes, and emphasized movement and posture exercises as a way of initiating autonomous psychophysiological responses that are not subject to the immediate willful command (Sofia, 2014; Lutterbie, 2015). To help actors temporarily merge with the characters they sought to portray, Chekhov laid emphasis on gesture and pose as a foundational stepping stone for developing the contour of the role. The "psychological gestures" used by Chekhov in training actors were symbolic archetypes, or condensed sketches of various characters' most salient attitudes. Although "psychological gestures" begin as willfully induced, symbolic movements, Chekhov argued that dwelling on the somaesthetic experiences induced by these motor actions leads the actors to embrace the character's mood and attitudes as their own:

> So we may say that the strength of the movement stirs our will power in general; the kind of movement awakens in us a definite corresponding desire, and the quality of the same movement conjures up our feelings (Chekhov, 1953, p. 65).

Chekhov's technique, then, aims to provide a physical approach to uncovering a character's emotional state. The text of the play provides the given circumstances, dialogue, relationships, and action of the character that guide the actor to create an appropriate "psychological gesture." Using the text as a template, Chekhov directed actors to create bold gestures as the first step toward inhabiting the character's inner life.

In this study, we were not guided by a dramatic text; rather, we appealed to the participants' imagination to provide motivations for the movement. In this respect, we took inspiration from Chekhov's stand-alone exercises, not tied to any play (Chekhov, 1953, pp. 63–84), in which various gestures and poses were combined with verbal prompts relevant to the character's temperament and attitudes. For example, Chekhov associated an energetic thrust of one's arms upward and a wide stance with a prophet-like figure, characterized by "a fanatical, fiery will," who is "open to influences from above," but at the same time "stands firmly on the ground and receives equally strong inspirations from the earthly world" (Chekhov, 1953, p. 68). To create an opposite effect, Chekhov (1953) asked his students to inhabit a character who is "entirely introspective, with no desire to come into contact either with the world above or below, but not necessarily weak" (p. 68). This "brooding" persona prone to self-isolation was portrayed by the bent head, clenched fists, arms pressed close to the body, and unstable, contorted posture suggesting withdrawal and avoidance (Chekhov, 1953, p. 68). It is important to note that Chekhov did not provide precise instructions on the actual movements and poses to be performed: he presented his students only with character traits and some general guidelines on gestures, leaving it up to each person to discover the expression they thought most appropriate. In our experiment, we designed exercises that are closely aligned with Chekhov's principles, although we modified the wording of the verbal cues as described in the "Materials and Methods" section. Our verbal prompts served to create an interpretative context for the movements and stimulate the participants' imagination.

Chekhov's method is routinely used by both professional actors working on new roles, and by novices taking their first steps in acting training. Our study focused on the core principle underlying the creative process of the actor in Chekhov's system – the possibility of psychological transformation through guided exercise.

Overview

The present study investigated whether movement exercises, foundational for actors' training based on Michael Chekhov's system, impact subjects' emotional state and perception of their own height. Participants in this experiment performed three sets of exercises based on Chekhov (1953): neutral, expanding, and contracting. A set of neutral exercises, performed at the beginning of the experiment, emphasized natural, relaxed postures and served as a baseline condition. Expanding exercises emphasized outward movement of the limbs and energetic, assertive posture in an imaginary supportive environment while contracting exercises encouraged curling up, withdrawal, and hiding from imagined oppression. Immediately after performing each set of exercises, participants reported their mood and perceived

height. Consistent with the idea that psychological states are simultaneously bodily states, we expected to find systematic changes in mood and perceived height following the exercises. Such a demonstration would support the theoretical basis of Chekhov's method and open the door to further exploration of the actor's creative process based on modern findings regarding embodied cognition.

MATERIALS AND METHODS

Participants

Twenty-nine undergraduate students (20 female, 9 male) at the Arizona State University participated in this experiment. We have not collected data on their previous experience with acting and various formal techniques of bodily mastery, such as dance, martial arts, or yoga, because Chekhov's method of actors' training does not distinguish between professional practitioners and novices (i.e., both beginners and professionals are expected to cultivate proprioceptive awareness and explore new poses that are not tied to codified movement protocols). Each participant was paid $10 upon arrival. Participants ranged in age from 18 to 49 years old (mean = 25.9 years; standard deviation = 7.5 years). The mean height of the participants was 172.8 cm (standard deviation = 10.6 cm; range from 158 to 198 cm).

Design

In groups of 5–10 (4 groups total), participants were led through three sets of exercises based on Chekhov (1953): neutral, expanding, and contracting. For two of the groups, the sequence was neutral, expanding, contracting, and for the other two, neutral, contracting, expanding. After each set of exercises, participants completed a survey of affect using an Affect Grid (Russell et al., 1989; see **Figure 1**) and reported their self-perception of height (Perceived Height) using a line projected on a wall. The Affect Grid provided separate measures of arousal and pleasantness, each on a 9-point scale. Analysis of Variance (ANOVA) was used to evaluate whether mood (arousal and pleasantness) and perceived height changed as a function of exercise. Multiple regression was used to identify whether variations in arousal and pleasantness could predict variations in perceived height.

Apparatus

The experiment was run in a large room typically used for theater and dance rehearsals. A curtain hung through the middle of the room so that the exercises were done on one side of the curtain and the measurements of mood and perceived height were done on the other. Mood was measured using an Affect Grid (Russell et al., 1989). An Affect Grid (**Figure 1**) is a 9 × 9 grid of boxes with pleasantness labeled along the horizontal dimension (from unpleasant on the left to pleasant on the right) and arousal labeled on the vertical dimension (from sleepiness on the bottom to aroused on the top). In the four corners of the Grid, the dimensions of pleasantness and arousal intersect, producing four affective states: stress, excitement, depression, and relaxation. The Affect Grid is commonly used to gather reports of mood

FIGURE 1 | Affect Grid (Russell et al., 1989) used to report Mood. Participants placed an X in the box that corresponded to their current experience of arousal (vertical dimension) and pleasantness (horizontal dimension).
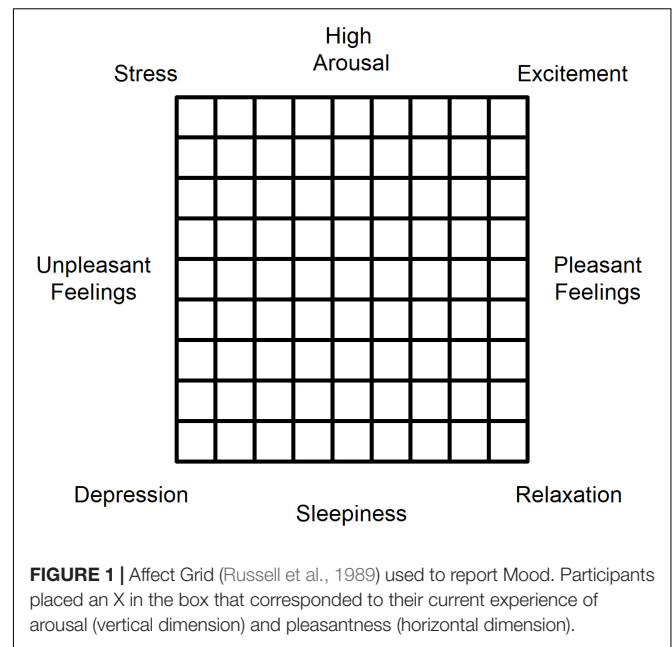
for self (Cain et al., 2019; Emmerdinger and Kuhbandner, 2019; Finisguerra et al., 2019; Ogawa and Nittono, 2019) and others (Cain et al., 2019; Chen and Whitney, 2019). The advantage for the present experiment is that it allowed for rapid and repeated measures of mood while the participant is engaged in other tasks. Grids were preprinted on individual sheets of paper so that participants would make each report on a clean grid, with no information about their previous responses. Participants were instructed to place a mark in the square that corresponded to their combined experience of arousal and pleasantness at that moment. Perceived height was measured using an electronic version of the methods used by Warren and Whang (1987) and Mark (1987). Participants stood 6.1 m from a wall and matched a line projected onto the wall to their self-perception of height. A projector connected to a computer was used to project a horizontal white line on a black wall. There were no marks on the wall to provide feedback about actual height and all furniture was moved away from the wall. Using a handheld remote, each participant was able to move the line up and down until it matched their self-perception of height. Two measures of height (one with the line starting at the top of the range, 223 cm, and one starting at the bottom, 136 cm) were taken after each set of exercises; the two measures were averaged and used as the perceived height for that condition.

Procedure

Upon entering the room, the participants' actual height was measured using a tape measure. For the experiment, participants were led through three sets of exercises, adapted from Chekhov (1953, pp. 62–84). Each set of exercises began by adopting a posture, followed by a set of movements derived from that posture, and finished with movements through the room. The first set, serving as a baseline, was always the Neutral exercises. We started with it in an effort to focus the participants' attention

on the present moment and the inception of the experiment. This set began by standing in a relaxed posture with the feet directly under the hips and arms and hands relaxed by the sides. Then participants were instructed to imagine that the head is a balloon, floating up and lengthening the spine. They then walked around the room in a relaxed and neutral posture. The second and third sets of exercises (expanding and contracting) were performed in a randomized order: in two groups, the sequence was neutral, expanding, contracting, and in the other two, neutral, contracting, expanding. The expanding exercises began by standing in a comfortable posture while imagining a source of energy "radiating" from inside their torso, or an "internal center." Then participants were instructed to raise their arms, widen their stance, expand their torso, and lengthen their reach and body. They finished this set of exercises by lunging forward in different directions and moving through the room in a way that filled as much space as possible. In the contracting exercise, participants were asked to imagine that the space outside of them was shrinking, and some imaginary outside force was closing in around them. Participants were verbally prompted to push away or retreat from these external energies. The contracting exercises began by adopting a contracted posture in which they made themselves as small as possible while imagining an external force acting upon them. Then participants were instructed to make retreating movements intended to resist or avoid this external force. They finished this set of exercises by moving through the room as if this external force was compressing and slowing them. In each set of exercises, the instructions were general, and participants were encouraged to be creative in how they expressed their movements. Participants were also free to open or close their eyes.

Each set of exercises lasted 15 min. At the end of each 15-min set, an experimenter tapped participants randomly one-by-one to perform the measurements of mood and perceived height. Each of the three times (i.e., after the neutral exercise, after the contracting, and after the expanding exercise), the participants picked up a new, clean Affect Grid to report mood and then moved on to report perceived height. After making these two reports, participants returned to the group exercises and were instructed to continue the exercises until the new set began. The entire procedure lasted approximately 1 h. The Institutional Review Board at Arizona State University approved all elements of the procedure.

RESULTS

Actual and Perceived Height

Actual and perceived height data are reported for all participants in **Table 1**. The mean height of the participants was 172.8 cm (SD = 10.6 cm; range = 159–198 cm). The mean perceived height across all experimental conditions was 178.9 cm (SD = 10.4 cm; range = 161.8–200 cm). Actual and perceived height were significantly correlated, $r(27) = 0.7$, $p < 0.01$.

The ANOVA of perceived height as a function of exercise is reported in **Table 2**. The main effect of exercise on perceived height was not significant, $F(2,56) = 1.53$, $p = 0.23$,

TABLE 1 | Actual and perceived height in cm.

Participant	Actual height	Neutral	Expanding	Contracting
1	172	177.2	180.8	178.1
2	171	173.7	168.8	157.3
3	164	167.1	167.4	168.1
4	168	178.4	168.3	165.2
5	167	181.6	183.5	184.7
6	198	193.3	195.3	198.4
7	164	178.4	172.3	172.8
8	179	179.4	175.0	180.1
9	168	173.7	173.5	175.9
10	182	177.4	185.7	176.4
11	171	182.5	182.5	179.8
12	186	193.1	199.4	187.4
13	185	179.1	183.3	182.3
14	159	175.4	176.9	165.7
15	162	164.4	167.9	161.5
16	171	176.7	174.5	171.8
17	172	174.2	177.6	189.9
18	162	170.5	159.3	162.2
19	171	178.6	178.1	180.1
20	182	194.5	205.0	200.4
21	165	167.4	162.5	155.6
22	162	178.4	165.4	164.4
23	198	192.8	198.7	195.5
24	158	177.4	177.2	180.6
25	169	178.6	181.3	183.0
26	188	179.8	171.8	176.4
27	175	194.8	209.0	196.2
28	176	183.0	190.6	188.2
29	167	179.1	180.3	176.4
Mean	172.8	179.3	179.7	177.7
Standard error	2.0	1.5	2.3	2.3

Perceived height was measured after each of three sets of exercise. All participants performed the neutral exercises first. Participants 1–15 performed the expanding exercises next while participants 16–29 performed the contracting exercises next.

TABLE 2 | Analysis of variance results for perceived height.

Source	df	Mean square	F	p	η_p^2
Exercise	2	31.96	1.53	0.225	0.05
	56	20.84			

$\eta_p^2 = 0.052$. Mean perceived height (and standard error) was 179.3 cm (1.4 cm) following the neutral exercise; 177.7 cm (2.3 cm) following the contracting exercise; and 179.7 cm (2.3 cm) following the expanding exercise. Although the effect was not significant, 17 out of the 29 participants reported feeling shorter after the contracting exercises, compared to the expanding exercises.

Affect

Reported arousal and pleasantness as a function of exercise for all participants are reported in **Table 3**. Violin plots in **Figure 2** show the probability density correlating changes

TABLE 3 | Reports of arousal and pleasantness following each set of exercises.

Participant	Neutral		Expanding		Contracting	
	Arousal	Pleasantness	Arousal	Pleasantness	Arousal	Pleasantness
1	5	8	8	8	8	7
2	7	6	4	7	8	3
3	4	5	6	3	6	2
4	7	3	3	8	2	2
5	3	8	4	7	7	7
6	3	9	4	6	7	4
7	5	3	4	7	6	7
8	3	6	2	6	6	6
9	8	4	3	5	4	5
10	6	4	5	4	4	4
11	4	6	4	6	4	5
12	2	7	7	8	8	2
13	7	6	3	8	3	5
14	3	4	6	8	9	2
15	2	8	8	7	8	4
16	2	7	6	8	4	2
17	3	4	7	7	6	2
18	7	3	4	6	3	6
19	3	7	2	6	7	7
20	3	6	7	9	8	3
21	8	4	4	6	6	4
22	4	7	8	7	7	3
23	2	7	4	8	4	3
24	1	9	6	8	8	9
25	3	8	7	9	7	7
26	4	7	7	5	7	6
27	4	7	8	8	7	5
28	4	3	6	7	7	7
29	4	7	6	7	7	3
Mean	4.2	6.0	5.3	6.9	6.1	4.6
Standard error	0.4	0.4	0.4	0.3	0.3	0.4

All participants performed the neutral exercises first. Participants 1–15 performed the expanding exercises next while participants 16–29 performed the contracting exercises next.

in the reported arousal and pleasantness with each type of exercise. The ANOVA results are presented in **Table 4**. Overall, participants felt more pleasant than aroused, $F(1, 28) = 4.83$, $p = 0.036$, $\eta_p^2 = 0.15$. There was also a main effect of exercise, in which the combined arousal and pleasantness were greater in the expanding condition, $F(2, 56) = 5.61$, $p = 0.006$, $\eta_p^2 = 0.17$. However, these main effects were superseded by the significant interaction between mood and exercise, $F(2, 56) = 13.17$, $p < 0.001$, $\eta_p^2 = 0.32$. The data in **Figure 2** suggests that this interaction resulted from the expanding and contracting exercises having different effects on each measure of affect. Pairwise t-tests comparing arousal and pleasantness across the expanding and contracting exercise conditions revealed significant effects for each. Arousal was greater after performing the contracting exercises, compared to the expanding exercises, $t(28) = 2.60$, $p = 0.015$; pleasantness was greater after performing the expanding exercises, compared to the contracting exercises,

$t(28) = 5.08$, $p < 0.001$. **Figure 3** visualizes the correlations between the self-perceived height, arousal, and pleasantness as a 3D linear regression plot.

Perceived Height as a Function of Affect

Because there was variability in each measure not attributable to conditions, we sought a direct effect of mood on perceived height. To normalize the data to reflect changes within a participant and not across participants, the value of each measure (perceived height, arousal, and pleasantness) after the neutral exercises was subtracted from the values after the expanding and contracting exercises. These data (ΔPerceived Height, ΔArousal, and ΔPleasantness), then, indicate how much each measure changed relative to neutral. A multiple regression analysis (see **Tables 5, 6**) revealed a significant effect of ΔArousal and ΔPleasantness on ΔPerceived Height, $R = 0.403$, $F(2, 57) = 5.321$, $p = 0.008$. The coefficients on both predictors were significant: ΔArousal, $b = 0.79$, $t = 2.65$, $p = 0.011$; ΔPleasantness, $b = 0.68$,
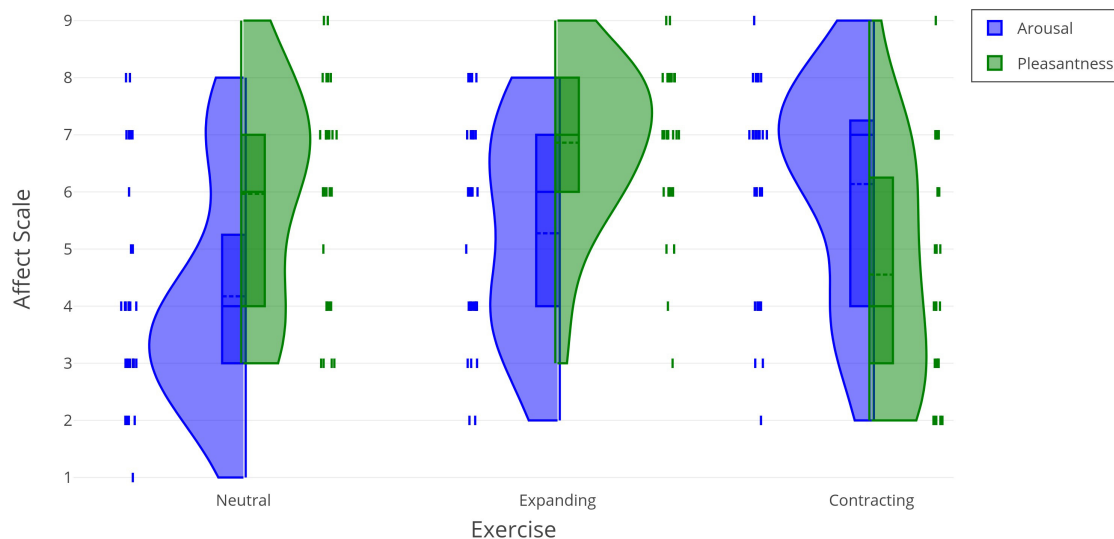
FIGURE 2 | Arousal and pleasantness as a function of exercise.

TABLE 4 | Analysis of variance results for affect.

Source	df	Mean square	F	p	η_p^2
Exercise	2	15.47	5.61	0.006	0.17
	56	2.76			
Mood	1	15.54	4.83	0.036	0.15
	28	3.22			
Exercise × mood	2	52.02	13.17	0.000	0.32
	56	3.95			

$t = 2.58$, $p = 0.013$. The resulting regression equation is,

$$\Delta\text{Perceived Height} = -1.22 + 0.79 \times \Delta\text{Arousal} + 0.68 \\ \times \Delta\text{Pleasantness} \quad (1)$$

Equation 1 reveals that increases in both arousal and pleasantness were associated with increases in perceived height. As participants felt more aroused and more pleasant, they felt taller. The reason that that there was no significant effect of exercise on perceived height, therefore, may have been that each exercise condition produced an increase in one dimension of mood and a decrease in the other, possibly canceling out the mean changes in perceived height.

DISCUSSION

The present study investigated whether the movement exercises used in Michael Chekhov's method produce noticeable effects on the participants' psychological experience, specifically, on their affective state and their perception of their own height. Chekhov's method for training actors was predicated on the assumption that movement influenced psychological experience, attuning the subject to the role. The present study was motivated to test for the specific psychological effects based on recent research supporting an embodied, situated, and

enactive perspective on psychology (Thompson and Varela, 2001; Chemero, 2009; Clark, 2011; Varela et al., 2017). Participants in this experiment performed three sets of exercises adapted from Chekhov (1953): neutral, expanding, and contracting. Following each set of exercises, participants reported their perceived height and affect. Consistent with expectations, these exercises induced changes in affective states. In comparison to their self-evaluations after the neutral exercises, the participants reported feeling more positive and aroused after the expanding exercises and more negative and aroused after the contracting exercises. It was possible to note that overall, the expanding and contracting exercises we observed tended to shift the participants' affect up and down along the diagonal running from "relaxation" (low arousal, high pleasure) to "stress" (high arousal, low pleasure) on the Affect Grid. On the other hand, the results for the self-perception of height did not reveal a statistically significant change after either of the three interventions. However, we have observed a strong correlation between a taller perception of height and increased arousal and pleasantness. The latter finding opens up a pathway for future research by suggesting that a more likely potential for shifting the subjects' self-perception of height could be found in experiments, capable of manipulating the participants' mood along the diagonal running from "depression" (low arousal and low pleasantness) to "excitement" (high arousal and high pleasantness) on the Affect Grid.

Very few previous studies have examined the effect of embodied or situated cognition on the perception of one's own height. Duguid and Goncalo (2012) established a positive correlation between the individuals' experience of power and self-perceived height, suggesting a general connection between perceived height and mood. In the present experiment, despite the lack of significant differences in perceived height across conditions, we found a significant relation between perceived height and the two dimensions of affect (arousal and
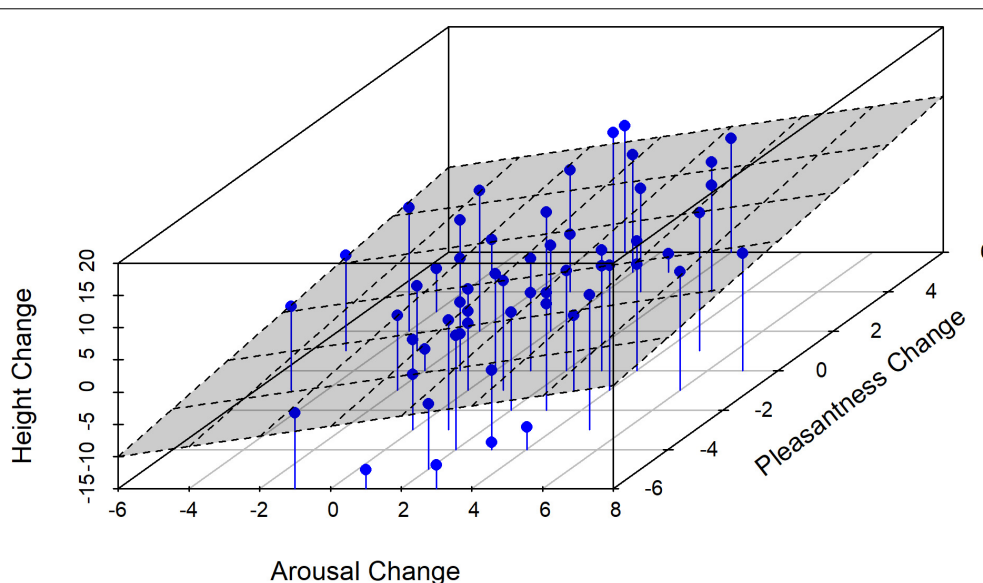
FIGURE 3 | A 3D linear regression plot, showing correlations between self-perceived height, pleasantness, and arousal.

pleasantness). Increases in both arousal and pleasantness were associated with increases in perceived height.

Taken together, our results suggest that the contracting and expanding acting exercises developed by Chekhov (1953) produce systematic changes in the psychological experience, specifically insofar as the practitioners' self-perceived arousal vs. sluggishness, and pleasant vs. unpleasant feelings are concerned. These results provide preliminary support to Chekhov's intuition that physically performing specific "psychological gestures" triggers specific inner responses from the practitioners.

In reporting these preliminary results, this study's limitations must be acknowledged, so as to mark the specificity of our findings and point to future studies that may help further elucidate the factors shaping the subjects' experience during Chekhov's "psychological gesture" exercises. We have used the neutral exercises as our base condition for our comparisons, with no measurements of affect taken prior to the beginning of the experiment. Our study also did not involve a control group. Objections may be raised as to whether any form of physio-mental exercise could produce the same effects as the contracting and expanding exercises we have adapted from Chekhov. In anticipating this objection, we point to the opposite trends in self-reported mood that we found after the expanding and contracting exercises, which suggests that specific types of movement routines, coupled with appropriate verbal instructions, tend to evoke specific inner experiences. Future studies may compare the subjects' self-perceptions of mood and height after Chekhov's acting exercises and after purely physical exercises, not accompanied by verbal prompts that endow actions with semantic connotations.

Movement and Affect in Context

An important feature of artistic performance is that it typically occurs within the context of a character, a narrative, or

TABLE 5 | Analysis of variance results for the multiple regression of ΔPerceived Heaviness on ΔArousal and ΔPleasantness.

Model	df	Mean square	R	F	p
Regression	2	176.65	0.403	5.32	0.008
Residual	55	33.20			
Total	57				

TABLE 6 | Coefficients for the multiple regression of ΔPerceived Heaviness on ΔArousal and ΔPleasantness.

Model	b	Standard error	β	t	p
Constant	−1.22	0.80		−1.53	0.132
ΔArousal	0.79	0.30	0.34	2.65	0.011
ΔPleasantness	0.68	0.26	0.33	2.58	0.013

some situational circumstances. Michael Chekhov designed his exercises to help actors discover embodied nuances of their roles within a specific dramatic text. In fact, the purpose of Chekhov's "psychological gesture" was to help actors capture complex context with simple archetypal gestures. Although we stripped the exercises of a specific narrative or character, verbal instructions allowed participants to generate their own imagined context. Thus, our verbal prompts, such as a request to imagine interacting with an "external force" while doing the exercises, could be considered situational circumstances. It is essential, therefore, to consider the role of context when evaluating the individuals' psychological experiences occurring in tandem with their physical performances.

A seminal study on the "power poses" by Carney et al. (2010) has linked open, expansive postures (expressions of power) and closed, contractive postures (expressions of powerlessness) to specific neuroendocrine changes, further implying that

a given set of poses will consistently produce the same psychological effect. The exercises used in the present study bear resemblance to dominant and submissive poses in Carney et al. (2010). In a critical review, Bavel (2013) pointed out that the linking of "power poses" to the increased self-confidence may not be as context-free as Carney et al. (2010) suggest. Other studies, according to Bavel (2013), demonstrate the importance of social context in which the experimental manipulations are taking place. Thus, Cesario and McDonald (2013) showed that the experience of dominance and submissiveness induced by expansive and constrictive poses occurred only within an interpersonal context, which endowed gestures with specific meanings. For example, holding an expansive pose while imagining being frisked by police resulted in less powerful behavior (Cesario and McDonald, 2013). As Laird and Bresler (1992) explain, the individual's self-perception is influenced both by the proprioceptive signals of posture and situational awareness.

Although the present study assessed the participants' self-perception of mood and height in subjective, ego-centric terms, we do not want to conclude that the psychological effects we observed are context-free. While the verbal instructions accompanying the exercises did not cue the participants to pay attention to their standing vis-à-vis others, they involved abstract metaphors of "supportive energy" in case of expansive gestures and "oppressing energy" in case of contracting ones. We found that in these circumstances, the expanding exercises produced a positive and relaxed mood, as they were coupled with verbal prompts to imagine "supportive energy" spreading out from the torso and filling up the body. However, it is possible to imagine a different scenario, in which the actor were performing expanding exercised to inhabit a character who is asserting his victory over an opponent. In this case, it is likely that the actor would follow up with a primal scream, suggesting an aroused rather than relaxed mood. This counterexample, however, does not diminish the value of research on the role of proprioceptive sensations of posture and gestures in mood regulation. Rather, it prompts us to acknowledge the role of situational circumstances, which impose an interpretative framework on the person's perceptions of their own bodily state.

Conclusion: Acting as Embodiment. Chekhov's Theory in Light of the Present Study

Chekhov's exploration of the "psychological gesture" anticipated modern embodied, situated, and enactive approaches to psychology. Whether he worked with beginner actors or seasoned professionals, Chekhov encouraged his students to enact their character's state of mind and attitudes in a specific scene through large gestures involving the entire body. By concentrating on the proprioceptive sensations of this pose, Chekhov's actor achieved the psychological state useful for approximating the character's internal emotional landscape.

Our study confirms Chekhov's predictions about the interplay between the sensations of bodily pose and affective state.

We demonstrated that expanding and contracting gestures and postures, coupled with verbal metaphors describing the situation, produce systematic effects on the subjects' mood: expansive movements result in higher pleasure, while closing in on oneself brings about higher arousal. Neither type of exercise appeared to significantly impact the subjects' self-perception of height. However, a correlation between the increased sense of tallness and rises in the self-estimates of arousal and pleasantness that we have observed opens up a potentially productive new research pathway, by suggesting a hypothesis that exercises inducing low arousal and low pleasantness (i.e., the state of depression as defined by the Affect Grid) would more likely bring about lowered estimates of one's own height.

Key aspects of Chekhov's training method were thus transformed in our study into testable hypotheses with the aim of deriving conclusions about general psychological mechanisms, relevant both inside and outside the actors' studio. We believe that a quantificational inquiry of this kind does not undermine the artistic dimension of Chekhov's legacy; nor does our study exhaust the full implications of Chekhov's exploration of embodiment. We share the performance theorist John Lutterbie's sense that cognitive psychology helps reveal the significance of Chekhov's "psychological gesture" in the creative process and provide a stronger foundation for this method of actor training without reducing the full spectrum of the artist's insights and observations to one rigid formula (Lutterbie, 2015, p. 96).

Acting in general remains an underexplored area for psychology, compared to music and visual arts (Goldstein, 2009). This relative scarcity of scientific studies is surprising, given the fact that many prominent 20th-century directors, whose work stands at the foundation of contemporary theater, have explicitly drawn on various trends of psychological and neurophysiological research (Roach, 1985; Pitches, 2005; Sofia, 2014; Sirotkina and Smith, 2017). Recent scientific studies have considered professional performance longitudinally, from the point of view of personal psychology in its developmental and social dimensions. Thus Goldstein (2009) has pointed out that empathy and emotional adaptability are childhood precursors of acting talent, which get mobilized in theater work in adulthood, while Thomson and Jaque (2011, 2012) have revealed potentially pathological tendencies of fantasy proneness, dissociation, and emotional vulnerability in professional actors. The immediate experience of acting – the process of imaginary transformation, which simultaneously involves the actor's body and mind – has been studied much less, but this is precisely the area where the cross-disciplinary dialogue between performers and cognitive psychologists has the greatest promise of illuminating the general human mechanisms of perception and mood regulation.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the manuscript/supplementary files.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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It's All Critical: Acting Teachers' Beliefs About Theater Classes

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Acting classes and theater education have long been framed as activities during which children can learn skills that transfer outside the acting classroom. A growing empirical literature provides evidence for acting classes' efficacy in teaching vocabulary, narrative, empathy, theory of mind, and emotional control. Yet these studies have not been based in what is actually happening in the acting classroom, nor on what acting teachers report as their pedagogical strategies. Instead, previous work has been unsystematic and fragmented in its measured transfer outcomes, and absent mechanistic explanation. Expanding research on this topic requires more grounding in teachers' beliefs about the acting classes they teach, as well as observation of the classes themselves. As a first step, we surveyed 173 acting teachers online, asking them about the activities within acting classes they believed caused change in their students, as well as which outcomes they believed were changed as a result of acting classes. Teachers taught across educational levels (elementary to professional) and had a variety of training in teaching acting. Overall, teachers rated almost every activity within classes as important for and causing impact on students, and almost every outcome as being positively influenced as a result of acting class. When forced to rank-order outcomes, teachers focused on collaboration, communication, creativity, confidence, and empathy as most likely to change. Teachers rated the importance of class activities and outcomes differently depending on what level they taught. This study shows the difficulty of surveying highly motivated teachers, given the globally high rankings, but also proposes candidate psychological skills likely to change as a result of acting classes and the mechanistic behaviors that may cause change.

Keywords: acting, theatre education, social skills, cognitive skills, teachers, arts education

INTRODUCTION

Questions of whether and how learning within arts classrooms transfers to cognitive, social, and emotional abilities outside of those classrooms are fundamental to the study of arts education. In fact, arguments about the importance of arts education tend to be founded on their utility for other academic areas (Winner et al., 2013). In theater specifically, both theory and empirical study provide growing evidence of its positive effects in other domains. However, evidence is mixed across studies, and research methods vary in their ability to determine causality. In addition, theater practitioners and educators sometimes criticize research for being disconnected from the actual practices that occur in classrooms and for reducing the complex activity of theater to just a few measured variables (Omasta and Snyder-Young, 2014). Most studies are not based on a systematic,

thorough investigation of which activities and behaviors are actually occurring in acting classrooms. One way to bridge this gap between researchers and practitioners, and to address critiques of prior work, is to directly survey stakeholders such as teachers about their perspectives on what occurs in classrooms that may transfer to general skills. Researchers can then use these results to structure future research studies. By asking theater teachers to report on what activities they use in their classrooms, and if they think those activities are important for transfer, as we do in the present study, researchers interested in acting can create a real-world, field-based starting point for understanding acting activities and their possible outcomes.

Previous research does provide evidence that overall learning within theater classrooms transfers to gains in other domains, particularly for verbal and social outcomes. A previous meta-analysis on the effects of theater training found that the only area with clear, causal, positive effects was verbal comprehension (Podlozny, 2000; Winner and Hetland, 2000). More recent research has found evidence of relationships between participating in theater and advancement of social–emotional outcomes such as theory of mind and empathy (Goldstein and Winner, 2012), emotional control (Goldstein and Lerner, 2017), emotion regulation (Larson and Brown, 2007; Goldstein et al., 2013), communication (Hui and Lau, 2006), narrative abilities (Nicolopoulou et al., 2015), and creativity (Sowden et al., 2015).

However, this extant research examines outcomes of theater classes without necessarily considering mechanisms of change. That is, previous work was not conducted based on specific behaviors and activities within an artistic practice or lesson but was, rather, holistically focused on "theater." Studies that show effects of theater rarely describe classroom experiences that may have contributed to those effects (Kardash and Wright, 1987; Podlozny, 2000; Fleming et al., 2004; Mages, 2006; Goldstein and Winner, 2012). Nevertheless, theories of how specific acting activities are connected to outcomes proliferate. Mages (2006) hypothesized 13 separate drama activities which could result in changes in narrative and verbal outcomes (e.g., rehearsal and explanation of complex language, use of imagery), but did not come to any strong conclusions. Other work has highlighted physical movement, verbal interaction, and group work (Cawthon and Dawson, 2009, 2011) as well as motivation and explicit discussions of characters' mental states (Goldstein and Winner, 2012) as possible mechanisms of change for student outcomes. Together, this previous theoretical and empirical work is missing a direct investigation of which psychological outcomes each possible mechanism may change.

To build a real theory of what acting may do for non-acting outcomes, researchers must consider the full landscape of a theater classroom and the goals teachers set within an acting class. This requires deeply analyzing the art form itself from a psychological perspective—to understand what is happening within it and therefore what students gain from participation. While such a study has been undertaken in the visual arts (Hetland et al., 2007), in music (Elliott et al., 2019), and in musical theater for children with autism spectrum disorders (Goldstein et al., 2019), to our knowledge, no such large-scale study has

looked at theater. One study of a singular acting exercise focused on breaking down how a single exercise ("the 8 steps") was linked to various cognitive and neuronal processes, in order to increase actors' metacognitions about training (Lippi et al., 2016). Authors found that discussing acting concepts in psychological terms such as attention and neuronal mirror helped actors think about what their training was actually doing. A full-scale analysis of acting classes could illuminate possible psychological and behavioral mechanisms of change and help researchers better design studies to investigate how theater training transfers to other areas of development.

Therefore, in the current study, we focus on what theater teachers believe is happening in the classroom that leads to outcomes outside of the classroom, and what those outcomes could be. We look at all levels of theater teaching, from K–12 school-based programs to community, college, and professional programs. We take this research as a first step: before future studies can fully understand transfer, we must identify specific activities within these programs that might affect domains where transfer is expected. Similarly, rather than casting about for multiple domain general outcomes, foundational research must specify which social, cognitive, emotional, and behavioral outcomes may change directly as a result of theater training. Teachers are an ideal population with which to take this first step—they are often trained in theories of drama education and its effects, they develop and follow acting curricula without necessarily having transfer effects in mind (unlike researchers), and they have practical experience with children and adults who participate in acting classes, watching them learn and grow while teaching.

Although research considering stakeholder perspectives in theater is limited, one previous study surveyed a nationally representative sample of theater teachers (and school administrators), focused on availability of theater programs, and included a few questions on outcomes. This work identified confidence, creativity, collaboration, communication, and interpersonal skills as stakeholder-endorsed outcomes of theater programs (Omasta, 2012). Stakeholders clearly felt that theater played an important role in developing these qualities, but there were no questions about *how* theater might develop these skills. In one other small-scale study, teachers, teaching aides, and administrators of a musical theater program for children with autism spectrum disorder were surveyed about which activities within their program they felt affected change in their students and which changes they thought were happening as a result of their theater program. Mechanisms identified within the classroom were imitation, relaxation, small group work, and warm-ups. Teachers believed these activities helped change students' imitation, motor, language, emotion recognition, and turn taking skills (Goldstein et al., 2019).

In the present study, we ask about both outcomes and mechanisms, with teachers rating the importance and the prevalence of each within their theater classrooms. We conceptualize outcomes from acting classes as social, emotional, cognitive, behavioral, and academic changes that occur as a direct result of participating in theater classes, such as skills described above as transferring from theater to other domains (e.g.,

verbal comprehension, social skills, creativity). We conceptualize mechanisms as the teaching techniques and classroom activities used by theater teachers that may facilitate change in students. Importantly, after rating the importance and prevalence of the listed outcomes and mechanisms (see **Supplementary Appendix A**), we asked teachers specifically which mechanisms are most responsible for change in the listed outcomes. In this way, we focus on classroom activities, transfer outcomes, and the connections between the two, both separately and together.

Because we are surveying teachers (rather than looking directly at classrooms or student outcomes), we also consider factors that might influence their answers, such as training and education, types of classes taught, and years of teaching experience. Critical to looking at the perspectives of teachers is also keeping in mind that teachers, parents, and program evaluators have a vested interest in the success of their programs (Eisner, 1997) and therefore may perceive many outcomes to be positively influenced by theater. Theater education is constantly under budgetary and educational threat. Therefore, teachers may be defensive about the activities within acting classes and the importance of their programs (Holcomb, 2007), and also may act as arts advocates who support and defend the impact arts can have in learning environments (Hayford and Kattwinkel, 2018; Robinson and Aronica, 2018).

MATERIALS AND METHODS

Participants

Participants were recruited through a snowball method in a variety of ways, given the specific qualifications needed for participation (i.e., individuals with experience teaching acting). The authors posted survey links multiple times on social media sites (e.g., Facebook, Twitter), personally emailed contacts in theater departments and schools and asked those contacts to distribute the survey, and discussed the survey at conferences such as the American Psychological Association Annual Convention, asking audience members to take the survey or send around the link if they knew theater teachers.

As is common with online surveys, many participants did not complete the entire survey, and therefore, participant numbers are uneven section by section. A total of 375 participants completed the consent form, and approximately 174 participants completed the demographic information. All demographic information was used in describing the sample. In order to create the analytic sample, we included any participants who had answered the individual question of interest, allowing for the number of participants to vary between questions. The difference of the Ns between questions of the same section did not exceed more than 3. At most, 216 participants answered questions about mechanism usage, 185 participants answered questions about mechanism importance, and 138 participants answered questions related to mechanism causality. For outcomes, 178 participants answered questions about theater's effect on outcomes, and 148 participants ranked outcomes. For later inferential analyses, we then applied a filter to exclude participants who did not give usable information about their time split between age groups

(e.g., did not respond, percentages did not equal to 100, or percentages exceeded 100), making the analytical sample, at most, 137 participants.

Participant Demographics

Of those who completed demographics, 32.9% identified as male, 66.5% as female, and 0.6% preferred not to answer. Participant mean age was 45 years old, with an SD of 12.6 years. Participants self-identified race (and could chose multiple categorizations): 91% self-identified as White; 2% Black; 5% Hispanic; 0.5% each Asian, Native American, and Native Hawaiian; and 0.5% declined to report race. Most of our sample was American, with 93% teaching in the United States and just single respondents working in other countries such as Italy, Ireland, Australia, Austria, China, and Netherlands.

Acting Training and Teaching

Participants were asked a variety of questions to ensure they had the requisite experience teaching theater. They were also asked whether they had earned a degree in theater and to describe the level and type of theater they taught. Allowed to choose multiple options, 30% had a degree in acting or performance, 12% in directing, 14% in theater education, and 17% in another type of education, including costume design, drama therapy, playwriting, dramaturgy, management, communication, music, psychology, and theater history. For level of education, 18% had an AA, BA, BS, or BFA; 66% an MA, MS, or MFA; and 16% a PhD, JD, MBA, or MD. Teachers taught acting classes at a variety of overlapping levels: 27% taught in elementary schools, 33% in middle schools, 52% in high schools, 49% in college or university settings, and 12% in community theater classes. In addition, 22% of participants had taught professional classes for children, and 12% had taught in professional conservatories for adults. Taken together, we were confident that all respondents had enough experience teaching acting classes to be able to answer questions about theater classes and possible student outcomes that result from those classes.

Participants were then asked to self-describe their time split among the various teaching level options described above. This was to investigate whether our sample spent time in early education, adolescent, or professional environments, as these environments have different demands for curriculum and engagement. The majority of participants spent the majority of their time teaching at the high school or college level. The mean percentage of time spent teaching youth (elementary and middle school) was 16.48% ($SD = 31.11\%$); the mean percentage of time teaching adolescents (high school and college level) was 70.07% ($SD = 39.79\%$); and the mean percentage of time teaching in professional schools (child or adult) was 10.96% ($SD = 27.43\%$).

Procedure

The link to the survey was anonymous, meaning it was the same link for all participants, and authors could not track individual responses. The link was directly to a Qualtrics (online survey platform) survey. The landing page was an online consent form describing the study and asking for informed consent, which was given by clicking "next" to proceed with the survey. Teachers

were instructed as follows: "This research is being conducted to examine the cognitive, social and emotional skills being taught in theater classes for children and adolescents. If you agree to participate, you will be asked to complete the following survey which involves questions about the habits of mind being taught in theater classrooms, and the techniques used to teach such habits of mind." Therefore, teachers were aware of the goal of the study. Participants completed the full survey, in order, beginning with rating classroom strategies, then outcomes, then linking the two, and finishing with demographics. IRB approval was given by George Mason University.

Survey

The survey was created by the authors to assess theater teachers' perceptions of different mechanistic activities and outcomes they believed to occur as a result of engaging in theater classes. Questions assessed perceptions in several ways to account for teacher bias toward the arts. Authors modeled part of the survey from previously published research and theory on acting classes (e.g., Goldstein et al., 2019) and also discussed and showed drafts of the survey to professors of theater education and high school–level acting teachers. Possibilities for the activities within acting classes were drawn from a wide variety of acting textbooks, including Spolin and Sills (1999) *Games for Theatre*, Stanislavski (1936) *An Actor Prepares*, Hull's description of Lee Strasberg's method (Hull, 1985), and texts on personal acting strategies and theories from Hagen (1973) and Meisner (1987). Outcomes were taken from the Core Arts Standards, as well as areas where researchers had previously published work, including meta-analyses. The final survey contained questions about 28 possible outcomes of theater education and 27 mechanistic activities within acting classrooms which may lead to outcomes. Types of mechanistic activities included various types of games (e.g., perspective taking, non-verbal, long- and short-form improvisation), types of modeling activities (e.g., by teacher, by peers, by video), physical activities (e.g., warm-up, calisthenics, meditations), rehearsal and performance activities (e.g., memorization activities, "speed through" lines, performance for the public, performance for classmates), and characterization activities (e.g., discussing characterization, sense memory, script analysis). Types of outcomes included social (e.g., eye contact, communication skills, empathy, turn taking), self-related (e.g., self-understanding, self-esteem, confidence, self-control, emotion regulation), physical skills (e.g., physical control, motor skills), and cognitive skills (e.g., memory, academic skills, focus, paying attention, language skills).

Teachers were first asked to rate mechanisms twice. They rated how often (from 1, not at all, to 7, multiple times per class) they used a mechanism and then rated its importance to the classroom (from 1, do not us, to 4, core to class). Then teachers rated outcomes twice. First by how much they believed each was positively affected by theater classes (from 1, not at all, to 7, a great deal) and then by a rank-order of the 28 outcomes from 1, most likely to change, to 28, least likely to change as a result of acting classes. Finally, teachers were asked about the explicit connection between mechanisms and outcomes by rating each mechanism's contribution to creating change in outcomes (from

1, does not cause change, to 4, is the most critical aspect of acting classes causing change). Finally, participants were given an open-ended question, "Which kinds of activities are causing which kinds of changes?", before completing demographic questions. Each outcome and each mechanism were presented in a random order by participant within each block of questions. The entire survey can be found in **Supplementary Appendix A**.

RESULTS

Mechanistic Activities

See **Table 1** for means, standard deviations, skewness, and kurtosis for all mechanism-related variables. Several of the mechanism variables were found to be non-normal (either skewness or kurtosis greater than 2; George and Mallery, 2009). Of the three ways (use, importance, and impact) participants were asked about mechanisms, issues of non-normality mostly occurred in response to being asked the importance of each of the mechanisms. Script/Character Analysis (skewness = -2.25, kurtosis = 5.27), Reflection (skewness = -2.03, kurtosis = 4.13), Exploring/Discussing Characterization (skewness = -2.18, kurtosis = 5.76), Performance for the Class (skewness = -2.32, kurtosis = 5.76), Social Interaction Games (skewness = -1.93, kurtosis = 4.08), and Rehearsing Work for Performance (skewness = -1.92, kurtosis = 3.75) were all negatively skewed and leptokurtic. The means for these variables were shifted to the upper half of the original scale, and data did not vary from around those shifted means. Put more simply, an overwhelming majority of teachers reported all of these mechanisms being very important to their classes. Practically all teachers endorsed many different activities at a very high rate.

Looking at average teacher endorsement of use (N = 216, see **Figure 1**), importance (N = 185, see **Figure 2**), and impact (N = 138, see **Figure 3**), respectively, teachers endorsed the 27 mechanistic classroom behaviors slightly differently depending on how they were asked. When using the 1–7 Likert scale for how often they used each activity (N = 216), teachers reported using Reflection (M = 5.00), Exploring/Discussing Characterization (M = 4.79), Social Interaction Games (M = 4.69), Defining Language (M = 4.64), Class Performance (M = 4.62), and Character Analysis (M = 4.59) most often. See **Figure 1** for average endorsement scores for use of mechanisms.

When then asked which activities were most important and core to class (N = 185, rated 1–4), teachers rated Performance for the Class (M = 3.72), Exploring/Discussing Characterization (M = 3.71), Script/Character Analysis (M = 3.71), Reflection (M = 3.68), Social Interaction Games (M = 3.07), and Perspective Taking Games (M = 3.04) as most core to class. Please see **Figure 2** for average endorsed scores for importance of all mechanistic class activities.

Finally, when asked how much each activity was instrumental in causing change (N = 138, rated 1–4), participants rated more than half of the activities as between "3, definitely causes change," and "4, is THE MOST critical aspect of acting classes causing change," with Reflection (M = 3.24), Social Interaction

TABLE 1 | Descriptive statistics for mechanism variables (in alphabetical order).

Variables	Often				Causal				Core			
	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
Body work	4.44	1.23	−0.12	0.04	2.62	0.71	0.31	−0.46	3.37	0.73	−1.30	2.01[c]
Define the language of acting, or define the language of a play/performance	4.64	1.25	−0.13	0.001	2.31	0.81	−0.04	−0.62	3.51	0.68	−1.36	1.80
Exploring/discussing characterization	4.79[a]	1.04	−0.03	0.65	2.91	0.70	−0.27	0.02	3.71	0.55	−2.18[b]	5.76[c]
Games and activities involving taking the perspective of other people	4.39	1.22	−0.15	0.24	3.04[a]	0.75	−0.17	−0.89	3.37	0.73	−1.12	1.19
Games and activities that involve non-verbal skills	4.10	1.13	−0.13	0.67	2.72	0.67	0.24	−0.58	3.46	0.65	−1.06	1.04
Games and related activities that require social interaction	4.69[a]	1.28	−0.42	−0.10	3.07[a]	0.65	−0.23	0.02	3.63[a]	0.63	−1.93	4.08[c]
Games that involve putting/adding on your body in relation to others' bodies	3.97	1.27	−0.21	0.52	2.46	0.75	0.31	−0.22	3.20	0.82	−0.87	0.27
Guided imagining	3.58	1.16	−0.02	−0.06	2.30	0.73	0.38	0.07	2.91	0.78	−0.60	0.29
Long form improvisation games	3.07	1.15	−0.13	−0.59	2.05	0.69	0.35	0.25	2.46	0.87	−0.20	−0.71
Memorizing lines	3.88	1.39	−0.04	−0.40	2.17	0.91	0.37	−0.64	3.19	0.82	−0.84	0.20
Modeling/demonstration – audio or video resources	2.98	1.14	0.19	−0.19	1.89	0.64	0.44	0.84	2.46	0.94	−0.28	−0.93
Modeling/demonstration – peer	4.21	1.22	−0.16	0.35	2.53	0.71	0.21	−0.25	3.43	0.76	−1.43	1.99
Modeling/demonstration – teacher	4.08	1.47	0.12	−0.51	2.14	0.76	0.46	0.14	2.96	0.91	−0.72	−0.13
Performance for the class	4.62[a]	1.26	−0.46	0.50	2.93[a]	0.74	−0.12	−0.60	3.73[a]	0.58	−2.32[b]	5.76[c]
Performance for the public	3.32	1.19	0.38	0.17	2.82	0.84	−0.25	−0.55	2.98	0.90	−0.64	−0.27
Physical conditioning	3.12	1.44	0.41	−0.59	2.19	0.71	0.46	0.37	2.69	0.95	−0.39	−0.71
Reading a script, either silently or aloud	4.03	1.18	−0.32	0.17	2.37	0.73	0.70	0.23	3.26	0.81	−1.00	0.57
Reflection	5.00[a]	1.31	−0.66	0.53	3.24[a]	0.74	−0.53	−0.62	3.68[a]	0.61	−2.03[b]	4.13[c]
Rehearsing work for performance	4.53	1.08	−0.30	1.25	2.86	0.73	0.004	−0.63	3.58	0.71	−1.92	3.75[c]
Relaxation techniques and deep breathing	4.19	1.29	−0.11	−0.53	2.62	0.74	−0.16	−0.20	3.24	0.74	−0.91	0.86
Role play games	4.09	1.23	−0.53	0.18	2.70	0.69	0.21	−0.51	3.28	0.80	−1.19	1.36
Scene study	4.49	1.07	−0.07	0.94	2.72	0.74	0.39	−0.86	3.54	0.67	−1.46	2.15[c]
Script/character analysis	4.59	1.06	−0.15	0.68	2.80	0.75	0.03	−0.64	3.71[a]	0.59	−2.25[b]	5.27[c]
Sensory or memory recall	3.56	1.19	0.18	0.32	2.31	0.76	0.31	−0.12	2.91	0.88	−0.67	−0.07
Short form improvisation games	4.13	1.14	−0.39	0.42	2.38	0.70	0.39	0.06	3.23	0.76	−0.94	0.88
Speed throughs	2.68	1.12	0.23	−0.61	1.62	0.65	0.75	0.25	2.30	0.88	−0.21	−1.03
Writing/developing original material	3.64	1.25	−0.25	−0.05	2.74	0.79	0.04	−0.64	2.94	0.94	−0.66	−0.38

[a]Highest Rated, [b]Skewness >2, [c]Kurtosis >2.

Games (M = 3.07), Perspective Taking Games (M = 3.04), In-Class Performance (M = 2.93), and Exploring/Discussing Characterization (M = 2.91) as most highly endorsed. Please see **Figure 3** for average endorsed scores for the causal impact of all mechanisms.

This means, across the three ways of asking about mechanisms, teachers indicated different sets of activities depending on how they were asked but ranked almost every activity highly, well above the mean of the scale. However, a few activities were seen repeatedly as the most
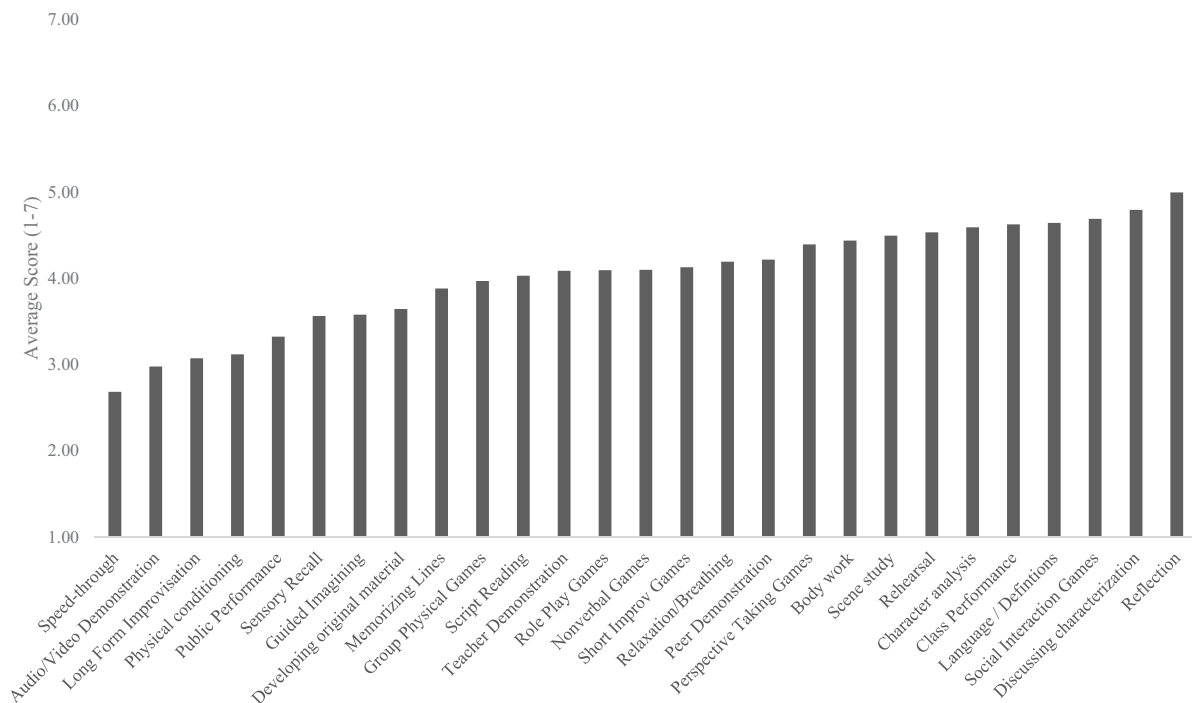
FIGURE 1 | Average endorsed use of mechanistic class activities.
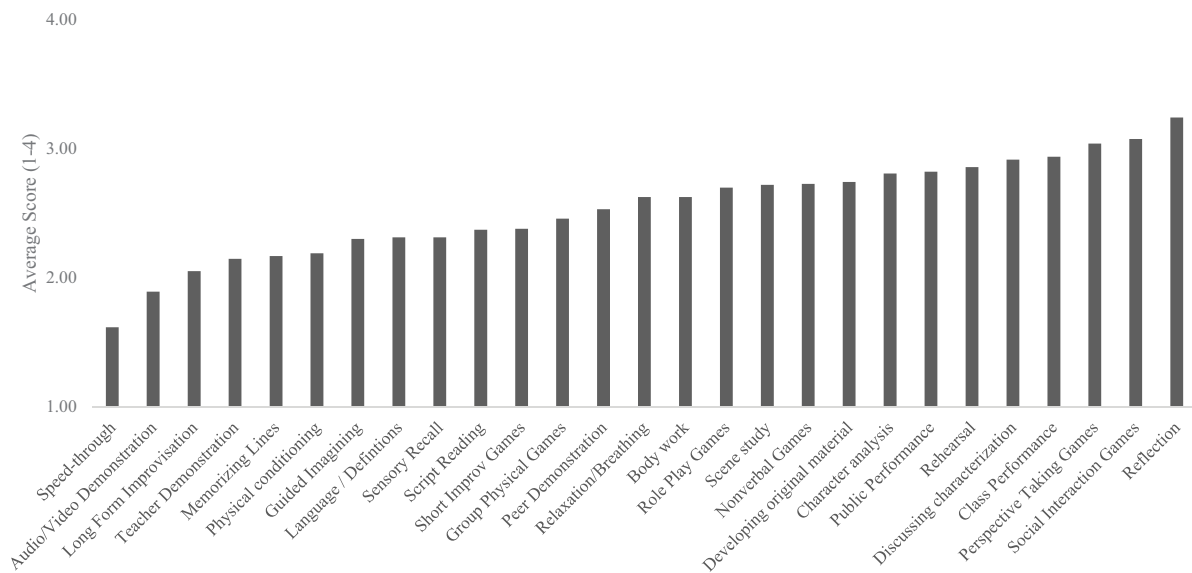
FIGURE 2 | Average endorsed importance of mechanistic class activities.

highly ranked—Social Interaction and Perspective Taking Games, Discussion of Characterizations, Performance in Class, and Reflection.

Outcomes of Acting Classes

Please see **Table 2** for means, standard deviations, skewness, and kurtosis for all outcome variables. Non-normality was again

an issue for endorsing outcomes of theater classes. Responses for theater's effects on Collaboration (skewness = −2.75, kurtosis = 10.26), Interpersonal Skills (skewness = −1.85, kurtosis = 4.77), Confidence (skewness = −1.62, kurtosis = 3.41), Imagination/Creativity (skewness = −1.86, kurtosis = 2.66), Emotion Recognition (skewness = −1.43, kurtosis = 2.81), Emotion Expression (skewness = −1.17, kurtosis = 2.09),
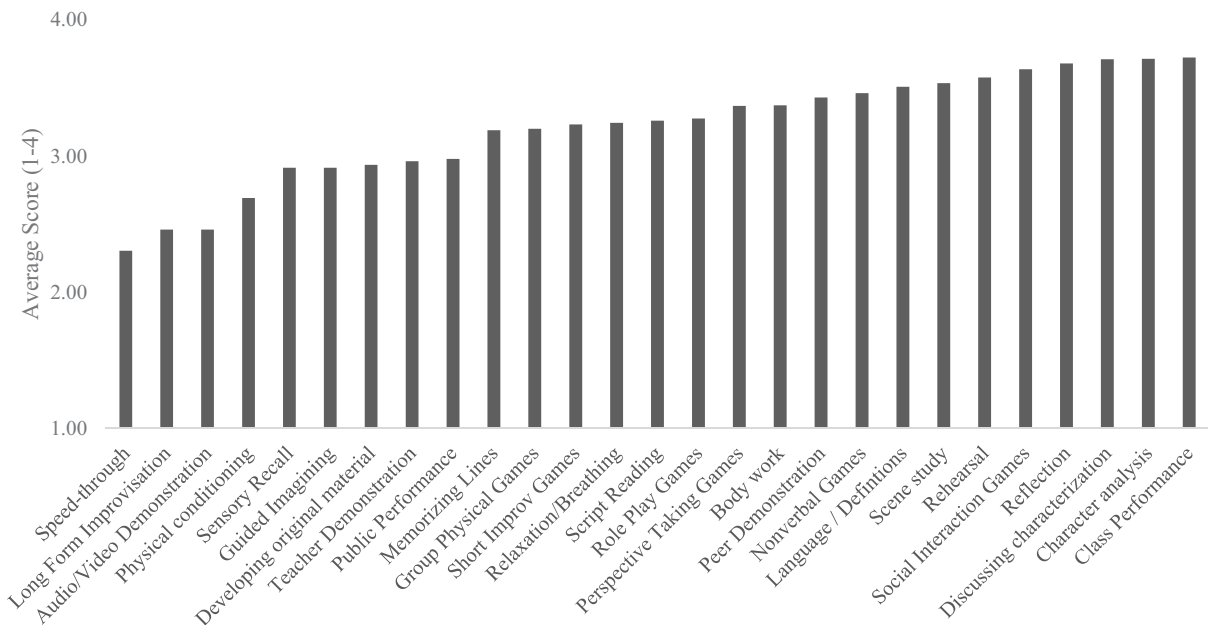
FIGURE 3 | Average endorsed causal impact of mechanistic class activities.

Self-Esteem (skewness = −1.78, kurtosis = 4.73), Trust in Others (skewness = −1.62, kurtosis = 4.24), and Empathy (skewness = −1.82, kurtosis = 4.95) were negatively skewed and leptokurtic. In general, participants' responses for these variables were clustered heavily around the mean. This means, again, that almost every teacher was rating all of these variables as highly likely to change as a result of theater classes, with very little variance in ratings.

Similarly to mechanism ratings, when teachers were asked to rate the 28 possible outcomes of theater classes on a 1–7 Likert-type scale ($N = 178$), they rated almost all outcomes as extremely likely to occur. The highest-endorsed outcome was Collaboration ($M = 6.65$), and the lowest was Motor Skills ($M = 5.20$), meaning that there was only a 1.45-point difference (out of a six-point possible spread) between the highest- and lowest-endorsed outcomes. Teachers simply did not use the full scale (as can be seen in our statistics of non-normality, above). When looking at the top outcomes on the Likert-type ratings, theater teachers rated Collaboration ($M = 6.65$), Imagination/Creativity ($M = 6.58$), Confidence ($M = 6.43$), Communication ($M = 6.38$), Empathy ($M = 6.35$), and Interpersonal Skills ($M = 6.25$) as most affected by theater activities and experiences. See **Figure 4** for average scores for endorsement of positive impact of all outcomes.

We also forced teachers to rank-order all the outcomes, from 1 (most likely to change) to 28 (least likely to change), N = 148. We hoped this would enable teachers to be more fine-grained in their analyses of which outcomes change as a result of theater, rather than globally endorsing theater as positive for all outcomes (which we hypothesized they would do, and they did). When looking at which outcomes were ranked

#1 most often, Imagination/Creativity ($N = 25$), Developing Acting Skills ($N = 20$), Empathy ($N = 20$), and Confidence ($N = 15$) were the top four. When looking at the average rankings (where lower is better), Collaboration ($M = 6.98$), Creativity ($M = 7.89$), Confidence ($M = 8.93$), Empathy ($M = 9.17$), and Communication ($M = 9.33$) were the top five, the same top five as the Likert-type rating. As a note, Developing Acting Skills was not as highly ranked ($M = 12.46$). See **Figure 5** for average endorsed ranking scores for all outcomes.

These results again show that theater teachers strongly believe in the power of theater to cause change, with high rankings for most outcomes. However, Creativity, Confidence, Collaboration, Communication, and Empathy seem to emerge as top rated.

Interestingly, although it had been previously proposed by previous research as likely to change as a result of acting classes, Academic Performance ($M = 18.74$) was not ranked highly. Verbal Outcomes ($M = 17.95$) and Emotion Regulation ($M = 17.91$), where there is actual causal evidence of positive change (Podlozny, 2000; Goldstein and Lerner, 2017), were also not at the top of teachers' rankings. This may be due to differences in the level and type of teaching our participants are engaged in.

Differences by Teacher Variables

We then investigated if teacher differences in level taught (i.e., elementary, middle, and high school) were driving results. However, we were limited by the data collected. We conducted an exploratory analysis using teacher education as a predictor of time spent with different age groups. Using a smaller sample of 137 participants who provided their education information, we first conducted a one-way ANOVA to assess whether teachers with different levels of education (i.e., AA/BA,

TABLE 2 | Descriptive statistics for outcome variables (in alphabetical order).

Variables	Positively Affected				Ranking			
	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
Academic performance	5.35	1.22	−0.63	0.741	18.74	6.45	−0.32	−0.70
Collaboration	6.65[a]	0.73	−2.75[b]	10.26[c]	6.98[a]	6.71	1.32	0.74
Communication skills	6.38[a]	0.86	−1.32	1.19	9.33	7.21	0.91	−0.15
Confidence	6.43[a]	0.85	−1.62	3.41[c]	8.93[a]	7.24	0.85	−0.43
Develop acting skills	6.23	1.07	−1.32	1.26	12.46	8.36	0.24	−1.16
Emotion expression	6.00	1.06	−1.17	2.09[c]	14.71	7.52	0.23	−0.92
Emotion recognition	5.84	1.24	−1.43	2.81[c]	14.99	7.40	0.16	−1.10
Emotion regulation	5.26	1.40	−0.69	0.32	17.91	7.03	−0.43	−0.79
Empathy	6.35	0.96	−1.82	4.95[c]	9.17[a]	6.72	0.72	−0.48
Expressive language	5.98	1.06	−0.97	1.10	16.02	7.49	−0.30	−1.04
Eye contact	5.85	1.25	−1.16	1.43	15.59	7.45	0.07	−1.11
Focus on task	5.78	1.11	−0.66	−0.27	16.11	6.91	−0.03	−0.95
Imagination/Creativity	6.58[a]	0.78	−1.86	2.66[c]	7.89[a]	6.94	1.07	−0.02
Imitation skills	5.28	1.33	−0.53	−0.22	19.06	7.33	−0.71	−0.55
Interpersonal skills	6.25	1.04	−1.85	4.77[c]	11.29	7.00	0.49	−0.69
Language comprehension	5.77	1.08	−0.79	1.07	17.95	6.62	−0.64	−0.22
Matching of physical body (including face) to emotional state	5.53	1.32	−0.99	1.14	17.26	7.38	−0.33	−0.96
Memory	5.53	1.36	−0.81	0.40	17.72	7.26	−0.61	−0.51
Motor skills	5.20	1.27	−0.61	0.58	20.00	6.91	−0.68	−0.69
Paying attention	5.69	1.19	−0.80	0.57	15.15	7.70	−0.06	−1.26
Physical control	5.54	1.14	−0.49	−0.06	19.53	6.52	−0.85	0.13
Resilience	5.77	1.20	−0.99	1.23	15.66	7.61	−0.13	−1.10
Self-control	5.50	1.18	−0.62	0.46	16.20	6.93	−0.25	−0.68
Self-esteem	6.17	1.08	−1.78	4.73[c]	11.92	8.03	0.38	−1.10
Self-reflection on work	6.01	1.10	−0.96	0.15	13.22	7.06	0.25	−0.76
Self-understanding	6.03	1.07	−0.96	0.40	12.03	7.51	0.39	−0.88
Trust in others	6.07	1.11	−1.62	4.24[c]	12.60	6.92	0.45	−0.75
Turn taking	5.49	1.31	−0.63	0.02	17.44	7.70	−0.26	−1.24

[a]Highest Rated, [b]Skewness >2, [c]Kurtosis >2.

MA, and Ph.D.) spent significantly different amounts of time with certain age groups. There were overall differences between teacher education levels and percent of time teaching adolescents [$F_{(2,132)} = 9.92, p < 0.001$] and professional students [$F_{(2,132)} = 10.38, p < 0.001$]. To further examine differences in time teaching adolescents, we used Bonferroni *post hoc* comparisons. Comparisons revealed that teachers with AAs and BAs ($M = 41.75\%, SD = 44.73\%$) spent significantly less time with adolescents than those with MAs/MFAs ($M = 71.60\%, SD = 38.13\%$; $p < 0.01$) and Ph.D.'s ($M = 92.50\%, SD = 21.59\%$; $p < 0.001$). Also, respondents with MAs/MFAs reported spending marginally less time with adolescents than those with Ph.D's ($p = 0.057$). When examining differences in time teaching professional students, *post hoc* comparisons revealed that those with AAs/BAs ($M = 33.00\%, SD = 45.92$) reported spending significantly more time teaching professionally than those with MAs/MFAs ($M = 7.47\%, SD = 20.94$; $p < 0.001$) and Ph.D.'s. ($M = 1.59\%, SD = 4.73$; $p < 0.001$). Those with MAs and Ph.D's did not significantly differ in their reported time spent teaching professionals. This means that respondents with higher

levels of education spent more time teaching in high school and college classrooms than those with lower levels of education, who were more focused on younger children, mainly in professional settings. As such, we continued to explore differences based on teacher level of education, and thus their time teaching at different levels or age groups.

Effects of Teacher Education

Because our analyses suggested significant differences in level of teaching between different types of teacher education, we then conducted analyses by teacher level of education, to see if teacher education is associated with differences across endorsed mechanisms and outcomes from acting classes. While there are individual differences across many of the different mechanisms and outcomes, we focus in on those ranked as the most important.

Mechanisms

We began with one-way ANOVAs to compare teacher ratings of mechanisms across levels of education (i.e., AA/BA, MA, and
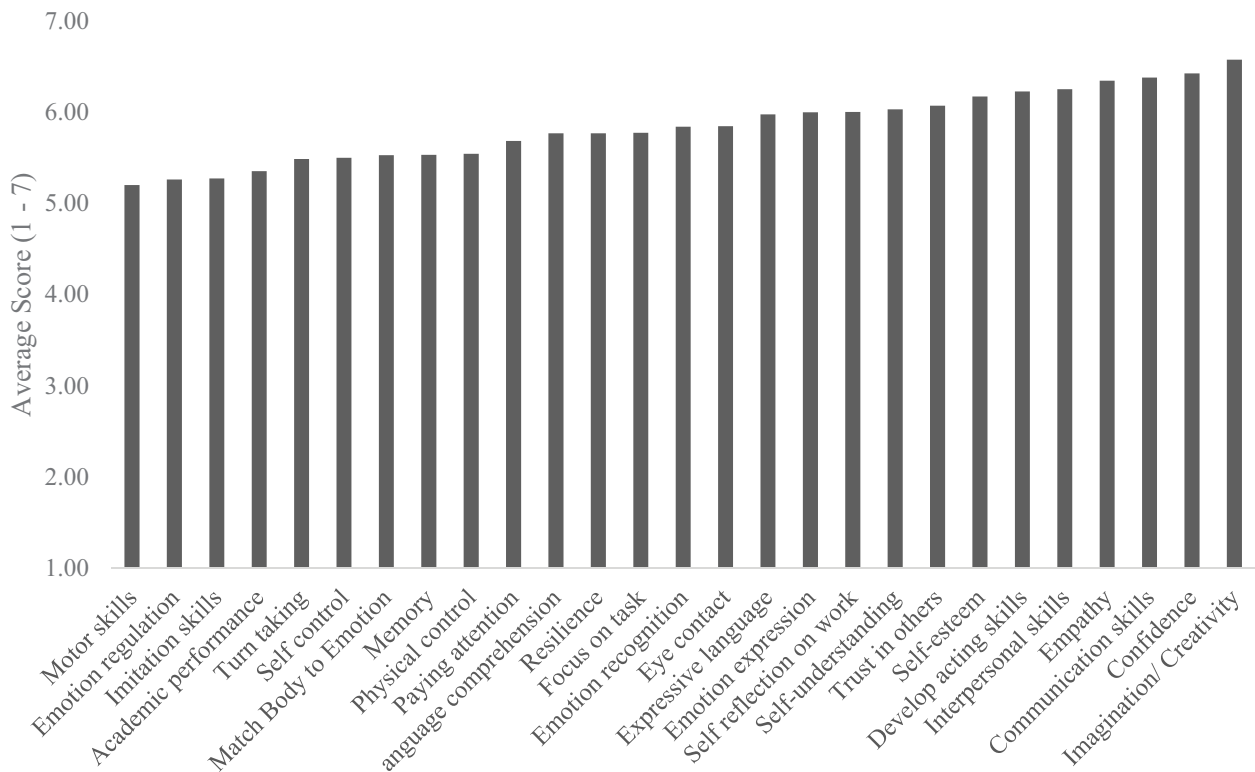
FIGURE 4 | Average endorsed positive outcomes from acting classes.
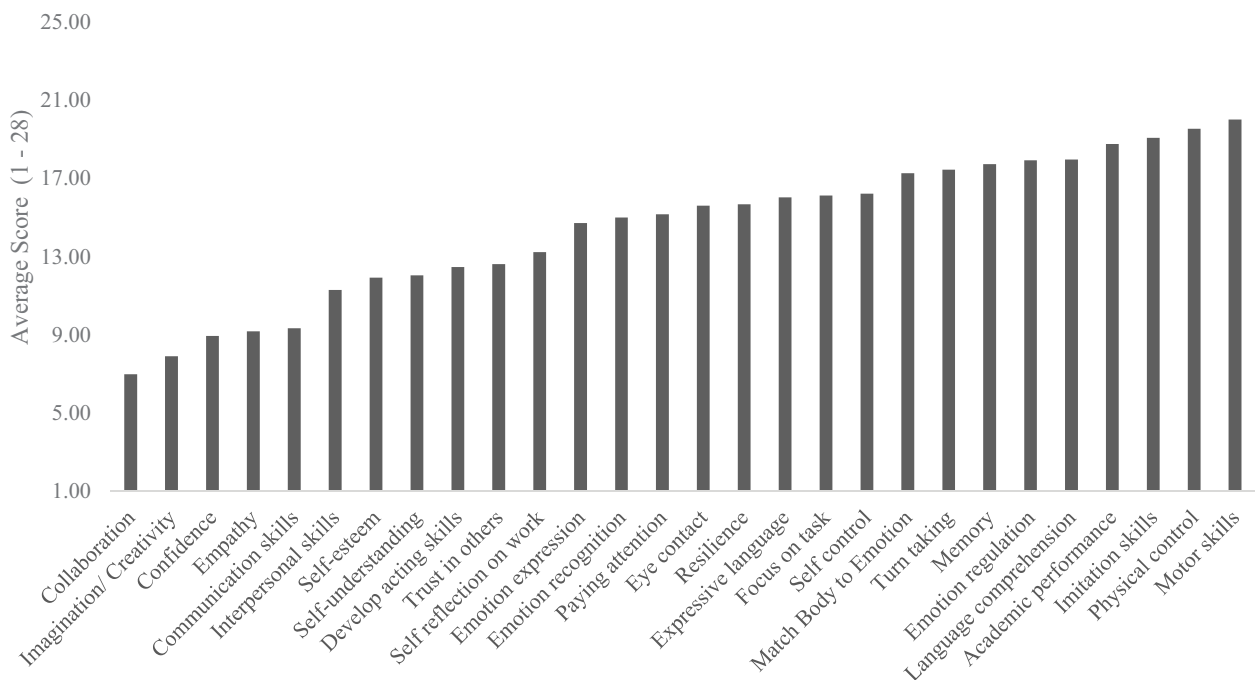
FIGURE 5 | Average endorsed ranking of positive outcomes (Lower Number = Better Ranking).

Ph.D.). For these analyses, we used a composite average across the three activity questions (normed to account for different scales).

There were significant differences in teachers' perceptions of activity importance by level of education. One-way ANOVAs revealed significant overall differences in perceptions of importance for Exploring/Discussing Characterization [$F(2,132) = 6.63$, $p < 0.01$] and Public Performance [$F(2,133) = 5.57$, $p < 0.01$]. Bonferroni *post hoc* comparisons were used to assess mean differences between the different education levels. For Exploring/Discussing Characterization, those with MAs ($M = 0.17$, $SD = 0.68$) endorsed this mechanism significantly more than those with AA/BAs ($M = -0.36$, $SD = 0.81$; $p < 0.05$) and PhDs ($M = -0.30$, $SD = 0.93$; $p < 0.05$), who did not differ in their endorsement. For endorsement of Public Performances, those with AA/BAs ($M = 0.52$, $SD = 0.64$) endorsed this mechanism significantly more than those with MAs ($M = 0.01$, $SD = 0.73$; $p < 0.05$) or Ph.D's ($M = -0.21$, $SD = 0.93$; $p < 0.01$), who did not differ from each other.

Outcomes

When asked about the outcomes being affected by theater classes, one-way ANOVA revealed significant overall differences in Communication Skills [$F(2,134) = 5.53$, $p < 0.01$], Interpersonal Skills [$F(2,134) = 8.54$, $p < 0.001$], Confidence [$F(2,134) = 6.13$, $p < 0.01$], Imagination/Creativity [$F(2,134) = 7.23$, $p = 0.001$], and Empathy [$F(2,134) = 4.28$, $p < 0.05$] by education level.

Post hoc comparisons revealed that those with MAs reported Empathy ($M_{AA/BA} = 6.38$, $SD = 0.92$; $M_{MA} = 6.51$, $SD = 0.75$; $M_{Ph·D.} = 5.87$, $SD = 1.49$) as being significantly more affected by theater classes than those with PhDs ($p < 0.05$). However, respondents with AA/BAs did not differ from those with MAs or those with Ph.D's.

Respondents with AA/BA and MAs rated Communication Skills ($M_{AA/BA} = 6.62$, $SD = 0.59$; $M_{MA} = 6.49$, $SD = 0.78$; $M_{Ph·D.} = 5.91$, $SD = 1.08$; $p_{AA/BA} < 0.05$, $p_{MA} < 0.01$), Interpersonal Skills ($M_{AA/BA} = 6.43$, $SD = 0.87$; $M_{MA} = 6.40$, $SD = 0.85$; $M_{Ph·D.} = 5.43$, $SD = 1.65$; $p_{AA/BA} < 0.01$, $p_{MA} < 0.001$), Confidence ($M_{AA/BA} = 6.71$, $SD = 0.64$; $M_{MA} = 6.51$, $SD = 0.72$; $M_{Ph·D.} = 5.91$, $SD = 1.28$; $p_{AA/BA} < 0.01$, $p_{MA} < 0.01$), and Imagination/Creativity ($M_{AA/BA} = 6.81$, $SD = 0.51$; $M_{MA} = 6.70$, $SD = 0.59$; $M_{Ph·D.} = 6.13$, $SD = 1.10$; $p_{AA/BA} < 0.01$, $p_{MA} < 0.01$) as being significantly more affected than those with Ph.D's. However, there were no significant differences between AA/BAs and MAs in perceived effect of theater classes in Communication Skills, Interpersonal Skills, Confidence, and Imagination/Creativity.

DISCUSSION

Taken together, a few patterns emerge in our study of teachers' perceptions of acting classes. The first, and largest, finding is that teachers almost universally believe that every possible outcome from acting classes is occurring. Across the 28 possible outcomes, there was consistently high endorsement, with teachers using only the upper end of the rating scale. The lowest-endorsed outcome was still significantly above the midpoint of the scale. Teachers also believe most activities within acting classes are

important. Across the 27 classroom activities that may be mechanisms for changing outcomes, there was high endorsement of their impact, with average ratings for even the lowest-endorsed mechanistic activity above the midpoint of the scale. This high endorsement was retained regardless of how we asked the question. Teachers seem to believe that all activities they engage in during an acting class are almost equally important to learning and that practically every possible outcome from acting classes is occurring in some way. This is seen in the kurtosis and skewness of our data. Yet simultaneously, there were a few emergent patterns that point toward both mechanistic activities in acting classes that could be used in future intervention work and for target outcomes for researchers interested in the effects of acting training to focus their energies.

First, the most commonly endorsed outcomes that may occur as a result of theater participation are Creativity, Confidence, Collaboration, Communication, and Empathy. Theoretically, these make sense as endorsed outcomes. Acting and theater are activities of creation, and students must be taught to believe in themselves and their creative impulses. Hence, creativity and confidence. Acting and theater are social enterprises, requiring group work and interaction as a baseline to creation. Hence, collaboration, communication, and empathy. A growing body of work has pointed to the social aspects of acting as generalizable outcomes affected by theater classes (e.g., Hui and Lau, 2006; Goldstein and Winner, 2012; Goldstein and Lerner, 2017; Rowe et al., 2018; Van de Vyver and Abrams, 2018). Critically, these findings link back to the one large-scale landscape study of theater classrooms (Omasta, 2012), which found that teachers endorsed Creativity, Collaboration, and Confidence as outcomes of theater classes. In light of these findings, acting teachers might consider specifically focusing on such social and emotional skills as intended goals of their outcomes by intentionally incorporating them into lessons. These outcome skills are all interrelated as well—the confidence to be creative and the need for empathy while engaged in collaborative activities show the ways in which acting classes can be considered holistic teaching opportunities for students to practice integrating various social and emotional skills into their daily lives.

Yet many of the areas previously highlighted as outcomes of theater participation were not endorsed by teachers as being the outcomes most likely to change. Language outcomes, including expressing and understanding language, and memory have both been extensively studied as positive outcomes from theater education and experience (e.g., Noice et al., 1999; Podlozny, 2000). While both highly endorsed (because everything was highly endorsed), neither was singled out as a particularly strong outcome of theater education. Similarly, overall academic performance was not particularly strongly endorsed as an outcome of theater, although of course, as all outcomes were highly endorsed, it was also not ignored. It may be that these commonly discussed outcomes were not rated as highly because teachers do not see immediate effects of their classes on vocabulary, academic performance, or memory in class, or because they cannot see how students do outside of their classes. However, it may also be that teachers focus their classrooms on other outcomes rather than academic ones. Researchers,

policy advocates, and educators would do well to focus on the uniqueness and specificity of the effects of this art form, rather than hoping for global outcomes or outcomes that are not necessarily related to classroom behaviors and activities that are mechanisms for change. Teachers, too, may have specific perspectives about the most likely outcomes to change, while research directly with student outcomes may show findings on other outcomes, such as academic progress.

Within mechanisms, the classroom activities of Reflection, Discussing and Analyzing Characterizations, and Social Interaction and Perspective Taking Games were most often noted as mechanistically important within a classroom. Reflection involves metacognitive thinking about words, characters, actions, and processes. It is a standard educational tool used for deep thinking and higher-order understanding (Kish et al., 1997; Quinton and Smallbone, 2010; Bertucci et al., 2012; Wade-Jaimes et al., 2018). It is not surprising, therefore, that acting teachers think of Reflection as critical to their process. However, Reflection is not particularly an acting or even artistic enterprise (despite being a critical part of other studies of the habits of mind involved in art making; Hetland et al., 2007). So, while critical to outcomes in acting, Reflection is not necessarily acting itself. Similarly, Social Interaction and Perspective Taking Games are not acting *per se* but, rather, are exercises meant to prepare students for acting. These build the skills of acting and the group and ensemble requirements for a group of actors to work together, which can then be taken into a scene (Spolin, 1963/1999).

More directly related to acting and performance is the endorsement for Analyzing and Creating Characterizations as a critical mechanism. Characterization involves thinking about characters, creating the mental, emotional, and behavioral lives of the people who must then be portrayed onstage. This really is the work of acting most directly. Students must learn how to figure out a character and create a portrayal before they begin to embody it. Yet even within characterization work, there are a number of key other psychological and behavioral skills, such as using theory of mind to think about characters, understanding personality and situational constraints on behavior, and placing characters in the right time and context for the play being performed. Each of these behaviors within the task of discussing, analyzing, and creating characterization is ripe for further inquiry, investigating component psychological requirements, and how teacher and student approach the task at hand.

While the results are not as clearly delineated as scientists of education and developmental psychology might hope, they also point to a real opportunity for future research. The description of specific outcomes and mechanisms that are core to theater classrooms, at least according to teachers who run those classrooms, provides an important roadmap for future research. The field must begin to link possible mechanisms of change to possible student outcomes to move toward causal explanations of what theater does for development and how it achieves those positive effects.

Limitations

This study was of teachers' perceptions—what they believe is happening in their classroom that is important and what they believe is changing outside of the classroom as a result. These opinions can be biased both by teachers' belief in the arts as a high-impact practice and by defensiveness about the importance of their programs (Holcomb, 2007; Hayford and Kattwinkel, 2018). More direct naturalistic measurement of what is actually occurring inside of classrooms and more mechanistically driven outcome research are still missing. An important follow-up to this study is pairing these findings with work that directly looks at classroom activities and student outcomes (as we are currently conducting in our research group). Such a pairing will be necessary as the field builds a psychology of acting and a full representation of the work of theater classes. Future research must also include teachers as members of the research team, rather than only as research participants. Such community–researcher partnerships (e.g., as in Olenina et al., 2019) can create a more ecologically valid research experience that illuminates important takeaways for practitioners.

An important limitation, too, is that our sample is overwhelmingly White and American, as is our research team. This means that the questions and ideas behind the survey came from a Western, text-based theater perspective, which holds at its core a focus on psychological realism. Theater outside of the United States, or taught by non-White teachers, may look fundamentally different (or be similar). Including samples and data from countries where the focus is not psychological realism may alter the results, toward self-expression or physical training. Only cross-cultural and cross-community sampling will help resolve this issue.

Our data were non-normal, and our respondents, obviously very enthusiastic about their topic. Researchers must understand stakeholder perspectives to build a research program that is sensitive and responsive to their needs and beliefs. Yet simultaneously, there is real validity to teachers' beliefs that most activities within classes are important and most outcomes are possible. Theater in schools has long been under threat (Parsad and Spiegelman, 2012; Sparks et al., 2015) and is often cut from curricula before other art forms or integrated into other subjects (such as Science or English; Dawson, 2018) rather than taught as its own, worthy subject. Therefore, teachers are understandably defensive about their programs and have a vested interest in their success.

To overcome issues of skewed data in the future, teacher surveys could ask teachers to specifically link mechanisms to 1 of the 28 outcomes, rather than asking about each mechanism impacting the outcomes generally, or follow up on surveys with additional requests of examples of mechanisms and their direct uses in the classrooms. Future work should also try to overcome skewness by asking about outcomes which may be completely unrelated to theater (e.g., getting better at Calculus) in order to get teachers thinking about the variety of domains where

theater may or may not apply. This is where a naturalistic observation methodology would also be helpful. For example, it could be that the specifics of discussions teachers are having about characterizations or within reflection activities are where collaboration, imagination, and empathy are being highlighted.

CONCLUSION

This study took its inspiration from Studio Thinking (Hetland et al., 2007), a framework for arts-based inquiry which sought to discover how arts classrooms are structured and what is taught in those classrooms. This framework for inquiry resulted in an understanding of how students are taught to think like artists, how teachers organize their time and space, and the interactions that occur in visual arts classrooms. We extended this framework to theater by taking the first step of surveying teachers about the perceived outcomes of participating in theater and activities within theater classes, or mechanisms that might be responsible for those outcomes. We hope this study provides a first look into what researchers should focus on when looking for positive effects of acting classes and what kinds of behaviors and activities, drawn from acting, may be best used in interventions seeking to improve such outcomes.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the George Mason University IRB. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

TG developed the study. TG and BT created and distributed the survey. TG and DY conducted the data analyses. TG, DY, and BT wrote the manuscript.

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Peer Actors and Theater Techniques Play Pivotal Roles in Improving Social Play and Anxiety for Children With Autism

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Children with autism spectrum disorder (ASD) have significant difficulty in social functioning to include engaging in natural play with peers. Many children with ASD exhibit significantly less interactive play and more physiological stress during benign social encounters with same-age peers on a playground. Theatrical role-playing and performance with expert role models may provide a unique opportunity for children with ASD to learn to engage with other children in a safe, supportive environment. SENSE Theatre® is a peer-mediated, theater-based program aimed at improving social competence in youth with ASD. Previous studies have shown significant improvements in social and communication skills following SENSE Theatre® intervention. The current project examined play with novel peers and self-reported anxiety before and after participation in SENSE Theatre®. Participants included 77 children between 8 and 16 years with high-functioning (IQ $\geq$ 70) ASD. The combined sample of three cohorts was randomized to the experimental (EXP, $N = 44$) or waitlist control (WLC, $N = 33$) group. Participants in the EXP group received 40 h (10, 4-h sessions) of SENSE Theatre®. The Peer Interaction Paradigm (PIP), an ecologically valid measure of natural play, was administered before and after the intervention. Group Play and Self Play on the playground equipment during solicited (T4) and unsolicited (T1) play were used in the current study. The State Trait Anxiety Scale for Children (STAIC; Spielberger et al., 1983) was used to measure self-reported current and persistent anxiety, respectively. Following treatment, children in the EXP group engaged in significantly more Group Play with novel peers [$F_{(2,73)} = 7.78$, $p = 0.007$] and much less Self Play [$F_{(2,73)} = 6.70$, $p = 0.01$] during solicited play compared to the WLC group. Regression analysis revealed that pretreatment play and group status were significant predictors of solicited Group Play. Children in the EXP group reported significantly less Trait anxiety following intervention [$F_{(2,71)} = 6.87$, $p = 0.01$]; however, State anxiety was comparable. Results corroborate

previous findings of significant changes in social and play behavior in children with ASD following the peer-mediated, theater-based intervention. Acting and theatrical performance with supportive role models facilitates social engagement in everyday settings with novel peers and reductions in self-reported anxiety.

Keywords: autism, theater, play, anxiety, peers

INTRODUCTION

Play is notoriously difficult to define but is generally thought to incorporate flexibility, non-literality, pleasure, spontaneity, and active engagement (Krasnor and Pepler, 1980; Garvey, 1999). Play has long been considered a vital component of a child's development (Vygotsky, 1978) and has a key role in the acquisition of multiple cognitive, socioemotional, and communicative skills. For example, play cultivates social referencing, role-taking, and symbolism (Lillard et al., 2011). Various social communication skills such as conflict resolution, negotiation (Sawyer, 1997; Frost, 1998; Ginsburg, 2007), and perspective taking (Burns and Brainerd, 1979; Jordan, 2003) are also built through play.

Indeed, communication and language are fundamentally connected to play particularly through the use of symbols (McCarthren et al., 1996). As language involves using words to symbolize what one is aiming to convey, play involves using pretense to symbolize meaning (Mccathren et al., 1999). For instance, Laakso et al. (1999) found that children's symbolic play abilities predicted later language comprehension skills. In this context, the definition by Leslie (1988) is adopted in which pretend play can have three basic forms or properties to include (a) object substitution, (b) attribution of false properties, or (c) imagining absent objects (Leslie, 1988). In pretend play, language can be used to communicate pretense. Thus, pretend play often incorporates communication (Garvey, 1982), such that conversational skills are developed within play between play partners (Sawyer, 1997).

Pretend play is closely linked to what Premack and Woodruff (1978) referred to as theory of mind – the ability to attribute mental states to others that are distinct from oneself (Leslie, 1987; Sawyer, 1997; Dunn and Cutting, 1999). Children who pretend more frequently have better theory of mind skills (see review Lillard et al., 2011). For example, Youngblade and Dunn (1995) found that the amount of pretend play predicted later abilities on a false belief task. Similarly, Schwebel et al. (1999) found that engagement in interactive pretend play positively correlated with scores on a theory of mind task measuring children's ability to differentiate between objects' symbolic and actual identities. The relationship between theory of mind and pretend play could be explained by specific aspects of pretend play, such as taking on the role of another, meta-representation, negotiation, or the socioemotional themes inherent in pretending (Lillard et al., 2011).

Children with autism spectrum disorder (ASD) demonstrate core impairment in reciprocal social communication and flexible thought and behavior (APA, 2013). Even though the diagnostic criteria have changed over time, key deficits have been constant to include impairment in social engagement and receptive and expressive language, which can include difficulty in sharing of imaginative play (Kanner, 1943; Wing and Gould, 1979; Mahjouri and Lord, 2012; APA, 2013). Children with ASD have significant difficulty socially engaging in reciprocal play with peers (e.g., Schupp et al., 2013). Some of the difficulties stem from the social challenges inherent in autism; children with ASD may demonstrate less play because they receive fewer invitations to play or experience more social failures (Jordan, 2003). Humphrey and Symes (2011) postulated a cyclical model for children with ASD, in which negative peer experiences lead to lower motivation for social interaction, thereby leading to poorer social skills (e.g., perceiving and responding to social initiations and bullying) that contribute to negative peer interactions. For example, Schupp et al. (2013) noted that, in observations of children with autism on a playground, older children with ASD demonstrated more social avoidant behavior than younger children with ASD. The authors suggested that this may be due to the history of negative social experiences that accumulate as children with autism age, in combination with increased insight into their social difficulties. In addition, core deficits in reciprocal social communication (APA, 2013) may impact the ability of children with autism to fully engage with others.

Besides deficits in social communication and engagement, individuals with ASD demonstrate restricted, repetitive, and stereotyped behavior (APA, 2013). These limitations in flexible thoughts and behaviors may result in reduced imagination and pretend play. Imagination, a central component of pretend play, is often deficient in ASD (Crespi et al., 2016). On some tests of imagination and creativity, children with autism produce less creative/imaginative responses than control groups (Craig and Baron-Cohen, 1999). Children with ASD seem to engage in more repetitive behaviors during play instead of imaginative play (Honey et al., 2007) and are less likely than typically developing (TD) children to spontaneously produce pretend play. Indeed, many studies indicate that children with ASD often exhibit deficits in pretend play (e.g., Sigman and Ungerer, 1984; Baron-Cohen, 1987; Jarrold et al., 1993). With that said, children with ASD are able to engage in pretend play when instructed to or when it is elicited (Lewis and Boucher, 1988; Jordan, 2003).

When compared to TD children, play behavior of children with autism is demonstrably different. For example, in playground observations, children with autism engaged in more Self Play (e.g., swinging on a swing), fewer interactions overall, and less cooperative play, such as playing catch (Humphrey and Symes, 2011; Schupp et al., 2013; Corbett et al., 2014b). Children with autism also tend to demonstrate more

repetitive play behaviors (Honey et al., 2007) and often do not engage in pretend play (Wolfberg, 2015).

Anxiety is common among youth with ASD (White et al., 2009; van Steensel et al., 2011), and social anxiety is particularly prevalent in this population (Bellini, 2004; White et al., 2009). Accordingly, the social aspects of play seem to be more stressful and anxiety-provoking for children with ASD. For instance, Corbett et al. (2014b) measured the response of cortisol, a stress hormone, during social play on a playground in children with TD and children with ASD; while the cortisol levels in the ASD group were variable, many children with ASD showed significantly higher stress in response to social play compared to TD children. This stress may lead to socially avoidant behavior in some children with autism (see Corbett et al., 2010).

It has been speculated that deficits in social communication may contribute to social anxiety (Corbett et al., 2010; Pickard et al., 2017). Bellini (2004) found a negative correlation between adolescent self-report of social skills (i.e., Assertion subscale) and social anxiety. Furthermore, Bellini (2006b) demonstrated that social skill deficits (along with physiological arousal) were significant predictors of social anxiety in youth with autism. Again, this could be a cyclical relationship, such that poor social skills create negative peer interactions, thus leading to anxiety in social situations, subsequent avoidance, and less opportunity to improve social skills (Bellini, 2004, 2006b).

Given the importance of play in development, interventions have used a variety of approaches aimed at teaching play to children with ASD. Henning et al. (2016) described a peer- and parent-mediated intervention involving clinic visits and video modeling, which increased play in a portion of the participants; however, these gains did not generalize. Another multiple case study was conducted by Jahr et al. (2000), investigating a cooperative clinician-mediated play training intervention, which led to increased cooperative play in children with ASD. A randomized controlled trial of two play interventions targeting symbolic play (i.e., number of different novel, child-initiated symbolic play acts, from single scheme sequences to sociodramatic play) or joint attention was investigated by Kasari et al. (2006). Findings indicated improvements in each treatment group's targeted behavior compared to a control group. Other interventions include parent-mediated behavioral interventions or facilitated peer groups (Jordan, 2003).

As some of the previously mentioned interventions demonstrate, peers can play an important role in interventions for children with autism. Corbett et al. (2014b) described how mere solicitation by peers increased the amount of social engagement in children with ASD by 30%. Not only can peers be expert role models, but they can help break the cycle of negative peer interactions leading to reduced social motivation (Humphrey and Symes, 2011). Moreover, utilizing peers can help with generalization of skills (Kamps et al., 1992).

Though play has a key role in early development, it serves as a key training ground as the skills it engenders continue to grow throughout the life span (Jordan, 2003; Goncu and Perone, 2005). Interactive play may be incorporated into different components of life and serves as a core component of theater. Play has been compared to improvisation (Sawyer, 1997) and theater more

broadly (Schmitt, 1981). Goncu and Perone (2005) highlighted several similarities between play and improvisational theater, including the flexible use of symbols and context, as well as the communal nature of the activities. Given these characteristics, Schmitt (1981) posited that pretend play engaged in with others is a natural predecessor to theater.

Theater, like play, involves the use of social and imaginative skills (Kempe and Tissot, 2012; Corbett, 2016). For example, acting relies on perspective taking, and participation in theater has been shown to improve skills in theory of mind in TD youth (Goldstein and Winner, 2012) and children and adolescents with ASD (Corbett et al., 2019). Additionally, participation in theater has resulted in changes in positive interactive play in a sample of children with ASD, attention deficit hyperactivity disorder, and non-verbal learning disorder (Guli et al., 2013). Thus, theater is increasingly being used as an interventional technique. For instance, some research has implemented theater interventions to successfully develop participants' imagination (Kempe and Tissot, 2012) and key social skills (e.g., face memory, theory of mind, and social communication with peers) (Guli et al., 2013; Corbett et al., 2016b, 2019).

As described above, many interventions aimed at improving play involve training and teaching play skills. SENSE Theatre® is a novel intervention that incorporates peer mediation and theater in a supportive social atmosphere to enhance social competence in children with ASD (Corbett et al., 2014c, 2016b). Though SENSE Theatre® does not explicitly teach play, it targets components vital to play. For example, engaging in imaginative play in the theater may provide a model for developing the imaginative skills necessary for pretend play and theory of mind (Goldstein and Winner, 2012). Peers are trained to implement other core objectives of SENSE Theatre®, including providing social support, modeling warm social interaction, and enhancing motivation (Corbett et al., 2014c). These supply positive social experiences to counter histories of negative social experiences that may lead to avoidance of social play.

In pretest/posttest and randomized clinical trial designs, participants in SENSE Theatre® have demonstrated improvements in social competence, memory for faces, social functioning, theory of mind, and adaptive skills (Corbett et al., 2014c, 2016b, 2019). Notably, in a randomized clinical trial, group play at post-intervention testing was higher in the experimental (EXP) group compared to the waitlist control (WLC) (Corbett et al., 2016b). Additionally, the participants revealed less Trait anxiety at posttest in the EXP group compared to the WLC, as measured by the State-Trait Anxiety Inventory for Children (STAIC) (Spielberger et al., 1983; Corbett et al., 2016a). Correspondingly, a negative correlation was found between amount of group play and trait anxiety. While mediation analysis did not reveal a mediating role for group play, this study indicated that SENSE Theatre® had positive implications for both anxiety and group play in children with ASD. However, this study was limited by the relatively small sample size. More recently, three cohorts in an extended randomized clinical trial were combined to explore changes in social competence related to SENSE Theatre®. Treatment effects were found on theory of mind and face recognition tasks. In addition, participants in the

EXP group engaged in more reciprocal cooperative and verbal interaction behaviors than the WLC group (Corbett et al., 2019).

The current study uses the three aforementioned merged cohorts to examine anxiety and group play in ASD, specifically investigating the impact of SENSE Theatre® on Group and Self Play and the anxiety that can hinder social play.

MATERIALS AND METHODS

Participants

Three merged cohorts of participants, from three implementations of the intervention, were used for this study. A total of 102 youth, ages 8–16, were recruited through word of mouth and local support organizations. Out of the 102 youth, 87 met inclusion criteria. Of this 87, 10 participants were lost to follow-up testing. There were no significant differences on diagnostic or demographic variables (all $p > 0.05$) between participants who did and did not complete the study. Thus, the final sample consisted of 77 youth with ASD. Participants were allocated using simple randomization by a non-affiliated statistician to EXP (44 participants) and WLC (33 participants) groups. Each cohort consisted of participants who were randomized to either the EXP or WLC condition which occurred over three consecutive years [Cohort 1 in 2014 ($N = 29$), Cohort 2 in 2015 ($N = 28$), and Cohort 3 in 2016 ($N = 20$)]. Cohort 1 consisted of 17 EXP, 12 WLC (age = 10.60, 5 females, 24 males), Cohort 2 consisted of 15 EXP, 13 WLC (age = 10.99, 7 females and 21 males), and Cohort 3 consisted of 12 EXP, 8 WLC (age = 10.70, 6 females, 14 males). The EXP group received the treatment initially, and the WLC group received the treatment 6 months later. See **Table 1** for demographic information; see Corbett et al. (2019) for an expanded characterization of the sample. The study is registered with www.clinicaltrials.gov ID# NCT02276534. The Vanderbilt

Institutional Review Board approved this study. Informed written consent (parents) and assent (children) were obtained prior to inclusion in the study.

Inclusion criteria for the study were a diagnosis of ASD and an IQ $\geq$ 70 using the Wechsler Abbreviated Scale of Intelligence (WASI-II; Wechsler, 2011). Participants with a history of aggression over the prior 6 months (per parent report or clinical observation) were excluded from the study for the safety of participants and staff. Diagnosis of ASD was made based on three criteria: (1) previous diagnosis by a psychologist, psychiatrist, or behavioral pediatrician with autism expertise, (2) current clinical judgment (BAC), and (3) corroboration by the Autism Diagnostic Observation Schedule-2 (ADOS 2; Lord et al., 2000) by research-reliable personnel. There were no significant differences between groups on inclusion criteria [ADOS and WASI scores, $t(75) = -0.96$, $p = 0.32$, $t(75) = 1.00$, $p = 0.07$, respectively] or on pretest variables (**Table 1**).

Intervention

Ten core objectives underlie SENSE Theatre®: provide social support, create an enjoyable environment, model warm social interaction, enhance motivation, engage in directed communication, use non-verbal communication, engage in imaginative play, use empathic responding, support active learning, and advance individual learning (Corbett et al., 2014a).

Peers receive training on SENSE core objectives and behavioral techniques (e.g., shaping, extinction) during a full day of training; fidelity is measured by a pretest/posttest on the day of training and is tracked by trained observers during intervention sessions. These observers tracked fidelity of behavioral techniques and core objectives; booster sessions were given if fidelity fell below 80%. For behavioral techniques, mean scores across all ratings for beginning, middle, and endpoint were 91.29%, 78.75%, and 87.86%, respectively. For core principles, mean scores across all ratings at beginning, middle, and endpoint were 88.86%, 78.75%, and 89.1%, respectively. Over the years, the most significant changes to the program include enhanced and efficient training (e.g., one full day instead of 2 days of training) and rigorous implementation fidelity measures to monitor peers during intervention sessions.

For the current study, peers ranged in age from 10 to 24 years of age, but most were in high school and recruited from the University School of Nashville high school and local community theater programs. The mean age and sex per cohort were as follows: 2014 (16.74 years, 14 females, 5 males); 2015 (17.83 years, 13 females and 5 males); 2016 (17.89 years, 15 females and 3 males), indicating that they were generally comparable across the cohorts.

SENSE Theatre® consisted of 10 4-h sessions. Schedules of each day's activities were sent to families in advance and written on a whiteboard for each session. Initial sessions included mock auditions, theater games, and imaginative play. Later sessions incorporated character development, role-play, and rehearsal of the play with music. Video modeling was integrated into the program: participants practiced theater games and songs at home using videos on a secure website. The intervention culminated in two public performances.

TABLE 1 | Demographic and pretest variables.

Variable	EXP	WLC	df	χ^2/t	p
Demographics					
Race					
Caucasian	36	29	1	0.53	0.47
African American	6	2	1	1.16	0.28
Asian/Pacific Islander	2	2	1	0.09	0.77
Ethnicity					
Hispanic	2	3	1	0.64	0.42
Non-Hispanic	42	30			
Pretest variables					
STAIC-State	31.68	31.69	1,74	0.004	1.00
STAIC-Trait	37.66	37.47	1,74	−0.10	0.92
Unsolicited (T1) Self Play	27.61	29.49	1,74	0.31	0.76
Unsolicited (T1) Group Play	8.29	7.33	1,74	−0.24	0.81
Solicited (T4) Self Play	12.42	12.78	1,74	0.06	0.95
Solicited (T4) Group Play	60.86	48.86	1,74	−1.43	0.16

EXP, experimental group; WLC, waitlist control group; STAIC, State-Trait Anxiety Inventory for Children. The duration of play behavior is presented as seconds.

Participants were not involved in selecting the plays. Three original theatrical plays with music were used, each lasting approximately 45 min in length and containing two group songs and one ballad. Select theater games were used that are presented in the manual and commonly used in theater (e.g., the Name Game, the Present Game) in addition to various improvisational exercises. Theater games were led by the peer actors. The participants were cast in a role commensurate with their ability regardless of age. When possible, unique talents of participants were incorporated in the show (e.g., playing an instrument).

Dependent Measures

Peer Interaction Paradigm

The Peer Interaction Paradigm (PIP) is a semi-structured playground observation protocol designed to provide an ecologically valid social interaction. Two gender- and age-matched confederates assist in dividing the interaction into free and solicited play. The established paradigm is described in detail in prior work (e.g., Corbett et al., 2010; Schupp et al., 2013). Briefly, the 20-min interaction is divided into four 5-min blocks (T1, T2, T3, T4), consisting of free play (T1), solicited cooperative play (T2), free play with toys (T3), and solicited cooperative play with toys (T4). Solicited play is invited by a lead confederate and occurs during T2 and T4; unsolicited play is initiated by the participant and not invited by a confederate and occurs during T1 and T3. To ensure distinct periods of time and to contrast the measurement of behavior, only T1 (unsolicited) and T4 (solicited) were analyzed.

Confederates for the current study were TD children between 10 and 16 years of age who responded to fliers, completed an interview, and underwent protocol training. Each confederate was trained on facilitating the PIP which required him or her to play independently (T1 and T3) or solicit play from the participant (T2 and T4). The confederate was instructed to always accept the play invitations of the participant even if it occurred during independent play periods. The distinct periods of play appeared seamlessly to the participant as the confederate received cues from research personnel through a discrete earpiece with a remote transmitter. At the beginning of the paradigm, the confederate was on the playground and the timing began when the participant entered the gated play area. Therefore, the confederate provided behavioral structure to the play by permitting key interactive sequences to occur within an otherwise natural interaction and setting. The confederate for the post-visit was a child the participant had not met before, thereby representing a novel peer interaction.

As noted, the lead confederate is cued to initiate these blocks of time by communication with research personnel through an earpiece, and communication is recorded with microphones clipped to each child (Sennheiser body pack and Audio-Technica transmitters and receivers). The interaction is recorded with four professional, remotely operated cameras (70 Sony PTZ). Recorded videos were behaviorally coded using The Observer XT (Noldus, 2008).

For the current study, the time duration behaviors Group Play and Self Play on the equipment during solicited (T4) and unsolicited (T1) play were used. Specifically, the percentage of time engaged in the behavior was the unit of measurement represented in seconds. Group play was defined as the duration of activity when the participant is engaging with the group together in an activity by using the same types of equipment or toys as other members of the group. This behavior was selected based on previous research with SENSE Theatre® that has shown significant treatment effects on this broad encompassing play variable (Corbett et al., 2016b). Self Play was defined as engaging in an activity independent of other children (e.g., ride a tricycle). If the child did not engage in any play activity, neither variable would be coded and it would have been coded as no play. Selected behaviors are distinct from Cooperative Play, which is reliant on reciprocal participation of two or more children (e.g., throwing a ball back and forth, playing a game). Recent findings examining cooperative play with the current cohort have been reported (Corbett et al., 2019).

State-Trait Anxiety Inventory for Children

The STAIC is a self-report questionnaire aimed to measure both State (current) and Trait (enduring) anxiety (Spielberger et al., 1983). It has been utilized among both TD youth (e.g., Muris et al., 1998) and youth with ASD (Lanni et al., 2012; Park et al., 2013; Simon and Corbett, 2013). Alpha reliability ranges from 0.78 to 0.91; test–retest reliability for the STAIC-Trait is 0.65–0.71 (Julian, 2011). Participants in the EXP and WLC groups were administered the STAIC after the PIP.

Statistical Analyses

Independent sample t-tests were conducted to examine baseline group differences in the demographic and diagnostic variables (**Table 1**) and in all pretest-dependent variables. As in previous related studies, to examine between-group treatment effects, a series of linear mixed analysis of covariance (ANCOVA) models were used to test the post-intervention between-group differences on each dependent variable (**Table 2**). The posttest (after intervention) score for each dependent variable served as the outcome variable, group (EXP/WLC) as the main independent variable while controlling for baseline (pretest) score and Cohort (i.e., 1, 2, 3), which served as covariates. In addition, regression analyses were conducted to predict solicited Group Play based on pretreatment Group Play, age, group, and ADOS score. This was also conducted for unsolicited Group Play. Statistical analyses were performed using SPSS 24 (IBM Corp.

TABLE 2 | Pretest-adjusted post-mean differences for play and anxiety variables.

Variable	EXP	WLC	df	F	p
STAIC-State	31.48	31.28	2,71	0.07	0.93
STAIC-Trait	35.07	39.44	2,71	6.87	0.01
Unsolicited (T1) Self Play	48.83	62.64	2,73	0.46	0.50
Unsolicited (T1) Group Play	16.41	6.88	2,73	3.83	0.05
Solicited (T4) Self Play	15.43	37.09	2,73	6.70	0.01
Solicited (T4) Group Play	68.37	44.09	2,73	7.78	0.007

EXP, experimental group; WLC, waitlist control group; STAIC, State-Trait Anxiety Inventory for Children. The duration of play behavior is presented as seconds.

Released 2016. IBM SPSS Statistics for Windows, Version 24.0; Armonk, NY: IBM Corp.).

RESULTS

Pretest adjusted posttest findings for the dependent variables outlined below are presented in **Table 2**.

Peer Interaction Paradigm
Solicited Play
Following treatment, children in the EXP group engaged in significantly more Group Play [$F(2,73) = 7.78$, $p = 0.007$] than children in the WLC group. Additionally, children in the EXP group engaged in significantly less Self Play [$F(2,73) = 6.70$, $p = 0.01$] than the WLC group.

Unsolicited Play
In regard to unsolicited activity by a peer, an increase in Group Play was marginally significant [$F(2,73) = 3.83$, $p = 0.05$]. In contrast, there was no significant difference for Self Play between the groups during unsolicited activity [$F(2,73) = 0.46$, $p = 0.50$].

Predictors
Regression analysis was conducted to predict solicited Group Play based on pretreatment Group Play, age, group, and ADOS score. A significant regression equation was found [$F(4,60) = 5.943$, $p < 0.0001$], with $R^2 = 0.284$. Pretreatment Group Play ($\beta = 0.380$, $p = 0.001$) and group status (EXP/WLC) ($\beta = 0.22$, $p = 0.05$) were marginally significant predictors of solicited Group Play. A similar analysis was run for unsolicited Group Play based on pretreatment Group Play, age, group, and ADOS score. A significant regression equation was found [$F(4,60) = 4.89$, $p = 0.002$] with $R^2 = 0.246$. Pretreatment unsolicited Group Play was a significant predictor ($\beta = 0.434$, $p < 0.001$), and group status was at trend ($\beta = 0.216$, $p = 0.06$).

State-Trait Anxiety Inventory for Children
Children in the EXP group reported significantly less Trait anxiety than children in the WLC group following intervention [$F(2,71) = 6.87$, $p = 0.01$]; however, there was no difference in State anxiety [$F(2,71) = 0.07$, $p = 0.935$].

DISCUSSION

The current study corroborated previous findings on the utility of SENSE Theatre® to increase Group Play and decrease anxiety in children with autism (e.g., Corbett et al., 2016a,b). Specifically, children who participated in the SENSE Theatre® intervention compared to a WLC group demonstrated increased Group Play during playground interactions with novel peers. These results suggest that engaging with TD peers during the theater activities may increase motivation for children with ASD to participate in subsequent play activities. This is further supported by a decrease in Self Play in the EXP group compared to the WLC group, indicating that youth in the intervention were more likely to

participate in Group, rather than Self, Play. Importantly, this observation was made during solicited play by a novel peer. During unsolicited play, there was no difference in Self Play between the EXP and WLC groups; Group Play was longer in the EXP group, but only marginally so. This underscores the significance of peer involvement in increasing engagement in play among children with ASD (Corbett et al., 2014c) and reinforces the importance of peer-mediated interventions not only for social engagement in general (Strain et al., 1979; DiSalvo and Oswald, 2002) but for play specifically (Jordan, 2003).

As is highlighted by the differences between solicited and unsolicited play, peer mediation is a crucial component of SENSE Theatre®. In peer-mediated interventions, peers often act as role models (DiSalvo and Oswald, 2002; Prendeville et al., 2006). Thus, in SENSE Theatre®, peers (as co-actors in the play) are role models for SENSE core objectives relevant to play, including non-verbal communication and imaginative play. Actors have been exposed to many of the theatrical techniques in the program and are conceptualized as expert models of reciprocal social communication and play; therefore, they are optimal trainers for the program. Peers in SENSE Theatre® are trained to create a supportive environment, which may help counter negative social experiences participants have had. This supportive environment can interrupt the cycle of negative social interactions that may lead to anxiety and social avoidance (Bellini, 2006a; Humphrey and Symes, 2011).

Peers are not only role models and agents of positive social interaction but also a means to practice skills, such as social or play skills. Such practice with peers improves generalization (Kamps et al., 1992) since peers are often the target of these skills in the participant's social environment. In this way, the context of supportive play relationships and practice in imaginative play with peers could lead to improved social play in arenas such as the school environment, as evidenced during the PIP, an ecologically valid measure of real-world social play with other children.

Along with increased play, participants in the EXP group demonstrated less anxiety – specifically, Trait anxiety as measured by the STAIC. This replicated previous findings that children with ASD who participated in the intervention self-reported reduced anxiety following social play with novel peers (Corbett, 2016).

In other words, children in the treatment group reported reduced anxiety following group play with new children who did not participate in the program and were unfamiliar to the participant. Findings that Trait, not State, anxiety was decreased in the EXP group mirror previous work (e.g., Corbett et al., 2016a). Youth with ASD may have more difficulties reporting a current affective state (Bolte et al., 2008) but seem to be able to report persistent traits, such as Trait anxiety, reliably (Simon and Corbett, 2013). In this way, the participants in the EXP group may recognize their enduring anxiety patterns as being lower yet may not identify changes in their related current feelings. Thus, the STAIC-State may not accurately reflect changes in state anxiety in youth with ASD, but the STAIC-Trait seems to be a reliable indicator of anxiety (Simon and Corbett, 2013; Corbett et al., 2016a). Since this pattern has been observed across distinct studies, it appears to be clinically meaningful.

Though the STAIC-Trait does not explicitly measure social anxiety, previous work investigated correlations of this measure, when given after various stressors, to the Multidimensional Anxiety Scale for Children (MASC) (March et al., 1997). Administered after the PIP, the STAIC-Trait was strongly related to social anxiety (Simon and Corbett, 2013). STAIC-State ratings were moderately related to the MASC social anxiety subscale but not consistently elevated in response to the given stressor (the playground) – unlike STAIC-Trait ratings. Thus, STAIC-Trait ratings could reflect some of the anxiety related to the immediate social situation (the playground).

Previous reports suggest that participation in SENSE Theatre® contributes to improvement in social abilities in youth with ASD (Corbett et al., 2016a, 2019). It is plausible that this improvement (and the positive peer experiences in SENSE Theatre®) played a part in reducing social anxiety in the EXP group. Anxiety in social situations can lead to social avoidance (Bellini, 2006b); less anxiety can ostensibly decrease this avoidance, increasing social (Group) play. Increased play can furthermore promote additional socioemotional gains; social play itself seems to develop social competencies and skills (e.g., Connolly and Doyle, 1984; Sawyer, 1997; Lillard et al., 2011). In contrast to Humphrey and Symes (2011) who postulated a cycle in which negative peer experiences lead to lower motivation for social interaction, reduced social skills, and negative peer interactions, participation in the intervention seems to alter such a pattern. In other words, it is speculated that participation in SENSE Theatre® sets into motion a positive feedback loop in which supportive social encounters with trained peers and theater activities provide an enriched environment where social skills are modeled, performed, and reinforced, leading to an increased likelihood of engaging in such behavior with others and across settings. Thus, continued gains are possible through play, ostensibly propagating a cycle of positive peer interactions which lead to increased play and social competencies.

Regression analysis revealed that pretreatment play and group status were significant predictors of posttreatment effects. This finding not only supports the impact of significant changes in the EXP group but also suggests that some fundamental level of play behavior or social motivation may be important. Children with ASD likely have sufficient basic skills, and through the theater intervention, these skills may be shaped and advanced to increase social motivation and play behavior with peers. Since there were no baseline differences between the groups for either Group or Self Play, the changes may be explained by the theater intervention.

Limitations

Though the current study included a large sample of participants with ASD, there was a relative lack of diversity (84% Caucasian). Additionally, the participants were classified as higher functioning (IQ ≥ 70). Future research with children with co-occurring intellectual disability is needed. Follow-up work with a more diverse sample may increase the generalizability of the findings.

In addition, the study did not compare SENSE Theatre® to another active control condition (ACC), thereby limiting the extent to which we can definitively state that the results are attributed to the peer-mediated, theater-based intervention. Efforts are currently underway to compare the intervention to an ACC in a large, multisite, randomized clinical trial.

Future Directions

The current study provides a foundation for further exploration into the impact of SENSE Theatre® on play and anxiety. Specifically, future work can elucidate the roles particular components of SENSE Theatre® play in the demonstrated gains in play and reduced anxiety (e.g., the impact of peer mediation compared to theater games or role play). Planned future directions include investigating treatment effects for the TD peers, such as enhanced empathic responding following the intervention. Further research can additionally investigate the impact of SENSE Theatre® on different types of play, such as imaginative pretend play. Finally, though the current study looked at anxiety in the context of a social situation (the PIP), social anxiety in a daily context was not specifically examined. As social anxiety can be particularly relevant to play, future work can explore changes in this construct as it manifests in the daily lives of children with ASD.

In sum, the current study extends previous research in SENSE Theatre® and adds to the growing body of literature on the significant impact that theater and peer mediation may have on the core and comorbid functioning of children and adolescents with ASD. As youth with ASD have demonstrated deficits in play (Jordan, 2003) and commonly experience anxiety (White et al., 2009), the findings discussed here are clinically relevant and are a starting point for further exploration.

DATA AVAILABILITY STATEMENT

The datasets generated for this study will not be made publicly available. The data is shared with the National Database for Autism Research (NDAR). Requests to access the datasets should be addressed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Vanderbilt University Institutional Review Board. Informed written consent and verbal assent was obtained from parents/guardians and children, respectively, prior to participation in the study.

AUTHOR CONTRIBUTIONS

The named authors made significant contributions to the investigation and manuscript. Specifically, SI provided the organizational and conceptual framework for the manuscript, reviewed and synthesized the relevant literature, provided interpretation of the statistical analyses, and co-wrote the initial draft of the manuscript. AK contributed to the organizational structure of the manuscript and assisted with further analysis

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The "Who" System of the Human Brain: A System for Social Cognition About the Self and Others

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Neuroscientists are fond of talking about brain systems for the processing of "what" and "where" information about objects and their locations. What is critically missing is the concept of a "who" system dedicated to the neural processing of information about social agents—both the self and others—and their interactions. I propose here the characterization of such a system, one that functions not only in perception but in production as well, such as when recounting stories about oneself and others. The most human-specific features of the "who" system are two complementary systems that I refer to as the *other-as-self* mechanism and the *self-as-other* mechanism. The major function of the other-as-self mechanism is to perceive other people egocentrically as proxies of the self, as occurs through the processes of mentalizing and empathizing in both everyday life and in the experience of the theatrical and literary arts. The major function of the self-as-other mechanism is to overtly depict other people during acts of communication through vocal and gestural processes of mimicry, such as occurs during quotation in conversation and through acting in the theatrical arts. Overall, the "who" system of the human brain mediates both perceptual and behavioral aspects of social cognition, and establishes the existential distinction between self and other in human cognition. I present neural models for the instantiation of the "who" system in the human brain and conclude with a discussion of how narrative serves as a foundation for human cognition more generally, what I refer to as narrative-based cognition.

Keywords: self, other, character, narrative, brain, theory-of-mind, mentalizing, mimicry

INTRODUCTION

Neuroscientists since the 1980s have been fond of talking about neural systems for the processing of "what" (object identity), "where" (object location), and "how" (sensory-guided motor activity) information in the brains of humans and non-human animals (Mishkin and Ungerleider, 1982; Mishkin et al., 1983; Goodale and Milner, 1992). What has been strongly lacking is a neural system for the processing of "who" information about conspecifics as social agents, despite a large impetus to develop a field of social neuroscience (Cacioppo et al., 2010). It should be possible to take advantage of findings from social neuroscience and consolidate them into a unified model of a "who" system in the brain, in other words a neurocognitive system for processing information about other people and the self as social agents. Such a system should be involved in: (1) distinguishing the self from others; (2) establishing the different personas of the self that occur in different social situations; (3) identifying other people based on both individual and group traits;

and (4) classifying them as either friends or foes in the drama of social life. Friends are people who are liked, trusted, cared about, and sought out. Foes are people who are disliked, mistrusted, feared, and actively avoided. A critical function of a "who" system is to establish the *social status* of other people in relation to the self as characters in the drama of one's life.

While the study of social cognition has put an overwhelming emphasis on perceptual processes, a more balanced approach to the topic must include the production component of social cognition as well. An analysis of production processes permits an exploration of not only social behavior, including all aspects of social interaction, but of the importance of role-playing in human life, a topic that has garnered little attention in either psychology or neuroscience (Brown, 2017), but which has acquired a strong historical presence in the study of acting theory since the 18th century (Diderot, 1783; Stanislavki, 1936, 1949; Kemp, 2012). An understanding of the core process that underlies acting, namely personal mimicry, provides an evolutionary unification of the two novel capacities for vocal imitation and gestural imitation that emerged during human evolution, even though the two are almost always discussed in separate literatures.

In developing the concept of a "who" system in the brain, I want to ground this system in the cognitive neuroscience of *narrative*, and argue that a narrative approach provides the best means for understanding "who" functioning in human cognition. I will capitalize on two major traditions in doing so. They reflect ideas related to character and plot, respectively, which are the two major components of narrative. First, the dramaturgical approach to social psychology (Goffman, 1959; Shulman, 2017) argues that the self and others can be conceptualized as a series of characters engaged in a web of social interactions driven by dramatic considerations. Individuals play different roles in different social situations based on the people they are interacting with at the time. Goffman (1959) focused his analyses on the role-playing that takes place in various professions and pointed out that such role-playing occurs in specific settings, that the players wear costumes specific for their role (e.g., the lab coat of a doctor), and that they employ props appropriate for the role (e.g., a stethoscope). In other words, social interaction is a form of stagecraft. From a dramaturgical standpoint, certain interaction partners are friends who support our goals by cooperating with us, while others are antagonists or competitors who obstruct us by providing obstacles to our goal achievement.

Second, Bruner (1986) argued that social cognition is mediated by a specialized mode of causal inference—what he called the "narrative mode"—that is distinct from the scientific mode that dominates our mechanistic understanding of non-social phenomena in the world. While the latter uses principles of physical causation to explain natural phenomena, the narrative mode of inference operates by conferring causal efficacy onto psychological states—for example, intentions, emotions, desires, goals, beliefs—in explaining the behavior of the self and other people, an idea that dominates folk psychology (Hutto, 2007). This is a distinctly social mode of cognition that is specifically dedicated to processing "who" information about social agents. The narrative mode can be thought of as the who

system's "why" mechanism (Spunt and Lieberman, 2014); it is its causal mechanism for explaining the behavior of others and the self with reference to psychological states. Developmentally, this emerges through children's widespread engagement with fictional scenarios in their daily lives (Hutto, 2007). Children learn not only about physical causality through an exploration of fictional worlds (Walker et al., 2015; Hopkins and Weisberg, 2017), but about psychological causality as well, such as the kind that underlies social reasoning in stories with moral lessons (Hopkins and Weisberg, 2017; Walker and Lombrozo, 2017).

A means of unifying these two perspectives—the dramaturgical perspective that social behavior is a form of role-playing and the proposal that social cognition is predicated on a narrative mode of inference that confers causal efficacy onto psychological states—is by considering social cognition to be mediated by *plot-schemas*, in which the behavior of the self is quite similar to that of a protagonist in a story. Much of human behavior is goal-directed, and such behavior is often hindered by obstacles, not least social obstacles created by antagonistic individuals or institutions. These obstacles trigger problem-solving strategies that aim to overcome the antagonism to achieve one's goal, oftentimes with the help of people who serve as supporters and enablers (Tu and Brown, in press). The result can be either a positive or negative outcome for the person, either terminating the plot or stimulating new attempts at solving the problem. Hence, goal-directed behavior often plays out in a plot-like manner in the context of a cast of characters, some of whom are antagonistic to and others of whom are supportive of the social agent. In the concluding section of the article, I will present a model of what I call narrative-based cognition (NBC) that proposes that goal-directed behavior can be thought of as being "a story in the making" from the standpoint of the social agent.

THE STANDARD MODE OF SOCIAL COGNITION

Throughout this article, I am going to consider a contrast between a "standard" mode of social cognition and what I will refer to as the "narrative" mode, in keeping with Bruner's terminology. These modes will be described in detail in the following sections. Both of them are predicated on the central importance of perspective-taking in human cognition. This can be described in at least two different manners. Literary theorists distinguish the *first-person* (1P) perspective of the self from the *third-person* (3P) perspective of the other. By this analysis, theory-of-mind is the process of adopting a 3P perspective on someone. A second manner of describing perspective-taking comes from the study of spatial cognition. Here one finds a distinction between the *egocentric* perspective, where spatial processing occurs from the internal corporeal perspective of the self (as in looking out through one's eyes), and the *allocentric* perspective, where spatial processing occurs with respect to some external frame of reference, most commonly a Cartesian coordinate system (Klatzky, 1998; Mellinger and Vosgerau, 2010; Gramann, 2013). Combining these two approaches to perspective-taking, we can see that the 1P perspective is generally

FIGURE 1 | The "standard" mode of social cognition. The standard mode of social cognition is defined as that mode in which the self is processed egocentrically and the other is processed allocentrically, both in perception and production.
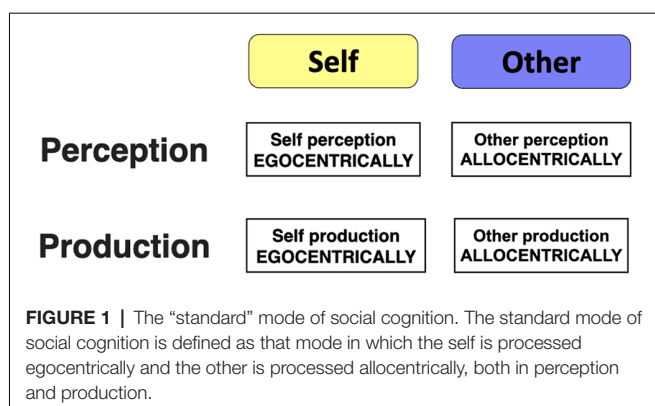
egocentric, while the 3P perspective is generally allocentric. Relations of this type define what I will call the standard mode of social cognition. **Figure 1** provides a conceptual description of the standard mode, covering both perception and production. Its 2 × 2 structure leads to four psychological processes:

Self-perception

This includes the fundamental process of self-awareness that forms the basis of consciousness and self-identity. Such self-awareness includes not only knowledge of one's fluctuating psychophysiological states—including emotions, feelings, desires, intentions, goals, and so on—but also knowledge of one's enduring trait features, including physical and personality features.

Self-production

The dramaturgical paradigm that was just discussed (Goffman, 1959; Shulman, 2017) posits that people present themselves during social interactions as a series of *personas* that vary in behavioral features as a function of social context and interaction partners. Such personas are not true characters (i.e., other people), but are instead variants of a multifaceted self. For example, a given individual can play the roles of mother, daughter, boss, customer, patient, and wife in different contexts as a function of the social situation and the interaction partners. Each of these personas is associated with a particular set of behaviors and social traits that reflect, in part, the social hierarchy of the culture and the inherent status and power relationships of that hierarchy (Brown, 2019). These include interactive roles related to coordinative behaviors, as seen in the group-wide dancing that occurs in ceremonial rituals in indigenous cultures, where status relationships are reflected in the coordinative roles of leader, follower, and coequal.

Other Perception

"Other" processing in the standard mode of social cognition involves allocentric processing of others in both perception and production (see the right side of **Figure 1**)[1]. At the most fundamental level, this involves the perception of people's trait features from an allocentric perspective. A critical part of "who"

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[1]I will discuss the perception of other people's internal mental states and intentionality in the next section about the narrative mode of social cognition.

functioning in cognition is the ability to recognize *who someone is*, that is to identify both the person's group memberships (e.g., gender, age group, family relationships) and their identity as an individual. I will consider four types of features that contribute to the social identification of individuals, and they apply as much to the self as to others. First, there are trait features that are perceived statically because they are either invariant or that they change very slowly over time. These include physical features such as gender, ethnic features, age group, height, facial structure, body size, and strength, among many others. Neuroscientists have proposed that there are specialized brain modules for the perception of faces, voices, and bodies, specializations that are devoted to social cognition (Schirmer and Adolphs, 2017). Second, some features are perceived dynamically, such as facial expressions, vocal prosody, and body movements and actions, that we can use to recognize who somebody is. Third, beyond physical and behavioral features alone, the perception of other people focuses on their psychological and social traits, including enduring features such as personality traits or more-variable features like social status. Within social psychology, the so-called Big 5 personality dimensions of conscientiousness, agreeableness, neuroticism, openness, and extroversion have been widely discussed as enduring trait features of people (Digman, 1990). Berry and Brown (2017) demonstrated that literary characters could be successfully classified in a two-dimensional manner according to the orthogonal personality dimensions of assertiveness and cooperativeness. Also, they formulated the concept of an "ethotype" (where the root "etho" means character) to connote a personality variant of a literary character, analogous to the way that persona describes variants of the self. For example, the character of the king can be virtuous or authoritarian. Likewise, the cynic can be a persnickety ogre or an elegant dandy, and such ethotypes should undoubtedly vary in their physical traits as well.

Fourth, the perception of other people in the standard mode of social cognition engages systems of emotional appraisal, especially as it pertains to interpersonal status relationships. These appraisals vary as a function of valence with regard to whether we see others as people whom we like, trust, and want to cooperate with (positive valence) or people whom we dislike, fear, and attempt to avoid as threats (negative valence). Dramaturgically, this creates a divide between supporters and antagonists, respectively, helping to establish interactive roles between the self and others in social dramas. This can be seen quite clearly in connection with status relationships with others. Some people are perceived as more dominant than ourselves (e.g., parents, group leaders), others as more submissive (e.g., children, the infirmed), and yet others as equals (e.g., friends, colleagues). Two of the most important social appraisals that we make of other people are moral appraisals of the propriety of their actions and aesthetic appraisals of their attractiveness (Ortony et al., 1988). Moral emotions play a central role in dramaturgy since we tend to make positive moral appraisals of supporters and friends, and negative moral appraisals of antagonists whom we perceive as threatening. Hence, the status distinction between friend and foe is a critical feature of what a "who" system is

designed to achieve in establishing social relationships and status hierarchies. Overall, allocentric perception of others focuses on a combination of trait perception (physical, psychological, social), action perception, and emotional appraisals.

Other Production

By "production," I am referring here to communicative processes that occur during social interactions, not just to involuntary emotional expressions. The production side of "other" processing in the standard mode of social cognition is the production analog of trait perception, which I will refer to as *description*. At the most basic level, this involves a description of people's trait features or actions, as conveyed through language, gesturing, or graphic-image generation. Later in the article, I will contrast description with *narration*, where narration incorporates a mentalistic understanding of people's intentionality and agency, as based on the narrative mode of inference using theory-of-mind mechanisms. Description in the standard mode of social cognition is a more constrained process, one that is limited to *non*-mentalistic production processes, as related mainly to a description of people's trait features, be they physical, psychological, or social. Description can also include a basic understanding of actions and events, but it should preclude an analysis based on people's intentionality, emotions, and other psychological explanatory factors that are the purview of the narrative mode of cognition.

THE NARRATIVE MODE OF SOCIAL COGNITION: THE OTHER-AS-SELF AND SELF-AS-OTHER MECHANISMS

I have defined the standard mode of social cognition as that psychological mode in which self-related processing occurs egocentrically and other-related processing occurs allocentrically (**Figure 1**). The current section examines mechanisms by which social cognition can move psychologically beyond the confines of these perspectives and help establish several human-specific features of social cognition. These mechanisms will comprise the narrative mode of social cognition. If the standard mode emphasizes the mechanisms that underlie our ability to socially identify other people—in other words, to recognize *who* someone is—then what I am calling the narrative mode moves beyond this recognition process to allow people to both get into the mind of another person through mentalizing and to portray another person through mimicry. I will talk about the two principal mechanisms of the narrative mode as being the "other-as-self" (OS) mechanism and the "self-as-other" (SO) mechanism. They reflect the two major modalities of storytelling outlined by Plato (1968; 380BCE) in *The Republic*, namely diegesis and mimesis. In diegesis, the characters of a story are described by a narrator, whereas in mimesis, they are conveyed through impersonation by actors. The OS mechanism is diegetic, while the SO mechanism is mimetic.

The Other-as-Self (OS) Mechanism

We can perceive other people, not just in standard allocentric terms with reference to their observable physical traits and actions, but also *egocentrically* as people like ourselves whose unobservable mental states we can infer, understand, and share in through theory-of-mind and empathy mechanisms. OS functioning is the ability to perceive other people as proxies of oneself. The top panel of **Figure 2** outlines the logic of the predominant form of OS processing, namely the ability to perceive others egocentrically through mentalizing. It states that "me perceiving another person is processed as if perceiving myself." I will argue in the neuroscience section below that this process is mediated by a mirror-type neural mechanism that underlies ostensive communication in humans. *Mentalizing is the most basic other-as-self function in human cognition.* Mentalizing—also known as theory-of-mind and mindreading—is a process by which a person mentally looks beyond him/herself to develop inferences about the thoughts, beliefs, desires, intentions, and emotions of another person (Frith and Frith, 2003; Nichols and Stich, 2003). It is the ability to see other people in egocentric terms as proxies of the self and to understand their psychophysiological states through cognitive mechanisms of mental stimulation, or what some have referred to as "mental mind travel" (Ferretti et al., 2017). It is a process that is deficient in individuals with autism, who have a reduced ability to mentally extend beyond themselves and to think about people's mental states, including their own (Williams, 2010).

Mentalizing is the instantiation of the narrative mode of causal inference in social cognition, where social phenomena are understood and explained with reference not to physical causation but instead to mentalistic causation related to people's intentions, desires, beliefs, and emotions. As mentioned earlier, the narrative mode comprises the who system's "why" mechanism; it allows people to explain the behavior of others using principles of psychological causation, rather than physical causation. Importantly, mentalizing is not merely about making an inference about another person's mental states, but about translating these mental states into egocentric terms as states that we ourselves can understand and engage in. This is relevant not only for the perception of people during standard social interactions but also for the perception of characters in the theatrical and literary arts, with whom people readily engage psychologically (Fludernik, 1996; Oatley, 1999; Palmer, 2004; Zunshine, 2006; Mar and Oatley, 2008; Hogan, 2011; Herman, 2013). Hence, this is a major mechanism for narrative perception and perspective-taking in the arts.

The extreme version of OS perception is empathy, in which a person not only *infers* information about another person's emotions but *feels* the emotions assumed to be felt by that person (de Waal, 2008; Hatfield et al., 2009). Empathy is the contagious process of sharing in someone's psychophysiological experience at the same time that they presumed to. In empathy, we perceive others egocentrically to the point that we vicariously experience their emotions and bodily states (Paulus et al., 2013). Empathy can be conceptualized in OS terms as a process of engulfment. It is as if my skin has somehow wrapped around your skin such that, if I see someone placing a pin into your skin, I feel your pain at the same time that you are presumed to be feeling it. Through this process, you become an extension of my own
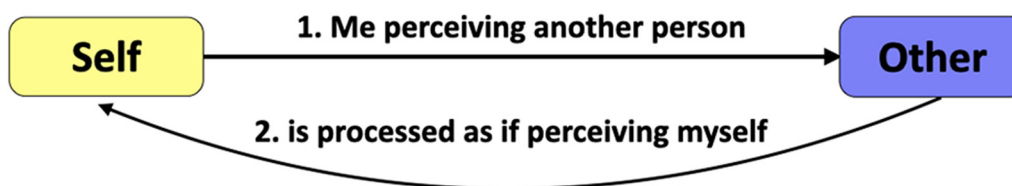
FIGURE 2 | The other-as-self mechanism. The principal other-as-self mechanism is found in perception (top panel): perceiving others egocentrically through mentalizing processes. A second, though uncommon, mechanism is found in production (bottom panel): producing the self allocentrically. This can occur as a projection of the self onto a self-avatar or other object, for example in virtual reality applications. The term "object" is used here to refer to either a physical or virtual representation of the self.

body, a part of me.[2] The result is a state of shared emotional experience. There are several distinctions in the psychology literature between mentalizing as a process of mere awareness of someone's emotions and empathy as a process of actually feeling someone's emotions. These include sympathy vs. empathy, cognitive empathy vs. affective empathy, cognitive empathy vs. compassionate empathy, and cold empathy vs. hot empathy (Davis et al., 1987; Shamay-Tsoory, 2011; Winner, 2019). To my mind, terms like cognitive empathy and cold empathy are inaccurate descriptions of the concept, since mentalizing without empathy does not qualify as empathy, which is a process of contagiously sharing in the emotions of another person, not just developing a cognitive awareness of or intuition about that person's emotions. What this implies is that most psychological models of empathy operate hierarchically such that the cognitive (mentalistic) process of inferring an emotional state is seen as being a prerequisite to the affective (physiological) process of feeling an emotion.

[2]It is interesting to point out that, in forms of dancing like tango in which there is body contact between the dancers, one's dance partner becomes a synergistic extension of one's own body, much the way that hand-held tools are conceptualized in neuroscience (Maravita and Iriki, 2004). Hence, this might be another example of the engulfment of another person in human cognition.

While the OS mechanism just discussed is perceptual, its discursive counterpart creates a significant innovation in the capacity for communication in human cognition, namely *narration*. Narration permits a transition from a non-mentalistic process of description based on people's observable trait features and actions to a mentalistic and agentic process in which the behavior of other people is described and explained with regards to their intentions, desires, beliefs, and emotions. In other words, narration is a description of others and the self using the mentalizing-based narrative mode of inference, rather than the scientific mode based on descriptions of observable traits and actions alone. It is a process of "narrativizing" human behavior in terms of mentalistic and intentional causes, about conveying the "why," not just the "how," of human behavior. Importantly, *narration is the production analog of theory-of-mind*. If theory-of-mind is the covert process of inferring a person's desires, motivations, intentions, beliefs, and emotions, then narration is the public process of externalizing and depicting such psychophysiological states during acts of social communication (Clark, 2016). The neuroscience section below will discuss the fact that narration (as production) and mentalizing (as perception) take advantage of a shared sensorimotor mentalizing system that is comparably active in production and perception, suggesting a model in which theory-of-mind and narration

co-evolved during human evolution, doing so *via* a mirror-system mechanism.

Narration permits the emergence of stories as a communicative phenomenon in human evolution (Gottschall and Wilson, 2005; Boyd, 2009, 2018), a significant innovation in social cognition and a major force in cultural evolution. Through narration, we can communicate psychologically about other people and the self as social agents driven by desires and intentions. In its richest forms, narration is not only able to convey information about people as they currently are, but also about their past behaviors and potential future actions. As Aristotle pointed out in *Poetics*, "... the function of the poet is not to say what has happened, but to say the kind of thing that would happen, i.e., what is possible in accordance with probability or necessity" Aristotle (1996; 16; 335BCE). In terms of real life, this amounts to a process of prediction and simulation about the probable behaviors that people will carry out based on psychological inferences about their desires, intentionality, and emotional states. This underlies the unlimited potential of writers of literature and drama to creatively invent story-worlds, characters, and plot scenarios that are fictional yet still realistic (Hogan, 2013).

A critical part of narration is a process that I call "protagonism" (Brown et al., 2019a), also referred to as focalization in literary theory (Abbott, 2008). Protagonism is the fundamental narrative function of establishing a single person's perspective in a story, namely that of the protagonist. In real life, events typically involve multiple individuals or even masses of individuals. While histories and news stories have mass protagonists, personal and literary stories do not. Personal stories are always protagonist-centered. They describe events from the standpoint of one person's interests and welfare. Protagonism is about carving out that person's perspective and distinguishing it from the perspective of all of the other agents taking part in the event. For self-related stories (1P perspective), we ourselves are the protagonist (Sarbin, 1990; Labov, 2001; Bauer et al., 2008; De Fina and Georgakopoulou, 2012). For stories about other people (3P perspective), we select one particular other for this role and describe outcomes in terms of his/her interests and welfare. However, the critical caveat here is that the other-as-self mechanism ensures that narration operates by developing insights into other people as relatable self-proxies (Storm, 2016). In other words, the protagonists of stories are people like ourselves who we can relate to egocentrically. Hence, whether in production or perception, protagonism defines the protagonist's perspective for a narrative. Producers and perceivers of stories latch onto the perspective of that one character and exclude all others. In the vast majority of stories, this is presented as an antagonism between a protagonist and other individuals or institutions having competing interests with him/her (Abbott, 2008). This is a critical facet of how we view social phenomena as plot-schemas and another manner in which personal stories are different from news stories.

The lower part of **Figure 2** shows a second, though relatively uncommon, the process of OS functioning, one that occurs in production, rather than perception. The logic of this process is that "me representing myself is done with an object," rather

than egocentrically with my own body. A contemporary example of this is the use of avatars of the self in virtual reality chat rooms and role-playing video games (Caracciolo, 2015). In such situations, a person has to project him- or herself onto an avatar, resulting in an other-as-self process in production. A more common example is found in pantomime. Consider the pantomime of someone walking in which the mimer represents herself walking down the street not by performing a full-body egocentric gesture the way that a mime actor would, but instead by using the index and middle fingers of her hand to represent her two legs walking along the street. This is referred to in the gesture literature as a body-part-as-object (BPO) pantomime (Boyatzis and Watson, 1993; Suddendorf et al., 1999) since the mimer's fingers undergo a process of object substitution to become legs. In such a pantomime, the self is represented in production in an allocentric manner, which is a deviation from the self → egocentric processing of the standard mode of social cognition.

The Self-as-Other (SO) Mechanism

If the predominant form of OS functioning is the perception of others as proxies of the self through mentalizing, then the predominant form of SO functioning is the portrayal of others using the self as a vessel, in other words *producing others egocentrically* through mimicry and acting. Note that I am using the term mimicry in a broad sense throughout this article to refer to the impersonation both of familiar individuals and dramatic characters. Mimicry is being used in the Platonic sense of likening oneself to another person, rather than of producing a replica of some known person or entity. In SO functioning, the self is transformed, either partially or wholly, into another person. The top part of **Figure 3** outlines that the logic of the SO mechanism is that "me representing another person is done using my own body." This occurs *via* gestural and vocal mechanisms of personal mimicry, such as that which occurs during quotation in conversation (Bavelas et al., 2014; Blackwell et al., 2015; Stec et al., 2016), during the impersonation of characters in bedtime-story reading (Matharu et al., in press), and in the performative context of the theatrical arts (Konijn, 2000; Kemp, 2012; Schechner, 2013). While dramaturgical theory in social psychology tells us that we present different personas of our self in different social situations, there are also occasions in which we portray *other people* during social interactions. In the extreme case, this is done by professional actors when performing the role of fictional characters in dramatic works as part of theatre performances. However, there is a large diversity of functions in which character portrayal occurs during everyday social interactions, what I have referred to elsewhere as proto-acting (Brown, 2017). These are processes of personal mimicry and character impersonation that occur in a far more transient manner than that which takes place during full-fledged theatrical performances. The most common form occurs when quoting someone in conversation, such as when a man raises the pitch of his voice when quoting his wife having said to him "Honey, did you take out the trash?"

I propose that, through the SO mechanism, another person comes to impinge on our self and take us over, leading to a
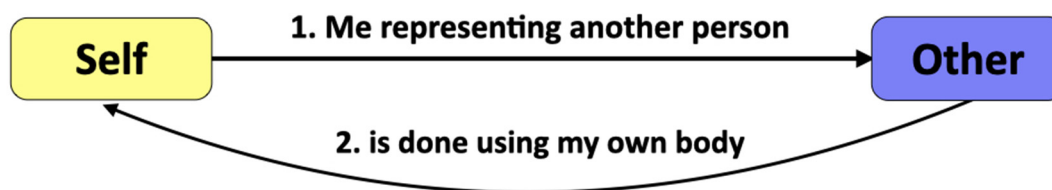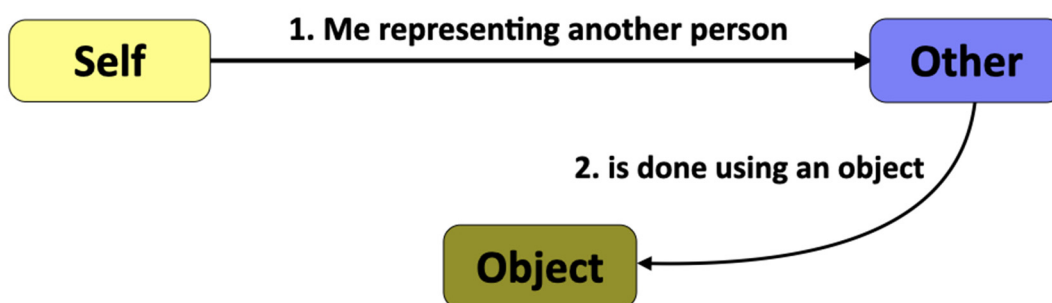
FIGURE 3 | The self-as-other mechanism. The principal self-as-other mechanism involves portraying others egocentrically through mimicry and acting (top panel). A second, though uncommon, mechanism involves producing others allocentrically (bottom panel). This can occur as a portrayal of another person using an object, for example a dummy in ventriloquism or an avatar in role-playing video games. The term "object" is used here to refer to either a physical or virtual representation of another person.

retraction of self resources. Like all human beings, I have only one voice, one face, and one body. The more that I perform the gestures of another person through mimicry, the less that there is of the features of my voice, face, and body. Because of this resource competition, mimicry is a zero-sum game. While I can certainly alternate between myself and another person—much the way that a ventriloquist does with a dummy—I cannot be both of us at the same time. Resource limitations demand that mimicry be, at least to a significant extent, a retraction of the self. True acting is an extreme form of this, in which a character takes over a significant part of the actor's self. By this line of reasoning, acting is akin to a process of possession, a phenomenon that is seen across world cultures in religious rituals in which participants come to be taken over by spirits, ancestors, and deities (Rouget, 1985; Schechner, 2013). Perhaps the main difference between spirit possession and acting is that, while actors maintain a stable sense of "split consciousness" between themselves and their character (Konijn, 2000; Kemp, 2012), participants in possession rituals can transiently cross the divide to the point that they have lost themselves and have become fully taken over by the spirits (Rouget, 1985), much as occurs in a more chronic and debilitating manner in psychiatric conditions of personality disorders. In such cases, identification

with a character is complete, and there is a minimal splitting of consciousness between the self and the other. I will argue in the neuroscience section below that acting is, at least in part, a "loss of self," and that this comes about through suppression of the intrinsic self-persona (Brown et al., 2019b). This process can become accentuated when performers employ acting methods that encourage deep self-identification with characters.

As mentioned in the "Introduction" section, character portrayal through personal mimicry creates a union between the two newly-evolved capacities for gestural imitation and vocal imitation found in humans. This is significant since gestural imitation is discussed in relation to language evolution separate from speech (Arbib, 2012), whereas vocal imitation is discussed in relation to speech evolution separate from language (MacNeilage, 2008). Therefore, the self-as-other mechanism of personal mimicry and proto-acting provides *an evolutionary unification of gestural and vocal imitative processes* for the first time (although see Donald, 1991 for related ideas). Proto-acting also establishes role-playing as a pervasive process in human social cognition. A universal ontogenetic manifestation of this is seen in the pretend play of children, where the participants portray characters in improvised dramas, often involving props (Walton, 1999; Harris, 2000). Some of these

props also serve as characters in the drama, such as dolls and toy animals, which are brought to life through a process of animism. Compared to narration's ability to depict other people from a third-person perspective, the self-as-other mechanism permits a depiction of people from a first-person perspective through the embodied process of impersonation, something that establishes the "fictional first-person" perspective of the actor (Brown et al., 2019b). Despite decades of work on theory-of-mind and its neural basis, there has been scant work on personal mimicry and character portrayal in the fields of psychology and neuroscience (Goldstein and Bloom, 2011), least of all in the field that calls itself social neuroscience.

The bottom panel of **Figure 3** shows an additional, though uncommon, mechanism of SO functioning: producing others allocentrically using objects. The various SO functions discussed thus far—mimicry, acting, and possession—are all forms of character portrayal that use the full body of the self to impersonate the other in an egocentric manner. However, there are also allocentric means of impersonating the other, and that

is with the use and control of objects. This can involve physical objects like puppets or dummies (Orenstein, 2017), or virtual objects like the computer avatars that are found in video games (Caracciolo, 2015). Compared to the egocentric forms of SO functioning, the allocentric forms create a triadic relationship between self, character, and object. Also, while virtually all forms of mimesis in the Platonic sense are performed egocentrically, character portrayal using an object as an implement is the only format of mimesis that is allocentric.

Figure 4 provides a combined summary of the OS and SO mechanisms, both egocentric and allocentric forms. The figure proposes a rough directionality of the effects between self and others using shading and arrows. The major form of OS functioning is mentalizing, in which the self reaches out to perceive the mind of the other. Narration is the production analog of this. Empathy is a more extreme form of this, in which the self engulfs the other and shares in that person's psychophysiological states. The allocentric form of OS function is the projection of the self onto self-avatars, as in virtual reality

FIGURE 4 | Summary of the narrative mode of social cognition. The principal other-as-self mechanism involves perceiving others egocentrically through mentalizing and empathy. A production counterpart occurs in the form of narration. A second mechanism works in production to represent the self allocentrically using objects such as avatars. The principal self-as-other mechanism involves portraying the other egocentrically through mimicry, acting, and occasionally spirit possession. A second mechanism works to portray others allocentrically using objects, such as puppets and avatars. The figure uses shading and arrows to provide an approximate representation of the dynamics of self and other processing for each mechanism. In mentalizing, empathy, and narration, the self reaches out psychologically to an other's mind. In the use of self-avatars, the self gets projected onto an object. In mimicry, acting, and possession, an other comes to inhabit the self's body during a performance. In the use of other-avatars, the portrayal of an "other" occurs using an object, rather than the self's body. Note that the processes shown horizontally on either side of the central vertical divider are not meant to be paired with one another; the organization is arbitrary.

chat rooms. For SO functioning, the egocentric forms are shown as progressive retractions of the self by the other, from simple mimicry to dramatic acting to spirit possession. The allocentric form of SO is the use of other-avatars, either physical or virtual, as representations of others, as seen in ventriloquism, puppet theatre, and role-playing video games. A basic proposal of the current model of human cognition is that the evolution of the sense of self comes about not just by the ability to perceive the self egocentrically (i.e., self-awareness), but by the ability *to perceive and produce others egocentrically through mentalizing and mimicry*, respectively.

Before concluding this section, I would like to apply the reasoning developed here to the cognitive basis of religion, in particular to the observation that *gods are typically seen as characters in the drama of human life* and are thus subject to the operations of the "who" system. Gods are frequently conceived of as personified beings, as in the case of the Judeo-Christian God, who is seen as a male parental figure. In polytheistic religions, some gods function as supporters and protectors, while others function as antagonists, just as in drama. Even in folklore, there are supernatural beings that are the sources of good (e.g., angels, fairies) and those that are the sources of evil (e.g., demons, evil spirits). In many cultures, but by no means all of them, gods take the form of dead ancestors and hence have many of the salient physical and psychological attributes of human beings (Steadman and Palmer, 2008), including the ability to communicate with living humans using natural language. Gods are often portrayed as moralizing beings and authority figures who make emotional judgments about the actions of humans (Johnson, 2005, 2015). These are typically prosocial judgments that resemble the social appraisals that humans make of one another. Prayer provides an accessible means of communicating with gods using natural language. This can be done to make requests for desired things, to express thanks for requests that were granted, or to seek forgiveness for behaviors that might normally lead to punishment. In most cases, prayer is a monologic activity directed toward the god (even when it is done as group worship), although some people report hearing the voice of a god talking back to them or seeing signs that the god has responded to a request that occurred in a prayer. This strongly suggests that prayer is a process that has a clear mentalizing component to it, as if people are trying to read the mind of a god while talking to it and are engaging in processes of persuasion. It is not surprising, therefore, that conceptions of gods often have a strongly egocentric form to them (Epley et al., 2009), reflecting the person's own conception of themselves (i.e., other-as-self).

THE "WHO" SYSTEM OF THE HUMAN BRAIN

Just as neuroscientists talk about "what," "where" and "how" systems in the brain, I would like to suggest that the brain also contains a "who" system for social cognition and that this system operates by processing information about others and the self as actors in social dramas. The "who" system should mediate both the standard mode and the narrative mode of social cognition. The core of the "who" system is comprised of a well-described

neural system that processes mentalistic information about both oneself and other people. It is generally referred to as *the mentalizing system* (Frith and Frith, 2003, 2006; Spunt and Lieberman, 2013), which is important both for self-awareness and for creating inferences about the mental states of others, including their beliefs, intentions, desires, and emotions. This system functions as a hub for many aspects of social cognition. The mentalizing system strongly overlaps with the "default mode network" involved in developing a sense of internal awareness about the self, as opposed to an external awareness of objects in the environment (Andrews-Hanna et al., 2010; Mars et al., 2012), where the latter is much more the domain of the "what," "where," and "how" systems.

Figure 5 shows schematically that the core of the "who" system is made up principally of medial cortical structures, including the ventromedial prefrontal cortex (vmPFC) and posterior cingulate cortex (PCC), but also the precuneus, and potentially the retrosplenial cortex. The only major component of the mentalizing system that is on the lateral surface is the temporoparietal junction (TPJ), although several models also include the anterior temporopolar cortex (ATPC) as well. Another medial brain area that I include in this system is the dorsomedial prefrontal cortex (dmPFC), which is less involved in acquiring mentalistic knowledge as in understanding the trait features of oneself and others (Benoit et al., 2010; Ma et al., 2012; Garrison et al., 2015), including physical characteristics, which is another critical facet of who processing. The overlap between the mentalizing network and the default mode network occurs more so in the posterior regions of the TPJ and PCC than in the anterior region of the vmPFC (Mars et al., 2012).

Two kinds of areas interact with this mentalizing core: first many sensory areas that contribute to "allocentric perception of others" (**Figure 1**), as is key for the operation of the standard mode of social cognition, and secondly emotion areas that process moral appraisals regarding the social status of others in relation to the self, i.e., whether someone is a friend (resource) or a foe (threat) in the narrative sense, including ingroup vs. outgroup status. Regarding the first type of area, information about the trait features, actions, and expressive behaviors of other people is processed in higher-order sensory areas in the posterior part of the brain, including modules devoted to the perception of facial structure (fusiform face area), facial expressions (posterior superior temporal sulcus, pSTS), voices (voice-selective temporal-lobe areas), vocal prosody (pSTS), body structure (fusiform body area, extrastriate body area), and expressive movement patterns (area V5 and the pSTS; reviewed in de Gelder et al., 2015; Schirmer and Adolphs, 2017). The pSTS, which is shown in the figure, serves as a multisensory convergence point for perceiving vocal, facial, and bodily forms of emotional expression.

The second group of brain areas that interact with the mentalistic core of the "who" system is comprised of limbic emotion areas that mediate appraisals about the social status of others with regards to the self, not least whether someone is a friend or a foe. These are systems that work to help organisms recognize threats in the environment, but in this case they apply to *social* threats within and between social groups. For people
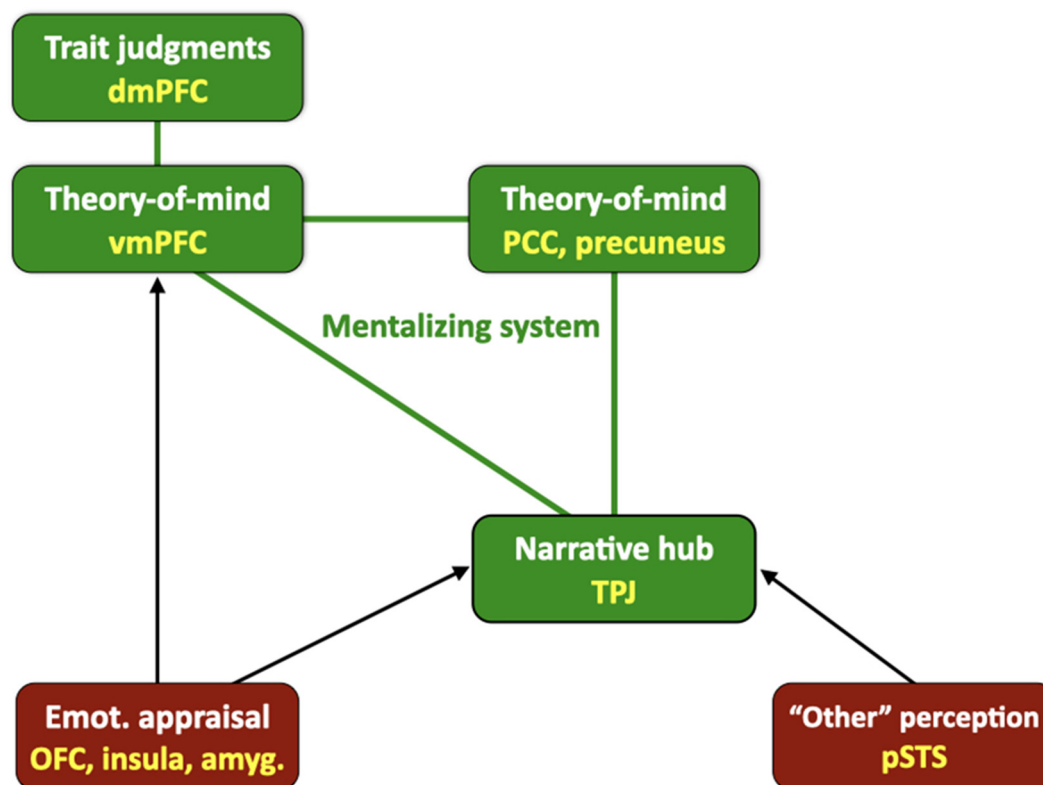
FIGURE 5 | A neural model of the "who" system of the human brain. While "who" processing involves all facets of sensory processing about physical features and movement across the five major senses, the core of the who system is a network for character processing. It maps onto systems for mentalizing, trait processing, emotion perception, and emotional appraisal. The mentalizing components include the ventromedial prefrontal cortex (vmPFC), posterior cingulate cortex (PCC), precuneus, and the cortex of the temporoparietal junction (TPJ), which acts as a hub that interfaces areas for processing emotional appraisals [orbitofrontal cortex (OFC), insula, and amygdala (amyg.)] and the perception of emotional expression (the posterior superior temporal sulcus, pSTS), as well as episode processing for plot-schemas that is not shown in the figure. Trait processing includes areas in the dorsomedial prefrontal cortex (dmPFC). Components of the mentalizing system are shown in green, while sensory and emotion areas are shown in red. The figure is oriented anatomically such that the left side of the figure corresponds with the anterior part of the brain. Abbreviation: Emot., emotional.

whom we appraise as friends, we are inclined to cooperate with them, help them, share with them, trust them, sympathize and empathize with them, and engage in approach behaviors toward them. For people whom we see as foes, we have the opposite emotional profile and tend to engage in avoidance behaviors in relation to them. Interactions with friends are rewarding, while interactions with foes are threatening. Brain areas of relevance to status appraisals include the amygdala and insula for negative (threatening) social appraisals, and the TPJ and ventral striatum for positive social appraisals. Both sets of areas interact with the orbitofrontal cortex and vmPFC, which are involved in creating social appraisals and valuations more generally. Looking at the network in **Figure 5** as a whole, the TPJ (and adjacent angular gyrus) is a good candidate for being a *narrative hub*, since it is involved in numerous functions that support narrative cognition, including language semantics (being a component of Wernicke's area), speech processing (most especially phonological processing *via* the dorsal speech pathway), mentalizing (being a component of the mentalizing system), and social cooperation (Carter and Huettel, 2013; Strang

and Park, 2017; Patel et al., 2019). In the remainder of this section, I will discuss key properties of the "who" system of the human brain that are relevant to its general function as a narrative system about the self and others as characters in social dramas.

The Overlap Between Production and Perception

A handful of studies have directly compared the production and perception of narratives in the same participants. Both Silbert et al. (2014) and AbdulSabur et al. (2014) directly compared narrative production with narrative perception and found an overlap between the two in a large number of areas. Among them are all of the areas shown in **Figure 5**, including the TPJ, pSTS, mPFC, and PCC. As mentioned in the section about OS functioning above, I argue that narration is the production analog of theory-of-mind as a perceptual capacity. If theory-of-mind is the covert process of inferring a person's motivations, beliefs, and emotions, then narration is the public process of externalizing such motivations, beliefs, and emotions through

depictive acts of communication (Clark, 2016). Narration takes advantage of the other-as-self system for mentalizing, making narration an intrinsically mentalistic and thus character-centered process. This model implies that *theory-of-mind and narration co-evolved* as a coupled sensorimotor mechanism during human evolution. It is interesting to point out that, from a narrative standpoint, the system that mediates mentalizing is also involved in episodic memory about past personal episodes and prospective thinking about future personal actions (Buckner and Carroll, 2007; Spreng and Grady, 2010), suggesting that the mentalizing system truly is a narrative system.

An important implication of this overlap between the production and perception of narrative processing—as well as the proposal that social cognition operates according to a narrative mode—is that *the mentalizing system is the quintessential mirroring system in the human brain.* The standard view of a mirror system in the brain is based on the idea that observing a person's action, especially a manual object-directed action, triggers a motor representation of that action in the perceiver's brain (Rizzolatti and Craighero, 2004; Arbib, 2012). In other words, the perceiver develops an egocentric perspective on the actions of another person through motor simulation (Gallese, 2009). While this process has been discussed in great detail in the literature, I believe that the more significant effect of mirroring for social cognition is the achievement of an egocentric perspective on people's *unobservable mental states*—not just their observable actions—and that this is far more the domain of the mentalizing system than the action-based mirror system. Vogeley (2017) proposed a useful functional comparison between the mirror neuron and mentalizing systems in which the mirror neuron system is involved in the social *detection* of spatial and bodily signals, while the mentalizing system is involved in social *evaluation* of the emotional and psychological states of others. This detection/evaluation dichotomy maps more or less onto my distinction between the standard and narrative modes of social cognition. Likewise, Spunt and Lieberman (2014) have described the distinction between the mirror system and mentalizing system in social cognition as that between "how" (behavior identification) and "why" (social causal inference), respectively.

The mirroring of intentional states is a critical prerequisite for the achievement of parity in the evolution of communication systems since such an evolution requires that all parties have a shared understanding of the communication signals and their referents (Arbib, 2012). Parity of this kind is based on *intersubjectivity*, which can be defined as "information processing allowing the exchange of inner experience in communicative acts" (Vogeley, 2017:2). The sharing of intentional states that the mentalizing system permits is far more central to the evolution of communication than are the functions of the hand-based mirror system, which has no particular connection with intentionality (although see Gallese, 2009, for an opposing view). A major function of the "who" system of the brain is to mediate the narrative mode of causal inference, in which behavior is understood by perceivers in mentalistic and intentionalistic terms, rather than in purely physicalistic terms. The narrative mode sets up the conditions for

understanding the mental states of others and thus for achieving intersubjectivity between people. As a result, the mentalizing system, far more than the hand-related mirror system, is the mirroring system of greatest relevance for the evolution of human communication (Vogeley, 2017). The narrative mode of cognition is based not on motor simulation but on mental-state simulation. The metaphor of the mirror has far more significance when it comes to egocentric representations of intentions than to egocentric representations of visible hand actions.

The Overlap Across Modalities of Production

The mentalizing system, as a sensorimotor system for "who" processing, interacts with multiple systems for overt expression, including the voice and the manual system for gesturing and tool use. This was explored across modalities of production by Yuan et al. (2018). In this functional MRI study, participants had to produce simple narrations using the "narrative triad" of speech, pantomime, and drawing. Narrations were based on headline prompts describing simple transitive actions carried out by a protagonist (e.g., "Surgeon finds scissors inside of patient"). As a control condition to eliminate modality-specific sensorimotor activations and to reveal the narrative areas of the network, participants had to describe the spatial properties of familiar objects (e.g., binoculars), without any reference to humans or human use. When the narration vs. description contrast was analyzed, the same set of mentalizing areas was observed for each of the three modalities of production, most notably the TPJ and PCC. This suggests that a common set of mentalizing areas mediates protagonist processing across the three production modalities of speech, pantomime, and drawing. Hence, not only is the mentalizing system activated in both production and perception (as described above), but it is jointly activated across various motor modalities of narration. This suggests that "who" processing is potentially amodal, interacting with modality-specific systems for the externalization and perception of narrative using a given sensorimotor pathway. Hence, the pleiotropy of the mentalizing system is demonstrated not only by production/perception overlap but by a cross-modal overlap in production as well.

The Overlap Between Self and Other

The mentalizing system has historically been described as a system for 3P processing, in other words for inferring the mental states of other people through theory-of-mind mechanisms. However, the process of self-awareness is most likely mechanistically identical to inferring the mental states of others (Nichols and Stich, 2003). Consistent with this idea, almost all of the components of the mentalizing system are activated during *self*-processing tasks that involve mentalizing (Lombardo et al., 2010; Denny et al., 2012), suggesting that the network is more oriented towards the operation of mentalizing than to "other" processing *per se*. While a vast literature of studies has confirmed the importance of this network for mentalizing tasks, what has been far less clear is the *directionality* of the effects between 3P and 1P processing, except for the TPJ, which generally shows increased activity for 3P compared to 1P in direct

comparisons (Ruby and Decety, 2003, 2004; Elliott et al., 2006; Lombardo et al., 2010; Rabin et al., 2010; Spreng and Grady, 2010; although see Vogeley et al., 2001; Schulte-Rüther et al., 2007). For midline structures like the mPFC and PCC, some studies show relative increases in the activation for 3P tasks compared to 1P tasks (e.g., Ruby and Decety, 2003, 2004; Seger et al., 2004; Elliott et al., 2006; Pfeifer et al., 2007; Lombardo et al., 2010), whereas other studies show relative increases for 1P compared to 3P (e.g., Kelley et al., 2002; Vogeley et al., 2004; Heatherton et al., 2006; Schulte-Rüther et al., 2007; Ames et al., 2008; D'Argembeau et al., 2008; Lombardo et al., 2010; Spreng and Grady, 2010; Chen et al., 2013). Hence, while the polarity of effects in the mentalizing system is still under investigation, what is clear is that the same general system mediates the mentalistic processing of the self and others, rather than this being a specific other-based system.

The Overlap Between Trait Features and Mental States

The mentalizing system has been defined in experiments that require people to think about the mental states of other people and themselves. In many cases, the control condition for such studies is a non-mentalistic "trait judgment" of these same people, such as their gender, physical features, or personality features. However, studies that have looked at trait judgments on their own (rather than as a control condition for mentalizing tasks) or have compared trait judgments directly to mentalizing have yet again shown an overlap in the underlying network. In the context of this overlap, the dmPFC shows some preference for trait judgments compared to mental-state inferences and perhaps even self-trait judgments compared to other-trait judgments (Benoit et al., 2010; Ma et al., 2012; Garrison et al., 2015).

Self-suppression During Acting

Acting reflects the self-as-other function of the "who" system. As mentioned earlier, the dramaturgical approach to social psychology tells us that, while all people play multiple roles in daily life—for example spouse or employee—these roles are all facets of the self and thus the first-person (1P) perspective. Compared to such everyday role-playing, actors are required to portray other people and to adopt their gestures, emotions, and behaviors. Consequently, actors must think and behave not as themselves but as the characters they are pretending to be on stage. In other words, they have to assume a fictional first-person (Fic1P) perspective. In the only fMRI study of theatrical acting to date, Brown et al. (2019b) sought to identify brain regions preferentially activated when actors adopt a Fic1P perspective during dramatic role-playing. In the scanner, university-trained method actors responded to a series of hypothetical questions from either their own 1P perspective or from that of Romeo (male participants) or Juliet (female participants) from Shakespeare's drama. Compared to responding as oneself, responding in character as Romeo or Juliet produced global reductions in brain activity. In particular, there were deactivations in the cortical midline network of the frontal lobe, including the dorsomedial and ventromedial prefrontal cortices, areas involved in self-processing, including self-trait processing. Thus, portraying a character through acting seems to be a deactivation-based

process, perhaps representing a "loss of self." It is important to note that the constraints on body movement inherent in neuroimaging experiments precluded the examination of gestural methods of getting into character in Brown et al. (2019b), and so it is not clear if a physical approach to character portrayal would produce the same results.

Another aspect of acting that was not addressed in the Brown et al. (2019b) study is that of self-regulation. The point mentioned earlier that acting involves a split in consciousness between self and character implies that self-regulation is a critical aspect of acting, for example in distinguishing character emotions from self emotions, the latter of which include what Konijn (2000) refers to as "task emotions" about the actor's task of performing. This taps into executive aspects of self-functioning. Brain areas involved in self-regulation (reviewed in Heatherton, 2011) include not only areas involved in executive control, such as the dorsolateral prefrontal cortex and anterior cingulate cortex, but areas involved in emotion regulation, such as the orbitofrontal cortex, amygdala, and ventromedial prefrontal cortex, the latter of which is involved in mentalizing function as well.

To summarize this section, the "who" system of the human brain contains the well-described mentalizing system at its core. It functions in both production (narration) and perception (mentalizing), making it a mirror system for the cognitive processing of intentionality and intersubjectivity in social communication. The system processes both mental-state and trait information, about both the self and others. This core system receives input from high-level sensory areas in occipito-temporal regions of the brain that process the physical and expressive features of people, as well as input from limbic emotion-appraisal areas that help establish the social and moral status of others in relation to the self, including distinctions such as friend vs. foe and ingroup vs. outgroup.

EMBODIED PLOT-SCHEMAS: NARRATIVE-BASED COGNITION

Having described a "who" system for the psychological processing of the self and others as agents in social dramas, I would like to conclude this article by integrating the character-based "who" system with the second major element of narrative theory, namely plot. It has been argued for quite some time that life is similar to the theatre, and vice versa (Goffman, 1959); "all the world's a stage," as the saying goes. Storytelling and theatre tap into very fundamental processes of social behavior and social cognition. As mentioned earlier in the article, the protagonists of stories are essentially self-proxies, and stories oftentimes serve as prescriptions for prosocial behavior according to a society's norms (Scalise Sugiyama, 1996, 2017; Mar and Oatley, 2008; Dunbar, 2014; Wiessner, 2014; Smith et al., 2017; Bietti et al., 2019). Hence, protagonists resemble us and act as we would (or should) in similar situations. In addition Ryan (1980) has argued for a "minimal departure principle" for narrative, which states that storyworlds should tend the resemble the world that we know, rather than some other place that violates our intuitions about social worlds.
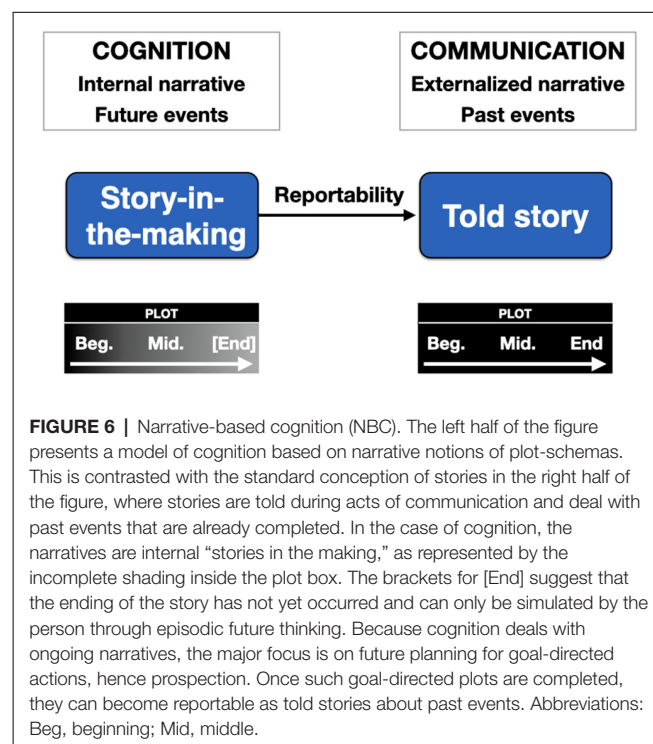
Stories are intimately connected with "who" processing, and vice versa. Stories typically display the exploits of people either seeking things that they desire or finding ways to emerge out of chronically oppressive situations to return to a state of normalcy. As a result, the plots of stories generally represent goal-directed behaviors, problem-solving strategies, and coping mechanisms related to obstacles and problems, just as in real life. Problems come in all forms, but literature and drama tend to highlight *social* obstacles first and foremost, i.e., antagonistic interactions and the appraisal of people in our social world as being either friends and foes. From a cultural standpoint, stories tend to be tools for social learning, helping people develop strategies for dealing with real-life problems through the simulations that occur in stories and their plots. The origin of plot-schemas is to be found in people's natural tendency to seek out the things that they desire and to deal with obstacles that they encounter along the way through problem-solving and conflict-resolution mechanisms. Hence, stories are not just about events or episodes or causal processing *per se*, but about the operations of psychological, protagonist-centered processes related to goals, appraisals, decision making, planning, problem-solving, and so on (Tu and Brown, in press). Perhaps the most artificial aspect of plots is their endpoint-driven nature, since situations in life are far more fluid than they are in stories. Stories always have to end, but events in real life have continuity. Reversals can occur down the road after a period of stasis. The bully who gets beaten up to make the happy ending of an oppression story may come back at a later time to seek revenge on the person who beat him up. People in real life do not live happily ever after.

An important way to integrate "who" processing with plot structure is to conceptualize plot in an intrinsically *character*-based manner as a protagonist-mediated process, something that my colleagues and I have referred to as protagonism (Brown et al., 2019a). Consistent with this, Tu and Brown (in press) developed an Embodied Plot model of literary plot structure, according to which the dramatic arc that is typical of story plots is attributable to psychological mechanisms related to the emotional appraisals of protagonists as they progress through attempts to achieve their goals and employ problem-solving strategies for dealing with obstacles along the way. According to this model, the critical ingredients for creating a plot are not just a series of causally-linked episodes, but also the psychological mechanisms that make these episodes consequential for the protagonist experiencing them. Hence, the sequence of a plot has to be conceived of as a sequence of psychophysiological states experienced by a protagonist, not as a disembodied episodic sequence divorced from human psychology. In particular, the Embodied Plot model argues that the arc-like shape of plot structure is, at least in part, attributable to the arc-like structure of the problem-solving cycle. There is now extensive work in both literary theory and cognitive psychology that argues that stories are first and foremost about the experientiality of people in social scenarios (Fludernik, 1996; Oatley, 1999; Palmer, 2004; Zunshine, 2006; Mar and Oatley, 2008; Hogan, 2011; Herman, 2013).

Having argued that literary plot-structure should be conceived of as plot-schemas that are embodied by a protagonist,

I would like to broaden this notion to encompass cognitive psychology more generally and argue that human cognition should be conceived of in the same way as literary plot structure, leading to a concept that I will call narrative-based (NBC) cognition. Hence, I would like to apply the notion of protagonism not just to literary characters but to the self, whereby people during everyday behaviors navigate through life in more or less the same way that a protagonist moves through a story. Much of social behavior, not just in humans but in all animals, is goal-directed behavior that is motivated to satisfy biological and social needs. Goals help formulate action plans, which themselves guide behavior (Schank and Abelson, 1977). Social behaviors are about the strivings and copings of people, just as story plots are. As a result, social behaviors have a story-like structure to them. Everyday life is storied and plotted, just as in literature (Bruner, 1986; Sarbin, 1990). This is not just about autobiographical narratives about one's past, but about moment-to-moment cognition. I concur with Sarbin (1990) that "the actions of people in daily life are guided by narrative plots, by storylines . . ." (p. 50).

To understand how NBC works, it is critical to place it in comparison to the process of storytelling, as shown in **Figure 6**. To make the connection to the self more explicit, I will compare NBC to the process of personal narrative, such as when someone tells a personal story about a past event. As shown on the right side of the figure, a personal story is told as a social act of narrative communication to one more audience members, either in person or through media technology. It typically relays information about past events, and is thus based on retrospection. A personal narrative, like a literary narrative, has a standard plot structure to it. In the Aristotelian sense, it has a

FIGURE 6 | Narrative-based cognition (NBC). The left half of the figure presents a model of cognition based on narrative notions of plot-schemas. This is contrasted with the standard conception of stories in the right half of the figure, where stories are told during acts of communication and deal with past events that are already completed. In the case of cognition, the narratives are internal "stories in the making," as represented by the incomplete shading inside the plot box. The brackets for [End] suggest that the ending of the story has not yet occurred and can only be simulated by the person through episodic future thinking. Because cognition deals with ongoing narratives, the major focus is on future planning for goal-directed actions, hence prospection. Once such goal-directed plots are completed, they can become reportable as told stories about past events. Abbreviations: Beg, beginning; Mid, middle.

beginning, middle, and end, where the middle typically presents a complication for the person, one that is resolved in some way by the ending. The story can deal with the self, but it can also deal with other people, including familiar people who are part of one's social circle, but also strangers, like politicians, celebrities, and other people in the news. Beyond the plot sequence itself, a personal story contains two additional phases that Labov (2001) calls the abstract and the coda. The abstract initiates a bout of storytelling by presenting an overview of the story. It could be something as basic as "You'll never guess what happened to me at the supermarket today." At that point, the narrative switches from the present to the past, and the events move into the realm of the storyworld. The storyteller then proceeds to recount the story, typically in a prospective fashion from beginning to middle to end. The coda occurs after the resolution of the complication, and returns the narrative from the past back into the present, and from the storyworld back into the real world of the interlocutors, as in "Can you believe that nonsense? I will never shop there again."
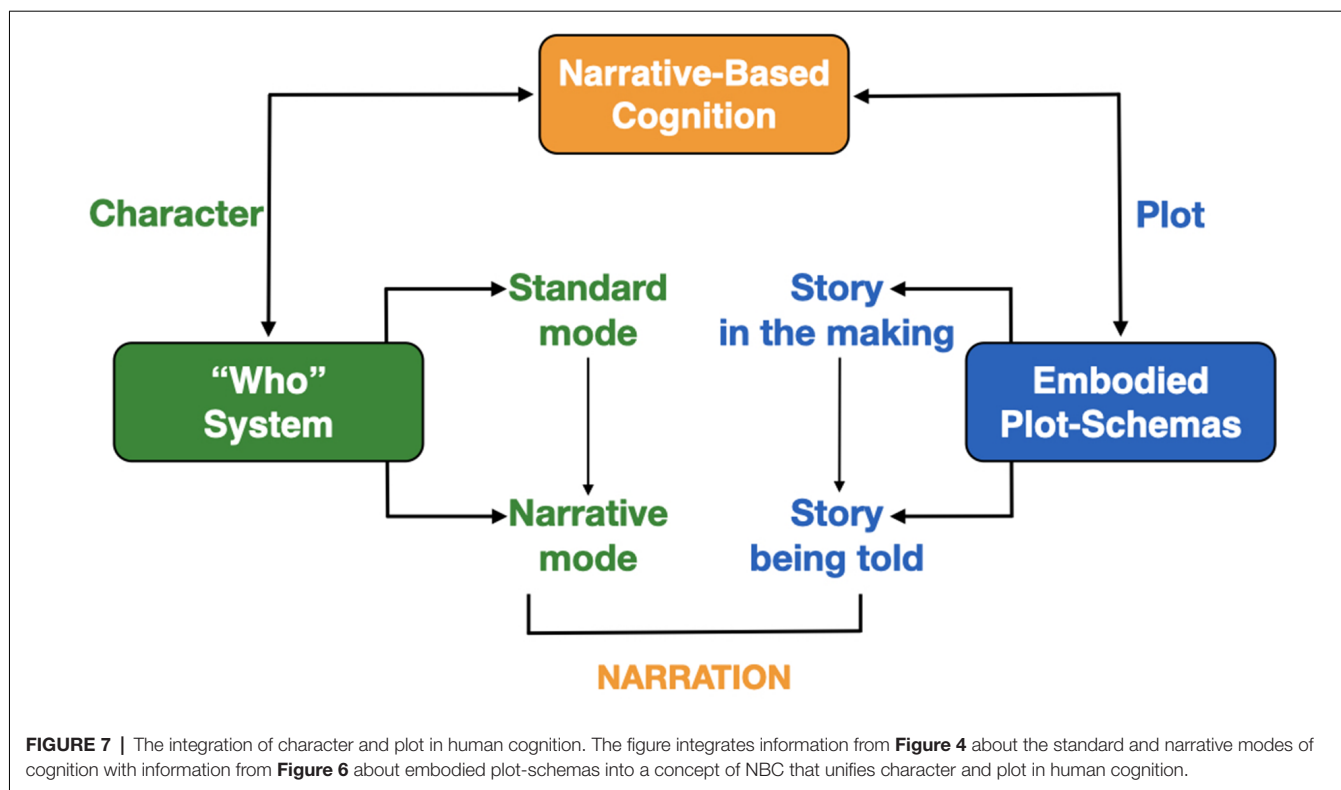
How does NBC compare to this? If a told story is about something that happened in the past, then NBC is about *a story in the making*, or more accurately a series of overlapping stories in the making at various points of completion. Another way of saying this is that, if a told story is about retrospection, NBC is about prospection, about an emergent story that is unfolding in time in one's actual life. It is about experiences that are being lived at the present time, compared to the temporal displacement involved in conveying a story about events that took place in the recent or distant past. A told story is an overt behavior that occurs in the context of interpersonal communication, whereas NBC is an *internal* psychological process that occurs as part of the operations of cognition. It is a key component of motivated behavior, whereby desires lead to goals, which lead to action plans, which lead to behaviors aimed at satisfying the desires. Because there are many obstacles to achieving goals, problem-solving strategies have to be activated as part of the process of goal-directed behavior. Decision-making processes require that people weigh the costs and benefits of alternative strategies to achieving the goal. Such decision-making processes require that people simulate the outcomes of these alternative strategies using what psychologists refer to as episodic future thinking (Schacter et al., 2017), by which people visualize not only the future outcome that they desire but also the strategies that they can potentially employ to achieve it. It is telling that the same neural "who" system that is involved in mentalizing about others and the self is also involved in prospective thinking (Buckner and Carroll, 2007; Spreng and Grady, 2010), hence suggesting that the mentalizing system is, at root, a narrative system.

This raises the point that a story-in-the-making, just like a told story, has a beginning, middle, and end, and that it progresses in the same sequence as a told story. However, a defining feature of NBC compared to told stories is that *the ending has not yet occurred*; it can only be imagined using episodic future thinking. NBC truly is an emergent story-in-the-making. Because of this, NBC mainly applies to the self, while a told story can be about the self, other people,

or some combination. Whereas told stories are interactive and dialogic, occurring in the form of communicative speech acts, NBC is fundamentally monologic, involving the stream of thought that utilizes inner speech as its primary medium (Wiley, 2016). Because it is internal, NBC lacks the abstract and coda that characterize told stories as speech acts. If a story-in-the-making actually obtains an ending through resolution (whether positive or negative), it can achieve a narrative feature that Labov (2001) refers to as "reportability." As a result, it can be externalized as a told story about a past event during an act of communication, in most cases as a personal story about the self. As with any personal story, it will convey information about goals, attempts, complications, and resolutions.

While it might seem intuitive that a story-in-the-making progresses temporally from beginning to middle to end, it is not clear why told stories should convey anything more than an ending. It is not clear why told stories should not progress from the end to the middle to the beginning. However, there is no question in my mind that one of the evolutionary design features of our narrative brain is that we convey stories "from the beginning." As Ryan (2015) pointed out, "when we read a narrative, even one in which the end is presented before the beginning, we adopt the outlook of the characters who are living the plot as their own destiny. Life is lived prospectively and told retrospectively, as Kierkegaard observed, but its narrative replay is once again prospective" (p. 83). This is not simply about preserving chronology to convey the causal structure of the events (e.g., who did what to whom, how it happened), but about the importance of conveying an embodied plot-schema that contextualizes the described events in terms of the intentions, goals, attempts, complications, and consequential outcomes of a protagonist whose welfare and interests are being considered. While the chronology alone might reflect Bruner's scientific mode of inference based on physical causation, the protagonistic approach to the story reflects Bruner's narrative mode of inference based on psychological causation. Hence, while a chronological presentation would explain "how" things happened, we need the protagonist's narrative mode to explain "why" they happened, in other words what motivated the events from a given personal perspective and how their impact was felt. The same series of causally-linked episodes can comprise very different stories for different people based on how the events impact each individual's personal goals and welfare. As the expression goes, one person's terrorist is another person's freedom fighter.

NBC takes full advantage of the mechanisms of social cognition outlined throughout this article. This includes both the standard mode and the narrative mode of social cognition. Given the fact that many, if not most, obstacles to goal achievement are social obstacles, then mechanisms of social cognition are among the most important for engaging in problem-solving processes. At the emotional level, motivational emotions reflect the goal-driven nature of social behavior (Ortony et al., 1988). These can be prospective emotions (e.g., hope, apprehension) or retrospective emotions (e.g., happy, sad). These are protagonist' emotions that are the driving forces for

FIGURE 7 | The integration of character and plot in human cognition. The figure integrates information from **Figure 4** about the standard and narrative modes of cognition with information from **Figure 6** about embodied plot-schemas into a concept of NBC that unifies character and plot in human cognition.

plots. Hence, we come to understand other people in terms of their NBC and their own embodied plot-schemas, since a critical aspect of the social brain is the realization that other people have minds that are fundamentally similar to our own. Not only are literary characters self-proxies, but so too are the people of our social world. Their stories-in-the-making are understood as being essentially the same as our own, and the process of mentalizing is about inferring how those stories are unfolding in terms of those people's motivations, goal structures, and agency.

A more complete view of NBC is the scheme shown in **Figure 7**. NBC employs both a character system (the "who" system") and a plot system. The character system operates using both the standard mode of social cognition and the narrative mode (both other-as-self and self-as-other). The plot system typically works using stories-in-the-making, but such stories can become reportable when the endpoint for a given goal is reached, where such narratives can be externalized as told stories during acts of communication. This is the process of narration (either first-person or third-person) that was described throughout the article.

CONCLUSIONS

Despite a great deal of work that has been devoted to the study of social cognition and its neural basis, no attempt has been made to characterize a specific "who" system in the brain for the processing of information about the self and others as social

agents, one that operates not just for everyday social cognition, but for our experience of the theatrical and literary arts as well. I have attempted to specify such a system, in which the self and others are conceived of as agents in social dramas whose embodied plot-dynamics are driven by a narrative mode of cognition based on mentalistic conceptions of intentions, beliefs, emotions, and desires. The "who" system, in addition to processing the physical and expressive traits of people, processes their mentalistic and narrative features as characters in social dramas. In the standard mode of operation of the "who" system, self-information is processed egocentrically, while other information is processed allocentrically. However, there are also two twists in the operation of this system, resulting in egocentric perception of the other through mentalizing (the other-as-self mechanism) and egocentric production of the other through mimicry (the self-as-other mechanism). The OS system allows us to see other people as proxies of the self and is utilized comparably during production and perception. The OS system is the ultimate mirroring system in human cognition, one that establishes intersubjectivity and parity in communication. The SO system allows us to impersonate others *via* mimicry and acting, capitalizing on the two novel capacities for gestural and vocal imitation that emerged during human evolution, leading to human-specific functions such as pretend to play and dramatic acting. The "who" system's processing of character information can be combined with embodied plot-schemas about personal narratives to establish NBC as a unifying perspective not just on social cognition but on human cognition more generally.

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Theatrical Performance as Leisure Experience: Its Role in the Development of the Self

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Theater has been used in psychological intervention and as a metaphor for social life, tendencies that affect the self, highlighting how influential theatrical performance can be for individuals. Their limitations – in terms of the empowerment of the self and its authenticity, respectively – can be overcome by treating theatrical performance as a leisure experience, which considers that freedom and satisfaction play a central role in a more comprehensive understanding and development of the self. With this in mind, we present the conceptual and empirical bases of the leisure experience as an alternative conception of theatrical performance. To do so, we organized a 20 h theater exercise workshop with 16 university students (15 women, one man), aged between 18 and 21 years old (M = 19.06 years; SD = 1.06). The instruments used were: the Time Budget Technique (questionnaire about the activities carried out in the workshop, valued in relation to two items: perceptions of freedom and satisfaction); the Twenty-Statement Test (where people list characteristics of themselves – self-descriptions – related in this case to the theatrical exercises); and, as a third instrument, a combination of the other two – specifying which exercises were more closely related to the self-descriptions. The results showed that group discussion was the activity with the highest perception of freedom, followed by obstacle exercises; as regards the perception of satisfaction, the highest value was observed in the relaxations. In the case of the self-descriptions, the acquisition of practical and intellectual skills was significant, as well as emotional outlook and the expression of self-esteem. In sum, this empirical support – using instruments that invite an exploration of the self – revealed, on the one hand, which specific characteristics of the self are manifested by doing theatrical exercises and, on the other hand, which exercises – when experienced as leisure – have a more decisive impact on the self. Thus, this paper shows what aspects must be taken into account when deciding which activities to include in a psychosocial intervention addressed to the development of the self from the standpoint of theatrical performance as a leisure activity.

Keywords: leisure, leisure experience, theater, self, psychosocial intervention

INTRODUCTION

Theatrical performance includes those behaviors that, both on- and offstage, help us to understand the details of the processes of the self – which requires adequate instrumentalization to contribute to this knowledge of human behavior (Wilshire, 1991; Marcus and Marcus, 2011; Zamir, 2014). This possibility of understanding the processes of the self resides in the fact that, unlike the enlarged

picture on the big screen or the reduced picture on a television or computer, "theatre is exactly the same size as life, neither larger nor smaller. Its subjects and its concerns may take on larger dimensions, but the form itself is life-size and that is how we receive it" (Finnbogadóttir, 1999).

Given this life-sized characteristic of theater, the origins of this activity can be imagined as an occasion where an agreement was made between human beings – at least two – to draw an imaginary line. At this invisible frontier, one party began to show the other something that had happened – or that could happen – at any time and place. In this scenario of interaction, the presentation of a past event (i.e., its re-presentation) or the act of anticipating something in the future (i.e., prospectively) sheds light, in the case of both parties involved, on the human capacity to transcend time and space (Petrella, 2011), this thanks to the faculty of the imagination (Rozik, 2002) and by virtue of the self – i.e., the ability to perceive oneself, even beyond the here and now (Mead, 1972).

This description condenses several issues that in one way or another – and in line with previous contributions – direct attention toward the self as a psychosocial process, which has in theater both a metaphor and a context for its analysis. This emphasis on the self does not obviate the fact that theatrical performance affects other psychological and/or social processes – such as attitudes (Hansen, 2015), learning (Webster, 2019), and emotions (Lazaroo and Ishak, 2019), to give some examples. Nonetheless, it is the self that contains the biological, intrapsychic (conscious, unconscious) and relational aspects, and "virtually any activity can be incorporated within the domain of self-psychology simply by prefixing it with 'self-' " (Swann and Bosson, 2010, p. 591). These characteristics of the self provide an understanding of the centrality of self-referential processes in the exploration of the different kinds of theatrical performance (see Pendzik et al., 2016 for a review of these processes).

In terms of the psychological and social aspects of behavior, theatrical performance and the self have been considered primarily from the following perspectives: (1) Jungian analytical psychology; (2) behavioral-cognitive social psychology; (3) humanistic psychology; (4) symbolic interactionism in its dramaturgical aspect; and (5) critical orientations inspired by Marxism. Each of these perspectives – which we detail in the paragraphs below – has provided particular insights into the use of theater to understand self-processes. Therefore, by specifying the contribution of each of these five perspectives, we highlight the proposed contribution of this research to the existing knowledge of the subject.

As shown in **Figure 1**, the first three approaches have focused on clinical interventions based around theater, while the other two offer important analyses of social life as a mise-en-scène (**Figure 1**). For our part, we include the perspective of theatrical performance as leisure experience (Pestana and Codina, 2017), which offers a theoretical and methodological alternative to clinical interventions and the analogies between life in society and theater. The situation of the leisure experience at a point between clinical intervention and societal metaphor is not a trivial matter, since the leisure experience embraces – at least potentially – both psychological and social factors. Furthermore, given that the

leisure experience is based on perceived freedom and satisfaction, research from this perspective can shed light on the self processes involved in theatrical performance.

Theater as a Technique in Psychological Intervention

The relevance of theater in clinical intervention is summed up by Walsh (2013, p. 73), who affirms that "theatre dialogues with therapy, positing itself as a related, if not an alternative practice for gaining insight into ourselves and our relationships." In fact, origins of theater as an artistic genre include a psychological component (Pandolfi, 1964): the extraversion manifested by the performers in front of someone observing an action understood by convention to be fictitious. This extraversion allowed something of the inner self to emerge and, in this process, it transformed itself into an object that became part of the relationship with the other (in line with Jung, 1976a). For example, an individual who was afraid of hunting animals might have presented other individuals with a scene depicting pursuit – imaginary, fictitious – by the intended quarry; in this way, the spectators were witnesses to a staging of the said fear, which would have helped them to take this emotion into account in their relationship with the individual who had expressed something of himself. In other words, in a situation like the one in the example, as explained by Cornejo and Brik Levy (2003, p. 51), what happens is that "the individual transfers his or her internal images to the external world and the changes that are engendered in them" (authors' translation).

This psychological component was also present in the liberation or purification proposed by Aristotle (1996, c. 335-323 BC/1996), under the name of catharsis, to define the public's reaction to the tragedy. This liberation or purification has been equated with an emotional manifestation of great intensity (Jackson, 1994; Turri, 2017), and even with the expression of the psychological conflict itself (Vives, 2011). This results in a learning experience (Ávila, 2015, p. 3) because:

In the tragedy it is always a question of "non-trivial" action, of significant and important action for human beings. The teaching contained in a tragedy is linked to life, to the life of human beings and what is truly meaningful to them (authors' translation).

The importance of the role of the psychological dimension in the origins of theatrical performance and in its initial impact on the public provides an understanding of how initiatives emerged that focused on the use of theatrical activities beyond the stage – in particular, in psychological analysis and intervention. However, these initiatives do not correspond to a sole conception of the psychological. In fact, the main approaches that consider theater as a technique in psychological intervention are found to respond to the principles of Jungian analytical psychology, behavioral-cognitive psychology and humanistic psychology. As described below, each one of these theoretical approaches is important when referring to a specific model of human being – or paradigm, in the words of Munné (1996) and Codina (1997), which in the case of theatrical performance implies highlighting the complexity of human nature that may be presented onstage.

FIGURE 1 | Main theoretical frameworks of theater as theatrical performance. Source: prepared by the authors following Munné (1996) and Codina (1997).
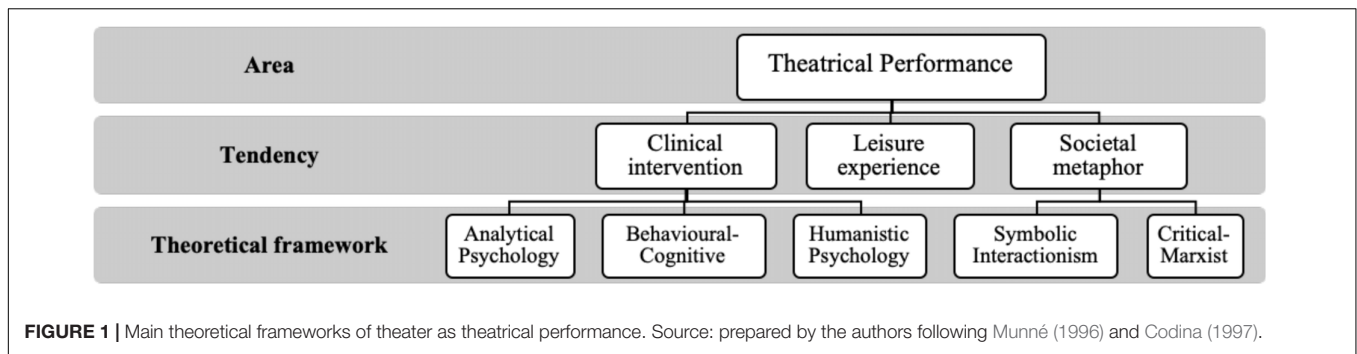
The modality of psychoanalysis derived from the contributions of C. G. Jung – i.e., Jungian *analytical psychology* describes the theater as "an institution for working out private complexes in public" (Jung, 1976b, p. 48). But then again, what are complexes and what does their observation in public entail? For Jung (Jung, 1976b) complexes are an amalgam of psychic contents that make up the self and of which we must become aware – the theater being precisely a place where this awareness can develop.

Using as an example the best known of the complexes taken from a play – the Oedipus complex (Freud, 1948) in *Oedipus Rex,* this tragedy about the King of Thebes synthesizes the difficulties involved in the relationship between children and their parents: "It is only in dreams that men find themselves in their mothers' beds" (Sophocles, 2007, p. 107). Similarly, Carlisky (1965) applied psychoanalytic concepts to interpret other theatrical characters besides Oedipus – Hamlet, Macbeth, Sigismund – and various cinematographic works. For his part, Weissman (1967) defended the usefulness of theatrical characters as a resource that compensates for the defects that, during childhood, may have influenced the posterior self-identity and body image of young people. Thus, a character on a stage can articulate the complexes of an individual, to the point that he/she can become aware of his/her own self conflicts.

In addition to challenging the individual, Jungian analytical psychology has also considered the collective importance of theater, i.e., its relevance as the fundamental container of all humanity, as an archetype of the collective unconscious. In particular, the connection with the archetypal image of Dionysus – from whose theater festivals derived (Grimal, 2018) – leads to "a vital experience, through which a psychic rebirth takes place" (López-Pedraza, 2004, p. 35 – authors' translation). The same author goes on to state that "there is a Dionysus in our body, who is waiting to be contacted and give us access to the richness of our emotions and feelings" (López-Pedraza, 2004, p. 45). In other words, when an individual experiences the Dionysian or theatrical archetype, this makes way for experiences that, while unrelated to everyday existence, have a revealing or even transformative impact on it:

The moment when this mythological situation reappears is always characterized by a peculiar emotional intensity; it is as though chords in us were struck that had never resounded before, or as though forces whose existence we never suspected were unloosed (Jung, 1971, p. 128).

That is to say, the mere exploration onstage of the different impulses that inhabit the body can lead to a Dionysian enjoyment that expands the self-consciousness of the individual.

As regards *behavioral-cognitive psychology*, its body of knowledge includes the cognitive abilities most apparent in people who take part in theatrical activities. For example, greater ability has been observed in faculties such as the creation of meaning (Klein, 2019), creativity (Eberle, 1974; Berretta and Privette, 1990), and memory and learning (Noice and Noice, 2002, 2006, 2013). In a more general theoretical sense, McConachie (2008, 2013) developed a proposal that defends, in the relationship between spectators and performers, the importance of mirror neurons, consisting of networks of brain cells that synchronize the transmission of both positive emotions (care, play) and negative ones (rage, panic, fear). This proposal provides a neurobiological basis for the relationship between performers and public that develops during the theatrical performance: "Theatre's peculiar strength lies in providing *another reality* that makes it possible to work on the ability of creating relationships" (Sofia, 2013, p. 179 – in italics in the original text).

Humanistic psychology – the third approach in the face of the determinisms of Freudian psychoanalysis and the behavioral-cognitive focus (Moss, 2001) – boasts a solid tradition in the application of theatrical performance in psychological intervention, thanks to the work of the psychiatrist J. L. Moreno. After some initial studies, he began to speak of "Theatre of Spontaneity" (Moreno, 1947). Moreno ended up conceiving the actor's role as "the functioning form the individual assumes in the specific moment he reacts to a specific situation in which other persons or objects are involved" (Moreno, 1994, p. IV). With this definition in mind, the implementation of psychodramatic roles, which are spontaneous reactions to imagined situations, is what enables the self to achieve a creative resolution of personal conflicts (Karp, 1994; Orkibi and Feniger-Schaal, 2019). Under this conception, individuals can experience possibilities of the self in situations not as yet experienced (Cruz et al., 2018). More recently, the combination of psychodrama and Jungian analytical psychology has allowed the observation of the expression of primary structures of human behavior and experience in general – i.e., archetypal patterns (Barz, 2014; Beach, 2014).

Mention should also be made of other approaches such as Dramatherapy and the Theater of voices (this one advocated as a tool for empirical research into the Dialogical Self). These are allied to psychodrama but not directly related to it.

Dramatherapy considers theater as an activity that makes it possible to establish links between the unconscious and the emotional processes of individuals (Jones, 1996, 2016; Emunah, 1999, 2015; Pitruzzella, 2004). This piecing together is achieved, basically, through the imagination and certain alterations of the perceptual focus, i.e., through new uses of certain objects or the exploration of the self through the body (Pitruzzella, 2017). In this way, the ability to take on another self identity is stimulated. Recent reviews of the effects of dramatherapy on its participants – adults with mental health problems – underscore improved self-consciousness, empowerment and social interaction (Jaaniste, 2016; Bourne et al., 2018). In respect of the use of theater in the analysis of the Dialogical Self (see Hermans, 2006, for the details), this approach highlights the importance of the onstage exploration of I-positions, these being characters or personifications of a sort that each individual has developed within him/herself. Establishing a dialogue with the different I-positions favors the constructive integration of the various – and sometimes contradictory – realities, "with the permission and encouragement to be real" (Rowan, 2010, p. 105).

As a psychological intervention technique, theatrical performance has led to the inclusion in clinical practice of exercises whose results show transformations in the self – interpretable from different perspectives linked by a common purpose: the improved health or full recovery of those who do the theatrical exercises (Pendzik et al., 2016). Implicit in this use of theater as a psychological intervention technique is the idea that, as a general rule, the individuals who participate in this type of intervention have problems that may limit the maximum empowerment or expression of the self (Pestana, 2007): a wounded self must heal first before broadening and expanding its potential. Consequently, theatrical performance in the context of psychological intervention must address this constraint and, consequently, introduce resources to deal with it.

A Metaphor of Theatrical Stage in Social Life

"All the world's a stage,/And all the men and women merely players;/They have their exits and their entrances;/And one man in his time plays many parts" (Shakespeare: As You Like It, Act II Scene 7; c. 1603/2005, p. 52). The analogies between theater and everyday life, present in dialogues such as this well-known one from Shakespeare, illustrate the analysis of behavior in society as a manifestation of the theatricality – which is necessary and inevitable – existing in interpersonal relationships (analysis pioneered by Evreinoff, 2013). In this conception of theater as a social metaphor, two branches can be distinguished: one based on symbolic interactionism and the other having a Marxist or critical orientation.

The scope of symbolic interactionism ranges from the ideas of Mead (1972) about the roles existing in the configuration of the self to the Dramaturgical Perspective (Goffman, 1959) and its subsequent derivations. Symbolic interactionism has shown that we are all, simultaneously, actors and spectators in social life, to such a point that, for Goffman (Goffman, 1959, pp. 252–253), our self-image is in effect received from others (instead of the more elusive, real self). Specifically, self-image is understood as

"some kind of image, usually creditable, which the individual on stage and in character effectively attempts to induce others to hold in regard to him. And the characteristic issue, the crucial concern, is whether it will be credited or discredited" (Goffman, 1959, p. 252). In other words, verisimilitude prevails over authenticity in the presentation of the self, which alerts us to the question of whether social situations – in general – tend to help show us as we are or, on the contrary, favor the genesis of strategies serving to present an alternative image of ourselves to others (see Walsh-Bowers, 2006, for a critique of this idea). As far as the Dramaturgical Perspective is concerned, these peculiarities of social interaction do not prevent individuals from maintaining the belief in a true or core self (Sullivan et al., 2014). As stated by Scheibe (2000, p. 227), "The dramaturgical perspective provides us with the keys for understanding why the problems of replication and the larger question of authenticity are so psychologically persistent." Furthermore, this perspective offers a defense of the depth of everyday life – frequently disregarded – together with its capacity for transformation (Scheibe, 2017).

With its Theater of the Oppressed (Boal, 2009) the Marxist or critical orientation offers a practice aimed at emancipating or liberating individuals from dominant social structures, together with the obligatory development of an awareness of the dynamics of oppression. As Gergen (2012) has reminded us, "resistance to oppression must be embodied." The Theater of the Oppressed has its origins in the theatrical pedagogy of Boal (2012) and one of the most popular branches is forum theater (Pestana and Codina, 2015a). In this, a member of the public is invited to re-enact the oppressed role from a previously observed scene. The interventions derived from the Theater of the Oppressed have even reached the business world (Meisiek, 2004; Meisiek and Barry, 2007), which confirms the popularity of this practice and its propagation in different fields.

Another proposal is F. Newman's developmental theater, related to Marx's thinking and also influenced by Vygotsky and Gergen. It considers that "the acting activity. . . is not an inner journey into a closed entity (either the character's or the actor's psyche); it is, instead, a social (interactive) journey into transformation" (Friedman, 1999, p. 177). Thus, the activity as a source of enlightenment or awareness takes precedence over the artistic purpose. Specifically, this practice draws attention to the efforts that people make to defend the strategies of the social institutions anchored in the self (Friedman, 1999). As a result of this discovery, individuals come to experience their own transformation.

In general, the traditions that have compared social life with theatrical performance have brought to light the diversity of resources that individuals – with a greater or lesser degree of self-consciousness – use to manage their personal relationships in the best way possible. However, two ideas overlie the metaphor of the theatrical stage in social life (Pestana, 2007): on the one hand, the inauthenticity or simulation that makes it difficult to access – or reveal – the essence of who we are; and on the other hand – and complementing the previous idea – the difficulties observed in certain social contexts when it comes to allowing individuals to experience who they are. In the words of Williams (2013, p. 95): "Thinking about authenticity in terms of dramaturgy

draws attention away from its introspective aspects and refocuses instead on how authentic selves are expressed and negotiated in situations."

Theatrical Performance From an Alternative Perspective: A Leisure Experience

The presence of limitations both in theater as a psychological intervention technique (individual problems with the expression of the self) and in the metaphor of the theatrical stage in social life (inauthenticity linked to the details of the context) prompts the introduction of a perspective that can both complement the ones described above and add a method that serves to analyze the relationships between theatrical performance and the self: the leisure experience.

The leisure experience can be situated at a point between the clinical intervention and the social metaphor. This is explained by the fact that, on the one hand, it combines subjective elements related to the therapeutic and, on the other hand, the social dimension is fundamental to determining whether an activity can be considered leisure or not.

Research into the construct of leisure experience has led to a deeper understanding of the possible implications for human beings of leisure activities – as in the case of theatrical performance. For Kleiber et al. (2011, p. 100) the leisure experience corresponds to "the emotion that is experienced when leisure is recognized as being at hand, as it is apprehended," understanding leisure as "a distinguishable context of relative freedom wherein preferred immediate experience has priority over instrumental outcomes... [considering freedom] not simply to be equated with choice or the lack of obligation but rather with the absence of worry and with a sense of opportunity and possibility" (idem). This experience is observed in particular when the activity is linked to the field of creation (Amigo and Cuenca, 2012).

With the incorporation of the experience into leisure research, we added to the analysis of what we do, the why and the what – specifically addressing the importance of perceptions of freedom (Iso-Ahola, 1980; Ellis and Witt, 1984) and satisfaction (Kleiber et al., 2011). In this way, the study of one of the main influences of leisure in the life of individuals – the development of self and identity – has been deepened (Kelly, 1983; Coleman and Iso-Ahola, 1993; Shaw et al., 1995; Kleiber, 1999; Kivel, 2000; Codina et al., 2017; Cuenca and Madariaga, 2017; Dattilo et al., 2018; Layland et al., 2018).

Nonetheless, that fact that an activity is experienced as leisure is not the only indicator determining whether it actually is leisure. Therefore, it is also important to consider the context in which it takes place. In the case at hand, it is obvious that theatrical performance is experienced differently depending on who takes part, whether they are professionals or not. However, in the first stage of training of performers – which is linked to self-knowledge, it can be observed that the relationship between leisure and self experience is related to the importance of freedom in the performer's process of self-knowledge (Stanislavski, 1922/1967; Stanislavski, 1936). Whether freedom comes from the

awareness of the dynamics of oppression (Chilcoat, 1998; Boal, 2009) or the individual's ability to overcome his/her adherence to a single point of view about him/herself (Cruise and Sewell, 2000; Rowan, 2010), the perception of whether we are free – and if we are satisfied with what we do – can provide clues about what activities are more central to our self when we practice theatrical exercises.

To sum up – and as we understand it – the introduction of leisure experience as a factor in the analysis of theatrical performance makes it possible to overcome – at least potentially – the deficiencies observed in clinical intervention and the social metaphor (Pestana and Codina, 2017): specifically, by considering the self in a context that by definition offers greater freedom and satisfaction. With the empirical verification of this premise, the observation of two types of differences can be hypothesized: on the one hand, the differences between the various exercises that are part of a theatrical performance; and on the other, between these exercises and their association with the participants' self-perception.

In other words, and in accordance with what has been exposed so far, this analysis brings with it a methodology that prioritizes the participants' perception of themselves as regards who they are and what they do, and how these two aspects relate to each other when experiencing theatrical performance as a leisure experience.

MATERIALS AND METHODS

In line with the classification made by Ato et al. (2013, p. 1,053), the empirical part of this research was developed through an observational study that meets all the requirements of a nomothetic and punctual kind. This implies that the data obtained was analyzed by means of a descriptive strategy, i.e., "the definition, classification and/or categorization of events to describe mental processes and overt behaviors" (authors' translation). **Figure 2** summarizes the main characteristics of this study.

Participants

A group of 16 university students (15 women, one man) taking a degree in public relationships and aged between 18 and 21 years old ($M = 19.06$ years; $SD = 1.06$) cooperated in the study. They attended a theater exercises workshop that lasted three days (20 h). This was part of an optional credit (non-compulsory subject) on the aforementioned university degree syllabus. The participants gained a pass in this workshop through voluntary participation in the different proposed activities, so as not to establish differences according to performance in the different theater exercises and minimize the compulsory component of the workshop – thereby maximizing its potential as a leisure experience.

Instruments

Data was collected using three instruments (all of them applied in the last part of the third day of the workshop).

The first was a version of the instrument known as the Twenty-Statement Test (TST: Kuhn and McPartland, 1967), which in its

FIGURE 2 | Main characteristics of the empirical study. Source: prepared by the authors.
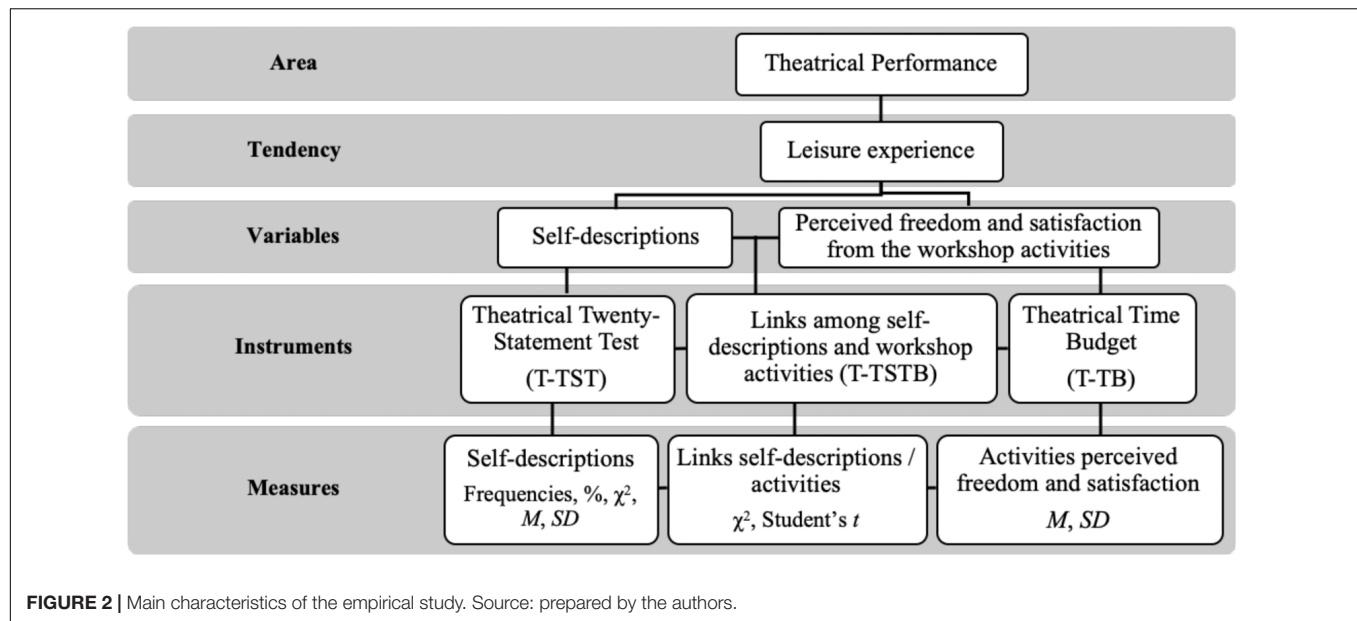
original form consisted of responding 20 times to the question "Who am I?" In the exploration of self and identity, the test offers the possibility of free expression without relinquishing the systematization of structured instruments (Codina, 1998). In the words of Rees and Nicholson (2004), it is "a qualitative research tool which can also yield codable and quantifiable assessments." The validity of this test has been demonstrated by its recent use in research carried out in different contexts (Azghari et al., 2015; Escobar et al., 2015; Codina et al., 2017; Suslova, 2018), including joint analysis of theater and self-knowledge (Pestana and Codina, 2017). In the case of this research, respondents were asked for "twenty statements about yourself in this workshop" (i.e., theatrical self-descriptions), which is why the version of TST used here answers to the name of Theatrical TST (from hereon, T-TST).

Subsequent to the T-TST, a questionnaire with the structure and characteristics of the technique known as Time Budget was used. The TB was originally an instrument designed to record activities carried out at a given time (Andorka, 1987; Codina, 1999, 2004; Steinbach, 2006). Its introduction in leisure studies counted on the essential contribution of Neulinger (1986), who incorporated the evaluation of activities attending to psychological variables such as perceptions of freedom, satisfaction and intrinsic motivation, basic to the understanding of the leisure experience (Codina et al., 2016; Kleiber et al., 2017; Webb and Karlis, 2017). The TB used here – Theatrical Time Budget or T-TB – recorded the activities carried out during the three days of the workshop, specifying two valuations of them: participants' perceptions of freedom and satisfaction (ranging from 0 to 100, from "not at all by choice/not at all satisfied" to "totally by choice/totally satisfied") in each workshop activity.

Lastly, the third instrument – with the same T-TST layout – served for the participants to specify which theatrical activities in the workshop were most closely linked to their theatrical self-descriptions: "For each of the statements you wrote in the

first questionnaire, indicate the activity in this workshop that you consider most closely linked to your answer. This consists of listing activities linked to the different statements about yourself" (for previous developments of this instrument, see Pestana, 2007; Pestana and Codina, 2015b, Codina et al., 2017). Thus, this last instrument highlighted the associations between self-descriptions and activities carried out, according to each participant's point of view.

Procedure

Before collecting data, we contacted the academic office of the university whose students would take part in the sample. After obtaining the corresponding authorization to use the applied instruments as a part of the research, the students were allowed to continue participating only if they agreed to sign the informed consent. The ethical requirements of the Ethics Committee of the University of Barcelona (University of Barcelona's Bioethics Commission, CBUB – Institutional Review Board IRB00003099) were applied to the current study, which meant that additional approval for the research was not required because the data obtained did not involve animal or clinical experimentation. Additionally, this study complies with the recommendations of the General Council of Spanish Psychological Associations (Consejo General de Colegios de Psicólogos), the Spanish Organic Law on Data Protection (15/1999: Jefatura del Estado, 1999), and the Declaration of Helsinki (World Medical Association, 2013).

The categorization of self-descriptions followed the criteria established by Escobar et al. (2015). These authors drew on the analysis carried out by Kuhn and McPartland (1967) on the subjective meaning of the definitions that people provide about themselves (also called sub-consensual statements) to define four attitudinal categories (each with examples from the participants in this study): (1) *self-evaluations*, through which individuals express their way of being in the light of five

possible dimensions –intellectual aptitudes (competencies that are not directly observable: "I've got to know myself better"), practical aptitudes (observable behavioral competencies: "I've learnt to control myself a little better"), character and morals (self-reflections: "I'm a creative person"), social life (relational characteristics: "I've experienced moments of closeness with strangers"), and emotional outlook (state of mind: "I've enjoyed myself"); (2) *self-esteem*, where people express their degree of satisfaction with themselves ("I'm less negatively self-critical"); (3) *preferences*, description of personal tastes ("I like facing challenges"); and (4) *ambitions*, statements regarding their own future ("I feel less afraid of the future").

The theatrical activities in the T-TB were organized taking into account the following exercise categories (derived from sources related to theatrical training): relaxation, improvisation, objectives and obstacles and group discussion. *Relaxation* favors self-expression (Lelong, 1985; Guirchoun, 1995), and may even facilitate the emergence of unsuspected aspects and components of the self in those carrying out this activity (Strasberg and Hethmon, 1968). *Improvisation*, of proven utility in psychological interventions (Wiener, 1994; Lösel, 2019), is spontaneous behavior based on certain conditions, highlighting in the participants the degree of agreement (logic, coherence) between behavior and situation – with themselves and in relation to their peers, while stimulating various forms of physical and vocal expression (Brook, 1968, 1993; Johnstone, 1979; Strasberg, 1987). Furthermore, the value of improvisation as a way of conducting oneself in emergent, unpredictable and complex situations has been pointed out (Crossan et al., 1996; Sawyer, 1999). The notions of *obstacles* (which prevent a task from being carrying out) and *objectives* (the purpose that guides the actions being carried out) fuel the creative thinking needed to come up with novel solutions in distinctive situations (Knébel, 1996; Gutiérrez Bracho, 2017). In the words of Gené (1996, p. 44), "The actor does not usually need to know why his character does things. but it is certainly essential that the actor knows what he does something for" (authors' translation). Lastly, *group discussion* encourages the participants to adopt an objective view of themselves in order to raise self-consciousness (Strasberg and Hethmon, 1968).

This description of activities is not intended to be comprehensive and the exercises are not mutually exclusive either. In general, having made a proposal for an exercise, its development and emphasis can be vary greatly depending on who carries its out. For example, in an improvisation it may be possible to experiment with different objectives or obstacles. Consequently, this classification of theatrical exercises should be understood as merely indicative, taking into account the main emphasis of the activity when presented to the participants. In any case, the selection of exercises takes into account the importance of theatrical activities "in analysing how the human being organises his own intersubjective relationships" (Sofia, 2013, p. 179).

The workshop schedule was organized as follows. The 20 h of the workshop were divided into two blocks of 7 h (during the first two days) and a block of 6 h on the third – and last – day. The start time was 10.30 a.m., with lunch from 1.30 p.m. to 3.30 p.m.

After this break, the workshop continued until 6.30 p.m. (except on the third day, when it ended an hour earlier). Pauses of 5–7 min were included in each block of activities (morning and afternoon), depending on the dynamics of the activities carried out at the time and by agreement with the group.

The workshop began with a presentation and an exploration of the participants' expectations, which led on to the activities. Regarding their distribution, each block began with relaxation followed by exercises involving objectives, obstacles and improvisations. At the end of each block, group discussion was used to find out about the participants' experiences when carrying out the various activities in the block. As mentioned above, the information was collected at the end of the second block on the third day of the workshop, after which a final group discussion was held to take stock of the whole experience.

Data Analysis
Self-Descriptions

In the case of self-descriptions registered by the T-TST, two data were obtained. The first concerned the prevalence of the categories used to classify the participants' responses, i.e., the number n of participants who, out of the total of $N = 16$, refer to the type of self-description which each category refers to. To facilitate the understanding of the information, these frequencies are also presented in terms of percentages.

In order to assess whether the observed n of the categories was due to chance (or not), the Chi square coefficient (χ^2) was calculated. In this coefficient, what was most important was the value ascribed to the probability p (ideally, $p < 0.050$), from which it is possible to reject the null hypothesis (Patten, 2005). In the case at hand ($N = 16$), if chance predominates, half the participants ($n = 8$) would be expected to present a type of categories and the other half would not. If this symmetry does not emerge, an absence of chance can be thought of as the cause of the phenomenon – in the case at hand, in the intervention carried out. When analysing the data obtained, it was taken into account that if 12 participants presented a category (and four did not), the value of χ^2 would be the same as if four participants presented a category (and 12 did not). In this respect, the logic underlying this research was given priority, i.e., the manifestation of self-descriptions in the workshop – with the interpretation of what does not emerge in the self going beyond the scope of this study (interpretation more typical of a theoretical framework related to psychoanalysis). As a factor that adds precision to the description of this data, Chi square coefficient values are accompanied by the effect size provided by the value of Cramer's V.

The second datum obtained about self-descriptions derives from how many times each participant mentions a specific T-TST category: specifically, the values of the corresponding means (M) and standard deviations (SD). In this way, it was possible to observe not only how many participants presented the categories of the self-descriptions, but also the mean of their responses in each category.

Theatrical Exercises

After calculating the Cronbach's alpha value of the T-TB – we show the means (M) and standard deviations (SD) corresponding

to the variables of the leisure experience: perceptions of freedom and satisfaction. As was to be expected, those exercises with the highest scores come closer to the leisure experience related to the development of the self.

Associations Between Self-Descriptions and Theatrical Exercises

These associations were analyzed in two ways. On the one hand, by looking at which exercises were significantly related to the categories of self-descriptions – and by using the Chi square coefficient. And on the other hand, by observing – with Student's t (and its corresponding effect size shown by Cohen's d) – whether the evaluations of the exercises are different according to whether or not there are categories of self-descriptions. In other words (and by way of an example), which exercise in the T-TST category of "practical" self-descriptions (related to acquired behavioral competencies) is perceived significantly as experienced more freely/satisfactorily? Answering this question implies assuming that if this description is to be fomented, the exercise closest to leisure experience should be given priority – also central in the development of the self.

RESULTS

In the case of the theatrical self-descriptions (**Table 1**), the presence of contents related to the acquisition of practical skills ($\chi^2 = 12.25$, $p = 0.000$, $V = 0.88$) and intellectual competences ($\chi^2 = 9.00$, $p = 0.003$, $V = 0.75$) was significant, as well as emotional outlook ($\chi^2 = 6.25$, $p = 0.012$, $V = 0.63$) and the expression of self-esteem ($\chi^2 = 4.00$, $p = 0.046$, $V = 0.50$). When observing means by category, the highest figures corresponded to the social ($M = 5.88$) and emotional categories ($M = 3.56$). When observing the mean of self-descriptions by category.

The T-BT with the list of theatrical exercises carried out during the workshop obtained a Cronbach's alpha of 0.877, which demonstrates the internal consistency of this instrument. Regarding the evaluations of the activities, of the five types of theatrical exercises developed throughout the workshop

TABLE 1 | Prevalence, means (M) and standard deviations (SD) of theatrical self-descriptions ($N = 16$).

	n	%	χ^2	p	V	M	SD
Intellectual	14	87.5	9.00	0.003	0.75*	2.50	1.75
Practical	15	93.8	12.25	0.000	0.88*	2.25	1.69
Character/moral	9	56.3	0.25	0.617	0.13	2.13	2.55
Social	16	100.0	6.50	0.090	0.64*	5.88	2.30
Emotional	13	81.3	6.25	0.012	0.63*	3.56	2.98
Self-esteem	4	25.0	4.00	0.046	0.50*	0.64	0.92
Preferences	9	56.3	0.25	0.617	0.13	1.00	0.96
Ambitions	7	43.8	0.25	0.617	0.13	0.63	0.80

n refers to the number of participants whose self-descriptions had the category. The asterisk indicates values of Cramer's V corresponding to a large effect size in the significant values of Pearson's Chi Square. M and SD are related to how many times each participant mentions a specific category.

TABLE 2 | Means and standard deviations for perceptions of freedom and satisfaction of theatrical activities practiced ($N = 16$).

Theatrical activities	Freedom		Satisfaction	
	M	**SD**	**M**	**SD**
Relaxation	62.32	42.53	81.33	23.48
Improvisation	62.88	26.69	64.88	21.31
Objectives	54.53	29.11	53.63	23.81
Obstacles	66.43	24.98	65.76	15.32
Group discussion	78.67	23.63	68.33	19.79

(**Table 2**), the group discussion was the activity with the highest perception of freedom ($M = 78.67$, $SD = 23.63$), followed by obstacle exercises ($M = 66.43$, $SD = 24.98$). On the other hand, the activities whose purpose was to achieve an objective were the theatrical exercises with a lower perception of freedom ($M = 54.53$, $SD = 29.11$). As regards the perception of satisfaction, the highest value was observed in the relaxations ($M = 81.33$, $SD = 23.48$); on the contrary, the exercises focusing on objectives were those perceived as less satisfactory ($M = 53.63$, $SD = 23.81$).

By associating the presence of theatrical self-descriptions with the activities of the workshop – data not tabulated – it was observed that among the 16 participants who provided theatrical self-descriptions with relational (social) characteristics, eight associated these self-descriptions with improvisations, four with group discussions, three with obstacle exercises and one respondent with objective-based activities ($\chi^2 = 6.50$, $p = 0.090$, $V = 0.64$).

DISCUSSION

In this paper we present the bases of the conception of theatrical performance as leisure experience, an approach that can complement the metaphor of the theatrical stage in social life and the use of theater as a technique in psychological intervention. Given that in the leisure experience freedom and satisfaction are central to a more comprehensive understanding and development of the self, interventions that use this alternative approach may provide a way of overcoming the limitations represented – at least potentially – by difficulties in expressing or empowering the self, or by the lack of authenticity linked to the circumstances of the context.

The conception of theatrical performance as leisure experience, instrumentalized by means of a workshop of theatrical exercises, offers promising results. It was observed that the exercises used in a theater workshop offer differentiated subjective experiences with respect to freedom and satisfaction. In other words, in an intervention carried out with theatrical exercises, each activity receives a specific assessment that must be taken into account. Regarding the results of the study carried out, the relevance of exercises such as group discussion (as noted by Strasberg and Hethmon, 1968), obstacles

(Knébel, 1996) and relaxation (insufficiently worked on as a personal experience according to Kleiber, 2000) should be highlighted. These stand in contrast to the scores obtained for the exercises focusing on objectives, which, although they were rated lower (within the set of workshop activities), offer the opportunity to experiment with directionality in this line of work.

Freedom and satisfaction, as the basis of the leisure experience, also affect the development of the self and identity (as recently noted, among others, by Codina et al., 2017; Dattilo et al., 2018; Layland et al., 2018). Regarding the self-descriptions linked to the theatrical performance, the centrality of the acquisition of competences – practical and intellectual – can be observed in the answers obtained. Thus, the intervention carried out specifies what characteristics of the self are manifested in a context of theatrical activities as a leisure experience. Furthermore, the participants pointed out the associations between self-descriptions and theatrical exercises: If we know what exercises mobilize certain aspects of the self, then psychological and social intervention with a theatrical base can be more enriching for the participants and more useful to researchers.

It is worth highlighting the relevance of the instruments used to obtain this data. Thanks to the combined application of TB (in line with Neulinger, 1986) and TST (originally proposed by Kuhn and McPartland, 1967) to theatrical performance, it is possible to specify relationships that deserve consideration in future workshops and interventions.

The arguments presented here in favor of theatrical performance as a leisure experience supporting the development of the self are susceptible to dialogue with other theoretical frameworks. By way of an example, the empirical approach proposed in this paper could be useful for identifying – in the self-descriptions themselves – psychic complexes, cognitive abilities, psychodramatic roles, self-image traits and embodied oppressions. In other words, the empirical research carried out in this study can also offer an instrumentalization suited to the analysis of theatrical performance as a clinical intervention and as societal metaphor.

This analysis of our findings does not ignore the limitations of the study carried out. The very core of the concepts worked here – being sensitive to both individual and social aspects – requires further studies to consolidate the findings of this research. In this respect – and by way of an example, if we were to use theatrical exercises different from those used in this study (as proposed by Olenina et al., 2019), or different taxonomies of self-descriptions, it might be possible to deepen the influence of theatrical performance – conceived as leisure experience – on the self. Likewise, the use of interventions of variable length, accompanied by their corresponding evaluation and monitoring in different samples, could serve to specify the type and characteristics of intervention programmes – as well as their results.

Whatever the case, any aspects that converge in the arena of behavior will find references in freedom, satisfaction and self that enhance the importance of the theatrical performance as leisure experience, when answering fundamental questions about the meaning of human existence.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The ethical requirements of the Ethics Committee of the University of Barcelona (University of Barcelona's Bioethics Commission, CBUB – Institutional Review Board IRB00003099) were applied to the current study, which meant that additional approval for the research was not required because the data obtained did not involve animal or clinical experimentation. Additionally, this study complies with the recommendations of the General Council of Spanish Psychological Associations (Consejo General de la Psicología de España), the Spanish Organic Law on Data Protection (15/1999: Jefatura del Estado, 1999), and the Declaration of Helsinki (World Medical Association, 2013). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JP conceived and designed the research for this manuscript. He was also responsible for drafting the whole work and revising it critically for important intellectual content. RV was responsible for the analysis of data gathered during the research, revising it critically with the purpose of improving its explanatory potential. NC was responsible for the analysis and interpretation of data gathered during the research, revising it critically for important intellectual – theoretical and methodological – content. All authors contributed to the article and approved the submitted version.

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The Demands of Performance Generating Systems on Executive Functions: Effects and Mediating Processes

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Performance generating systems (PGS) are rule- and task-based approaches to improvisation on stage in theater, dance, and music. These systems require performers to draw on predefined source materials (texts, scores, memories) while working on complex tasks within limiting rules. An interdisciplinary research team at a large Western Canadian University hypothesized that learning to sustain this praxis over the duration of a performance places high demands on executive functions; demands that may improve the performers' executive abilities. These performers need to continuously *shift attention* while remaining responsive to embodied and environmental stimuli in the present, they are required to *inhibit* automated responses and impulses using the rules of the system, and they strive toward addressing multitasking challenges with *fluidity* and *flexibility*. This study set out to test the mentioned hypothesis deductively and identify mediating processes inductively, using mixed empirical methods. In a small sample experiment with a control group (28 participants; 15 in intervention group, 13 in control group), standardized quantitative tests of executive functions (D-KEFS) were administered before and after an 8-week intervention. Participant-reported qualitative observations from the praxis were also collected throughout the intervention for grounded analysis. Within the limitations of small sample data, we found both statistically significant and trending effects on inhibition, problem-solving initiation, fluidity, and cognitive flexibility. Examining the mediating process, we found that participants experienced significant challenges sustaining the practice halfway through the intervention. The participant-reported solutions to these challenges, which emerged as the strongest behavioral patterns when coding the qualitative data to saturation, were strategies of problem-solving and of re-directing attention. These strategies support and advance our understanding of the effects measured in the standardized tests. In terms of application, our results identify characteristics of PGS that could potentially maintain and strengthen executive functions over and above less demanding performing arts interventions. The results also deliver new insight into how PGS works, which may contribute to the development and teaching of this artistic practice.

Keywords: executive functions, inhibition, problem-solving, cognitive flexibility, improvisation, dance, music, theatre

INTRODUCTION

If improvisation praxis within performance generating systems (PGS) in theater, dance, and music places high demands on the performers' executive functions, then might such demands result in positive effects on executive abilities? PGS require performers to continuously *shift attention* and remain responsive to embodied and environmental stimuli in the present, *inhibit* automated responses and impulses using the rules of the system, and strive toward addressing multitasking challenges with *fluidity* and *flexibility*. The specific characteristics of these cognitive demands led our team to anticipate and test quantitative effects on the associated executive functions. In addition, qualitative data was collected and analyzed to further our understanding of the mediating processes that caused measured effects and identify associated challenges and benefits reported subjectively by study participants.

Theoretical Framework

Executive functioning (EF) is a broad term used to refer to higher cognitive processes that allow one to mediate one's behavior in response to an ever-changing environment. EF refers to the ability to plan, organize, and maintain an appropriate action to reach a desired goal (Ozonoff et al., 1991), and it is used as an umbrella term to describe higher mental processes. Executive functions encompass the control, supervisory, and/or self-regulatory functions that organize and direct all cognitive activities, emotional responses, and overt behaviors (Isquith et al., 2005). These processes are controlled, rather than automatic, and include the regulation of attention and motor responses, delay of gratification, planning, problem-solving, inhibition of prepotent (or automatic) responses, concept formation, abstract thinking, cognitive and behavioral flexibility, inhibitory control, self-monitoring, working memory, and attention (Carlson et al., 2004; Wiebe et al., 2008).

The term "executive functions" was introduced in relation to the work of Luria (1966) who proposed a cognitive system in charge of intentionality and formulation of thoughts and actions, the identification of goal-appropriate cognitive routines, and evaluation of outcomes. EFs have been shown to be mainly regulated by the prefrontal cortex (PFC) through imaging and neuropsychological studies, though the PFC is not exclusively responsible for these cognitive processes (Goldman-Rakic, 1987; Elliott, 2003; Godefroy, 2003; Rubia et al., 2003). This area of the brain is thought to act primarily as a "control center" that mediates higher-level cognitive functions (Miller and Cohen, 2001). Typically, a quantitative understanding of an individual's EF abilities is captured using standardized neuropsychological tests that target the PFC, such as the Delis–Kaplan Executive Function System (D-KEFS; Delis et al., 2001).

A variety of overarching skill areas have been found to encompass the cognitive processes of EF. Although there are differing views on exactly what these dimensions are, one prominent perspective incorporates three important skills: inhibitory control, working memory, and cognitive flexibility (Diamond et al., 2007). Two of these EFs, inhibition and cognitive flexibility, are the focus of the current study.

Inhibition involves the ability to refrain from responding with an incorrect, yet prepotent response (Nigg, 2000; Carlson and Moses, 2001; Hala et al., 2003). For example, when completing a stroop task, participants are shown color names written in ink of a different color (i.e., the word "blue" would be written in yellow ink). Participants are asked to identify the color of the ink (i.e., "yellow"), thus requiring them to inhibit the more automatic response of reading the word (i.e., "blue"). Inhibition has been linked to positive social development (Pérez-Edgar et al., 2011), problem-solving (Passolunghi and Siegel, 2001), and academic achievement (e.g., St. Clair-Thompson and Gathercole, 2006).

Cognitive flexibility, also referred to as set-shifting or attentional flexibility, is another key component of EF. Cognitive flexibility is the ability to flexibly switch between rules, where one must disengage attention from one source or rule in order to engage with another (Stahl and Pry, 2005). It incorporates problem-solving, or the ability to work through new tasks applying previous knowledge (Zelazo et al., 2003). For example, in a classic shifting task, participants may be asked to sort a variety of cards based on a specific dimension (e.g., color), to which they receive corrective feedback. During the task, at an unspecified time, the sorting rule changes as indicated by negative feedback. Accordingly, participants must apply their flexible thinking skills and sort the cards using the new rule (e.g., size). To be successful, participants must inhibit previously learned mental sets. Failure to shift results in perseverative errors (i.e., continuing to respond according to the previous set of rules; Anderson, 2002). Poor cognitive flexibility has been linked to difficulties with academics, particularly in mathematics (St. Clair-Thompson and Gathercole, 2006), as well as reduced levels of self-awareness (Moore and Malinowski, 2009).

Research on the role of EFs has begun to integrate into the performing arts, with a focus on the impacts of EF on performing arts interventions. Although the literature in this area is limited, some benefits of music, drama, and dance on EFs have been found. For example, Thaut et al. (2009) utilized therapeutic music training to improve the EFs of patients with traumatic brain injury. This training included a focus on shifting between musical tones, matching rhythmic patterns, and using song as a mnemonic device to aid with recall. Specifically, improvement in cognitive flexibility and attention were found after participating in the intervention program. Comparable effects were found in a study by Biasutti and Mangiacotti (2018). They did a broad test of EF effects of a simple music improvisation intervention (described as imitation-based vocal and rhythm tasks without mention of multi-tasking or set-shifting) for older adults with cognitive impairments. While this study found no results on a test designed to measure cognitive flexibility, global results were found on a verbal fluency test which includes inhibition and shifting between word categories. More conclusive effects were measured on a short test of attention, memory, and visio-spatial perception, which are executive functions that reflect the demands of the intervention more directly. Additionally, Karakelle (2009) examined the impact of a 10-week course that provided students with the opportunity to build improvisation skills through drama, which encouraged students to construct ideas and emotions through symbols, acting, and semi-structured

interactions. It was found that divergent thinking, fluency, and cognitive flexibility were improved in a group of postgraduate students following participation in this course (Karakelle, 2009). Finally, Coubard et al. (2011) explored the connection between contemporary dance improvisation and cognitive flexibility in older adults (ages 65–88 years). They found that those who participated in dance improvisation, including free movement creation, stretching, body positioning, practice, and performance, improved in their cognitive flexibility and shifting abilities over those who participated in a more structured course (e.g., Tai Chi or fall prevention program).

A recent meta-analysis (Meng et al., 2019) highlights the impacts of dance intervention on global cognitive abilities as well as executive function in older adults. In this meta-analysis, it was noted that dance did not significantly impact EFs. The types of dance interventions included in reviewed studies of EFs were typically structured (e.g., ballroom dancing) or set (memorized choreography). The one exception mentioned, Coubard et al.'s (2011) study, used a dance improvisation intervention and found an effect.[1]

Looking across these examples, it becomes clear that the discipline of performing arts intervention may be variable, as improvements in EF have been found through music, dance, and drama programs. A similar observation can cautiously be made regarding population groups as effects have been found in studies with younger adults and both healthy and cognitively impaired older adults. What seems to be of greater importance is the focus of the performing arts intervention, as the rehearsal and repetition of memorized material (e.g., ballroom dance steps) does not specifically impact the key EFs of cognitive flexibility, inhibition, and problem-solving. Rather, there is support for the idea that interventions with a greater and more complex improvisation requirement or a specific task-based goal have a closer link to key EFs.

The independent variable of our study, PGS, is a form of improvisation with specified parameters that is comparable across theater, dance, and music. The concept of PGS was first defined by Pil Hansen in 2014 and refers to the generating characteristics of stage works that are not set and repeatable compositions, but rather systematic forms of task-based improvisation, constrained by predefined rules and source materials (Hansen, 2014).[2] For example, in the theatrical "Lie-line" (first developed by the United Kingdom-based theater company Forced Entertainment and later adapted by the

Canadian company Theatre Replacement), actors each select an 'enhanced' autobiographical anecdote and take turns sharing their stories over rounds with rules of engagement that gradually evolve from listening, through borrowing and incorporating components from one another's stories, to interrupting each other. This basic system generates collective stories through self-organizing dynamics of competition, adaptation of memories, and, eventually, disintegration of story and language. The concept of DST draws on dynamical systems theory to define the boundaries (performance context), energy resources (source materials), parameters (tasks and rules), variables (performer training and memories), and attractors (e.g., learning curve, competition, fatigue) of these systems (Hansen, 2015). Analytical and dramaturgical work invested in understanding how these systems generate performance has led to theories about the cognitive demands they likely place on performers (Hansen and House, 2015; Hansen and Oxoby, 2017). In this regard, there is a relevant difference between PGS and the classical forms of improvisation introduced as interventions in the EF studies previously mentioned. Classical approaches to improvisation in the performing arts, such as Paxton's contact improvisation, Spolin's theater sports, and Stockhausen's intuitive music, require performers to "get out of their heads" and instead draw on instinctive and implicit responses while remaining hyperattentive to their co-performers' shifting responses in the present (Paxton, 1975; Novack, 1986; Hogg, 2011; Drinko, 2013). In other words, performers likely rely on rather than inhibit prepotent (automatic) responses, while avoiding conscious thought processes associated with problem-solving and deliberate set-shifting. New and less commonly used approaches to improvisation are challenging this exclusive focus on the present by articulating the layers of memory and cultural training that inform improvised impulses while performing (Drinko, 2013; Sarco-Thomas, 2014; Midgelow, 2015; Hansen, 2018).

Like these culturally and dramaturgically aware improvisors, creators of PGS are critical of an over-emphasis on presence in classical improvisation methods because the techniques used tend to separate thinking from the body. Their response differs, though: they devise system rules that keep performers consciously and intellectually engaged throughout embodied work. Negative system rules, such as Deborah Hay's "avoid sequencing" or Ame Henderson's "don't copy," require dancers to consciously inhibit a trained, automated tendency. In these cases, they are the tendencies to string movement into sequences and to entrain to other dancers, arriving at unison and alignment through empathetic copying (Sofianidis et al., 2014; Waterhouse et al., 2014). To work with such rules, performers must render conscious otherwise implicit response habits and then inhibit them (Hansen and Bläsing, 2017, pp. 16–23; Stevens, 2017, pp. 56–57). The tasks created for the systems are often impossible to execute as posed and require that each performer addresses them like problems. When, for example, dancers are tasked to "move continuously" for 60 min but "never repeat movement" by Henderson, they are in fact tasked to remember and consult a vast amount of movement in ways that are humanly impossible. They address this problem by developing strategies that counter their trained tendency toward repetition and provide more limited

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[1] Meta-analyses of empirical studies into the cognitive effects of theater and music are not available. The field of theater psychology is emerging and features few evidence-based publications. The field of music psychology is significantly larger, but reviews focus on narrow population groups and areas of cognition (e.g., cross-cultural perception, dementia, and emotional control). There are no reviews available on executive functions and music, but reviews on music therapy from 2013 and 2017 with focus on dementia make brief mention on EF (McDermott et al., 2013; Fang et al., 2017). Unfortunately, the review from 2013 does not account for the kinds of intervention offered and the 2017 review does not mention improvisation. Both reviews conclude that the body of research available focusses on emotional adjustment over cognitive effects and is limited, leaving the area of music therapy and cognition with a significant gap.

[2] The term 'performance generating systems' categorizes comparable approaches that creators refer to as dance machines, rule plays, praxis scores, and indeterminate scores.

options (e.g., inhabiting a new space with each movement or shifting relationships with co-dancers or between body parts). As they do so, complex ideas become meaningful and a vast amount of information becomes clustered to avoid working memory overload (Hansen and Oxoby, 2017). As these examples indicate, PGS require performers to both:

(1) Respond in the performance presence with the fluency and attention-shifting that also is common for improvisation techniques, and
(2) Work consciously with shifting rules, inhibition of automated responses, problem-solving, and strategy.

When these observations are considered together, it is reasonable to hypothesize that the EF demands of PGS are significantly higher than the demands of performing memorized material and could be considerably higher than the demands of classical improvisation practices.

MATERIALS AND METHODS

Study Design

The study design applied mixed methods and included a control group. The three following data sets were collected: (1) surveys of demographic variables (completed by all participants), (2) quantitative pre- and post-tests of executive functions (completed by all participants, except one in the intervention study group), and (3) self-reported written observations prepared by participants during the intervention (only completed by the intervention group). Administration and processing procedures will be described later.

The first data set was used to consider variables, the second set was processed statistically to account for intervention effects on executive functions, and the third set was coded thematically to uncover patterns and factors that explain the measured effects. Finally, analytical comparisons and transfer were cautiously made across the quantitative and qualitative findings, which are included in the discussion section of this article.

Participants in the intervention group were recruited by a research assistant from a pool of senior students who were enrolled in a course for degree credit on PGS in the School of Creative and Performing Arts, University of Calgary.[3] Participants in the control group were recruited from the full cohort of graduate and senior undergraduate students at the school. Because the intervention was delivered within a course, it was not possible to assign participants randomly to the intervention and control groups, but we did eliminate the risk of selection bias through broad recruitment and inclusivity.

Our study protocol was approved by the Conjoint Faculties Research Ethics Board at the University of Calgary (REB17-2145).

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[3]Note that the study leader, Pil Hansen, was co-teaching this course. For ethical reasons, Hansen was thus not recruiting or testing participants and did not have access to the participants' surveys and test data until after final course grades had been submitted and the appeals period was concluded.

TABLE 1 | Demographic information by group.

	Intervention group (*n* = 15)	Control group (*n* = 13)
Gender	60% female (0.7% undisclosed)	77% female
Age	20–40, *M* = 24.12, *SD* = 5.50	19–30, *M* = 23.23, *SD* = 3.53
Mental health diagnosis reported by student (anxiety, depression, and ADHD)	8	5
Academic discipline	6 drama, 4 music, and 5 dance students	6 drama, 4 music, 3 dance students
Improvisation experience	5 students with 4+ years of experience	4 students with 4+ years of experience

Participants

There were 28 participants in the full study. Fifteen were in the intervention group (IG), though one did not complete the quantitative tests, and 13 were in the control group (CG). See **Table 1** for basic demographic information.

Intervention

The intervention was delivered in the form of an intensive course on PGS for 21 graduate and senior undergraduate performing arts students. Fifteen of these students participated in the study. The course had the educational aim of teaching how to perform and create PGS. The course was not altered for the purpose of the study. That said, the research team was aware of the cognitive demands involved in the taught praxis and the potential effects on EF that such demands might produce. The course took place over eight continuous weeks in studio spaces. During the first 5 days, the group worked for 7.5 h per day. Each day, a new PGS was introduced through articles on and archival recordings of the artistic approach, a mini-lecture on both the approach and key concepts associated with it, group discussions, practical exercises, and practical rehearsal. One third of each day was dedicated to analytical work and two thirds were spent on experiential components. Participants were tasked to upload a written reflection to an online learning system each evening. On day 1, the group was taught a dance system called "Futuring Memory." It was created by the Canadian choreographer Ame Henderson and the company Public Recordings for the 2013 work *relay* (Forté and Zimmer, 2011; Hansen, 2014, 2015). On day 2, the American 1960s avant-garde composer Cornelius Cardew's indeterminate scores were introduced. The group learned "Paragraph 7" for vocal performance from *The Great Learning* (Cardew, 1971). On the third day, the group's attention was turned to the Canadian theater director Paul Bettis' theatrical "rule plays," specifically *The Freud Project* from 1996 (Bettis, 2004; Hansen, 2008). The fourth day, the group returned to dance systems with a focus on the Canadian choreographer Christopher House's version of the American avant-garde choreographer Deborah Hay's solo commissioning scores and praxis (Hay, 2000, 2007, and 2013; Hansen and House, 2015). The fifth day was dedicated to the participants' own creation of PGS. After this

intensive week, participants were tasked to practice performing one or several of the taught systems for at least 45 min per day, 4 days per week. Their practice was restricted to the taught systems for the first 3 weeks. From the fourth week, participants were given the option of adapting the systems to address their needs as performers. Participants were required to upload a reflection post at the end of each of the seven practice weeks.

The analytical reflection on key concepts was designed to help students identify the procedures of each system and arrive at a preliminary understanding of how they generate performance. Experiential knowledge was then built onto this understanding, rendering it operational. This choice was based on the results of a pilot study into embodied and conceptual learning through PGS that Robert Oxoby and Pil Hansen completed in 2016 (Hansen and Oxoby, 2017). In this pilot, qualitative data revealed that students who engaged with both the conceptual analysis of the systems and participated in the experiential exploration of them advanced beyond students who only engaged with one of these components. Just like structural analysis has proven essential for the advancement of music performance (Bordin, 2017), we found that conceptual analysis of how a system is designed and works is relevant for PGS students' advancement.

The four systems in the intervention share the characteristics described in the theory section, and thus they likely place a series of comparable executive demands on the performers. What follows is a detailed practical and procedural introduction to these specific systems that accounts for the intervention focus.

In Henderson's dance system, the performers' memories of movement from past choreographies or everyday routines serve as sources. Performers pre-select these memories and practice recalling them. The system has three tasks: futuring, recalling memory, and futuring memory. When futuring, each performer is tasked to register their co-dancers' movement, form a hypothesis of what their movement will be in the next moment, and perform it. The objective is to reach unison (synchronized movement) collectively. The primary rule of this system is: do not copy. If an association arises to a source memory while futuring, then the performer must recall the memory and the group is tasked to future the recalling performer. The recalling performer allows the memory to be influenced by the futuring proposals. The generated choreography varies depending on how many source memories the group has available and how many different styles of dance the performers are trained in. Exhaustion is also a significant factor as the futuring task is demanding to sustain (Hansen, 2015).

To perform the music system, participants were given a printed score with a list of single words. A number and legend preceding each word indicates how many times and how loudly the word must be repeated. The system task unfolds as follows: performers begin by each selecting a pitch and a position in space. When prompted visually, they start singing the first word on the list in their selected pitch. After singing the indicated number of repetitions, each performer is free to move in space and tasked to seek out a new pitch from another performer. When they have found such a pitch, they once again position themselves in space and begin singing the second word in this pitch. The work continues this way until everyone has sung

the full list of words. The score and the pitches comprise the sources of this system. The rules are simple and govern when each performer can move in space as well as the fact that they are not permitted to add new pitches or words to the system. The generated composition shifts depending on variables such as participants' choices of pitch, tempo, pronunciation, sonic emphasis, position in space, vocal stamina, breath, spatial reverberations, and mistakes (Bertolani, 2018).

In preparation for the theater system, performers select source texts (plays, poems, theses, etc.) on a theme and devise transitional sentences. The latter are typically polite phrases that can be used to enter or exit a space, ask for permission to touch, or voice an opinion. The system the group worked on was devised on the theme of Freudian sexual transgression and gender/power roles. Performers added their own texts to sources first selected by Paul Bettis and his ensemble. These texts were hidden in properties and furniture within the rehearsal space, while transitional sentences were memorized. In pairs of three, participants started their system tasks by drawing cards that determine their character (mother, analyst/father, or daughter), their space (living room, office, or garden), and their objective (seduce, be seduced, observe). The style of performance of this rule play is exaggerated, melodramatic, and non-realistic. Rules include asking for consent before touching or entering a space, only using the selected text for improvisation (no added words), and responding to tasks prompted by light or sound cues. An outside manipulator is playing music and using spotlights and sound makers, which respectively prompt performers to dance a waltz, create a family tableau, read facts about Freud, perform a monolog, or hurry up and complete the character objective within 2 min. The generated story of this system varies depending on the texts, props, and space used and the performers' ability to mobilize them during interactive scenes. The actors' ability to transition when a new task is prompted and their competitiveness are also significant variables (Hansen, 2008).

In Hay and House's dance system, the source is comprised of a score with concrete and abstract tasks like "open up the space like a fan," or "three steps forward, two steps back." Performers memorize these tasks, but interpret them and respond to them differently each time they perform them. While performing this score, each participant is tasked to sustain Hay's practice. The foundation of this practice is a requirement to continuously draw in information from one's surroundings and body, respond to it, let it go before an idea takes shape, shift the point of attention, draw in new information, and so on. Rules include not repeating oneself, not planning, rejecting learned responses, and rejecting sequencing. The generated choreography varies depending on how performers interpret the score tasks, their ability to inhibit planning and repeatable or trained responses, and their ability to sustain continuous attention shifting (Hansen and House, 2015).

All four systems require performers to draw on pre-selected sources for performance generation (i.e., memories of choreography, memorized musical or choreographic score components, or a repertoire of text-based lines). While recalling these sources, the performers are inhibiting trained movement and vocal responses, other memories of choreography, or improvised impulses. The systems also require performers to

draw on new information selectively while responding to it physically, vocally, or in verbal and physical actions within a set of restrictive rules. Each system explicitly directs the performers' attention to different types of sensory stimuli: the dance systems mostly rely on visual and proprioceptive information, the music system primarily draws on auditory information, while the drama system emphasizes visual and auditory information. Both dance systems require continuous attention and set-shifting, while the music and theater systems alternate between a singular focus of attention and the need to rapidly shift attention and set when seeking out a new source or transitioning to a new task. The complexity of the tasks and rules also differ. The music system is the simplest, as its tasks are sequential instead of simultaneous and the rules remain constant. The dance systems involve three simultaneous tasks with some variation of both rules and tasks over the course of the performance. The theater system includes three simultaneous tasks at all times, but one of them changes sequentially, and the rules are complex. While some familiarity with the source materials, tasks, and rules is useful and helps performers achieve fluidity of performance, too much familiarity tends to lead to predictable repetition that stops the system from generating new performance.

Quantitative Test Instruments

The Delis–Kaplan Executive Function System (Delis et al., 2001) design fluency tests were administered to measure the higher-level executive functions of inhibition and flexibility. Participants were asked to create novel designs by drawing lines between dots within a set time limit, under three increasingly more complex conditions. The first condition asked participants to connect dots on the page. The second condition required participants to only connect certain dots and ignore incorrect dots. Finally, the third condition required participants to switch between rules for connecting dots (e.g., "connect dots of alternating colors"). Condition 1 is designed to test the higher-level executive functions of fluidity and problem-solving initiation, condition 2 measures inhibition in addition to these functions, and condition 3 furthermore tests flexibility. Conditions 1–2 also measure the more basic cognitive skills of visual attention, motor speed, visual perception, and simultaneous processing. Composite scores are also created. These tests were administered to the intervention group within 10 days before the intervention and within 2 days after the intervention. The control group was tested within the same time interval. In compliance with the standard D-KEFS procedure, age-based norms were used to determine the scaled scores of correct designs under each condition as well as the composite scores across all conditions.

Qualitative Data Collection and Processing

The intervention group was tasked to upload daily reflection postings throughout the first intensive week and weekly postings throughout the seven practice weeks. In each posting, they were instructed to include at least four observations on how the system works and how it affects them as performers that could be based on any of the materials or experiences from the day or week.

All reflection postings were transferred to the qualitative coding software NVIVO as participant-specific cases.

These data sets varied in posting volume and frequency, depending on how much participants wrote and whether they uploaded all or only some of the requested postings. Three participants who uploaded less than 2/3 of the required posts were not included in the analysis, as findings otherwise might reflect their limited data rather than their self-reported experiences and reflections. This elimination affected the distribution within the intervention group of gender (10F, 1M, 1 non-disclosed), discipline (five drama, two music, and five dance students), and significant improvisation experience (IG 4 with 4+ years of practice). The rest of the variables were unchanged. Although the volume (word count) of writing uploaded by the remaining 12 participants varied (range: 3,300–10,200 words, median: 7,800 words), this difference was found to mostly reflect whether each participant was reporting their observations directly or prefacing each observation with sections describing experiences in detail. This difference was addressed by coding observations, not details.

The data sets were coded to saturation using an inductive, grounded theory method. The work progressed from identification of concepts (open coding), through comparative analysis and discovery of relationships (generation of categories and axial coding), to analysis of these relationships and generation of theory (selective and theoretical coding). In particular, a word frequency search was first completed to identify concepts used by multiple participants to reflect on their praxis. More specified word searches were then completed on the terminology of these concepts and the results were auto-coded as possible categories. Returning to the case materials, the coded contents were reviewed for accuracy, text that did not belong in a category or derived from descriptive details was un-coded, and emerging sub-categories were coded at subcodes. To begin identifying possible relationships between the generated thematic categories, a cluster analysis was visualized, identifying codes with related and comparable coding patterns. A more detailed comparative analysis was completed of such clustered code contents to identify actual relationships. In the final phase, case materials were revisited with selective, but more detailed, attention to coded contents that contribute to the identified relationship and theory was articulated.

RESULTS

Cognitive Effects

The sample for our quantitative analyses included 13 participants in the control group and 14 participants in the intervention group. Given the small sample sizes and sample heterogeneity inherent in this type of research, data was analyzed using non-parametric Wilcoxon tests, which impose no assumptions on the distribution of the underlying data. Rather, this test looks at the distributions of the control and intervention populations and takes as the null hypothesis that the two populations are drawn from the same sample. This technique was used for both combined and individual Design Fluency (DF) test items.

FIGURE 1 | Scaled DF tests' distribution of pre- and post-test differences for condition 2.
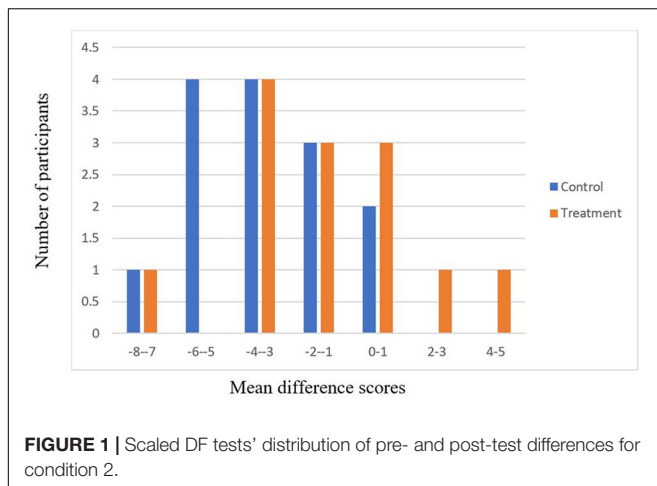
Wilcoxon tests provide a lower-bound on the significance of our results. We further explored the data from the experiment by conducting one-tailed t-tests to identify results in which the Wilcoxon tests were indicative of changes due to the intervention.

Looking at the initial distribution of DF scores, we cannot identify any differences between the pre- and post-intervention tests administered to participants across the control and intervention groups. As such, we chose to look at the data using a difference-in-difference approach in which we compare the changes (positive scores indicating improvement) across the pre- and post-administered tests to participants. This yields distributions of "post-score minus pre-score" for the control and intervention groups. The non-parametric tests identify an intervention effect with respect to the scaled scores in condition 2 of the DF tests [Wilcoxon $p = 0.054$; $t(26) = 4.2$, $p = 0.02$]. This result suggests that the intervention increased performance over the pre- and post-test period. **Figure 1** presents the distributions for this scaled test.

Thus, our quantitative data suggests a marked change in the pre- and post-test performance of subjects on the DF tests. The key to notice in these distributions is the upper tail observed in the intervention group, suggesting that the intervention resulted in improved performance. This result is bolstered by the results of scaled scores in conditions 1 and 3. Although we fail to identify

significant differences at the 5% level for conditions 1 and 3, we do see that Wilcoxon tests reject the null hypothesis at the 10% level for these conditions. This difference may in part explain a trending effect we found on the composite, scaled DF test score [Wilcoxon $p = 0.0696$; $t(25) = -2.06$, $p = 0.025$].

Although outliers and our small sample size reduce the statistical power of the sample, we do identify changes occurring as a result of the intervention, thereby illustrating the potential for our intervention (and PGS more generally) to yield changes (here improvements) in test performance.

Experiences of Mediating Processes

Our analysis of qualitative data from the mediating process revealed behavioral patterns. From these patterns, we learned how the demands of the intervention practice were experienced by the participants and how they responded. These insights provide additional explanations of the measured effects and raise questions of relevance to future research and implementation that will be addressed in the discussion and implications sections of this article. In this section, we first explore relationships between the primary categories of participant observation that our coding process revealed (**Figure 2**); then we offer analytical theory inferred from these relationships.

All participants *reflected* frequently on their own thinking process and on their analytical and conceptual understanding of the systems as both evolved throughout the intervention. It is therefore evident that our choice of complementing experiential learning with analytical reflection in the first five intervention days ended up informing the participants' independent practice weeks. Reflections posted in cluster 1 were primarily centered on how the system can continue to *generate performance* and the performer's *agency* to make choices within the system. These analyses often contributed to thinking through factors when addressing a challenge, developing ideas, or planning the next phase of practice. Reflections on *engagement, interest*, and *agency* remained high through the intensive days and the first three practice weeks, they dropped significantly in weeks 4 and 5, and resurged in week 6. Note that week 4 was when participants were given the option of adapting the systems in order to ensure that they continued to generate performance and address their needs as performers.

1. *Reflexivity:* understanding (632 observations), performance-generation (91 observations), agency and intention (179 observations); engagement and interest (241 observations).
2. *Problem-solving:* useful challenges (72 observations); problems to solve (35 observations); rules (227 observations); experimentation and exploration (115 observations).
3. *Barrier:* barriers, unchangeable challenges (85 observations); self-critique, need to let go of control (63 observations); safety and comfort (92 observations).
4. *Attention:* awareness of attention (121 observations); avoiding and inhibiting (35 observations); impulses and habits (76 observations); external surroundings (192 observations); internal focus, proprioception (42 observations).

FIGURE 2 | Clusters of related primary categories.

This delayed positive effect on *engagement, interest*, and *agency* can be explained by the participants' experiences of *barriers* and *challenges* (clusters 2 and 3). In the first weeks of working independently on the practice of the systems, the quantity of observations on challenges that were experienced as respectively unchangeable and useful grew. In week 2, individuals who reported unchangeable challenges began to describe them as barriers; and in the third week, reports of useful challenges dropped altogether while the experience of unchangeable challenges and barriers surged. Looking at the contents of the postings, the tendency reflects a learning curve. The more 'skilled' participants became at performing the systems, the harder it was for them to avoid repeating themselves and find fresh responses while performing. They reported feeling stuck with some of the tasks and becoming predictable in performance. In week 4, when participants were given the option of adapting the system, the pattern changed radically: challenges were predominantly reported as useful experiences again and reflections on agency shifted from a focus on choice-making to the participants' work on manipulating system rules. This development was sustained through the intervention, but it was not until week 6 that reports of unchangeable challenges and barriers dropped altogether. Looking more closely at the experiences that participants shared after week 4, many of the first ideas for adaptation failed because they introduced rules that were too restrictive. It took several attempts before more simple solutions, such as adding objects to a space, interpreting a task differently, or redirecting the performer's attention were tried out systematically instead. Those solutions reflected a stronger understanding of how the systems generate performance, they were experienced as more useful in practice, and they led to a surge in reports of engagement and agency.

As indicated above, participants approached challenges with distinct problem-solving or barrier attitudes. Each of these attitudes were associated with different behavioral patterns. The first manifested in observations of challenges that were regarded as *useful experiences* leading to new realizations or as *problems to be solved* strategically.

> I think that the magic of this system lays within its problem-solving component, and the harder this problem is, the more interesting it is to watch. Although, a choreographer could of course implement layers of challenges (intervention group participant).

Data coded at these categories are closely related to discussions of *rules*, including attempts to adapt them, and a tendency to frame the work as *experiments* or *explorations*. When this problem-solving attitude was expressed, challenges were perceived as changeable situations and approached with experimental attempts to manipulate rules and explore system options in search of solutions.

> Some problems that came up with my score include: transitions, inconsistent duration of each phase, wanting to be more internal than external, not having an actual audience, and wanting a bigger challenge.

> Possible solutions: create a task specifically for transitions, allow myself to be inconsistent with the duration of each phase or set up an alarm, be strict with the duration and task of each phase to avoid being more internal than external or the other way around, invite someone to be my audience, think about a bigger challenge (not being allowed to move the same body part twice in a row? Not being allowed to use the same movement vocabulary? To play with rhythm? To sing a song or speak while performing the score? Tell the audience a story?) (intervention group participant).

This reaction required analytical meta-reflection on system components and how they affect the performer rather than impulsive responses.

The other distinct attitude is evident in observations that represent challenges as *unchangeable* situations or *barriers* to the participants' performance. These categories were often related to comments on establishing a *safe* space, on feeling *safe* working with others, and on returning to a familiar source or task because it makes a participant feel more *comfortable*.

> I liked being in my safe zone of blurry dance rather than pushing beyond into more of the score. Despite my struggles to leave my comfort zone, I made it happen closer to the end and sang the song. Even though I struggled with the praxis overall, it felt like a very good day (intervention group participant).

For a subgroup of participants who reported anxiety, the barrier attitude was also closely associated with *self-critique* and reflections on the *need to let go* of control.

> I struggled yesterday with where Futuring ended and Hay began . . . I found myself wanting to combine the two practices and struggled with it. When I let go and let the influence of Hay's practice be part of how I worked, it became much easier to future (intervention group participant).

Most participants underwent a learning curve in which the barrier attitude grew from the second practice week and was replaced with the problem-solving attitude in the fourth practice week. Over the full intervention, this development meant that the two attitudes ended up being balanced. Two subgroups differed, though: a participant who reported having an attention deficit disorder, but no anxiety, leaned exclusively toward the problem-solving attitude from the outset and participants who reported anxiety leaned strongly toward the barrier attitude throughout the intervention.

Observations on *attention and awareness* are distributed evenly across most study participants with a range of 9–19 observations per person. The exception is two participants who reported having an attention deficit disorder; they only mentioned attention or awareness 2–3 times each in their postings. Interestingly, the participants with the highest amount of observations on attention all reported anxiety as well. In the category of *attention and awareness*, participants predominantly observed what they were attending to or how they were attending during performance. Focus on learned habits and the need to inhibit or avoid them is directly associated with the degree to which participants also discussed attention: participants with few observations on

attention also shared few or no observations on the topics of habits and inhibition.

Participants with a high degree of reflexivity about *attention* did all report strategic choices of redirecting their attention toward new *external* or *internal* sources of stimuli or shifting their mode of attending. The latter did, for example, bring about a shift from focused to peripheral vision, from isolating a sound to listening more broadly, and from internal to external stimuli. Looking more closely at these strategies, they often overlapped with reports of experiencing unchangeable challenges or barriers. Instead of solving or removing the challenge, participants with strong reflexivity about attention worked around the challenge by redirecting their attention, taking in new sources of information, and responding differently while performing.

> Because I was tired and I was by myself, I was very tempted to stop the system and do something else. The times [when] I felt I had to stop the system and do something else served as a tool to shift my attention to the space . . . I had fewer thoughts on where my body should go next, and I kept going and finding new exciting unexpected movements, as a reaction to my physical surroundings (intervention group participant).

Regardless of the degree to which participants were reflexive about attention, they generally described perceptual stimuli and discussed their experience of responding to them with performance. They were thus hyperaware of the need to take in new information and respond to it within the systems. In these descriptions, participants referred to their *external surroundings* (the space, sound, objects, other performers) to a much higher degree than *internal, proprioceptive* experiences. The external focus was typically used to draw new inspiration and the internal focus was commonly used to address feeling overwhelmed and needing to reduce the information used in the improvisation. Note that unlike engagement and enjoyment, which were significantly reduced during weeks 4 and 5, observations on *attention and awareness* remained consistent. A gradual decrease in the otherwise high number of observations on the external environment was related to a gradual increase in reports of internal perceptions, demonstrating the strategy of redirecting attention in effect.

DISCUSSION

Quantitative Results

The quantitative results from the DF tasks on the D-KEFS support the finding that involvement in the PGS increased fluidity, inhibition, and problem-solving initiation. The results further indicate improved flexibility in thinking over the course of the intervention. Given our directional hypotheses, one-tailed tests were carried out to determine the change in EF skills. In particular, condition 2 of the DF task, where participants are required to inhibit a prepotent rule when creating designs, demonstrated a significant and consistent pre-post change, whereby there was greater improvement in fluidity, inhibition, and problem-solving initiation for those in the PGS intervention

over those in the control group. Additionally, the composite scores of DF conditions 1–3, which also include tasks of shifting between rules, demonstrated a trending pre-post change, which indicated that the PGS intervention group experienced greater flexibility in thinking than the control group. It is possible that the PGS techniques of creating novel responses, restricting or inhibiting previously demonstrated movements, and responding to new information helped to increase (or bring increased awareness to) participants' fluidity, inhibition, problem-solving initiation, and flexibility in thinking, benefiting them on the DF task.

Qualitative Results

The qualitative results offer analytical insight into the demands that PGS place on performers. Our study participants underwent a challenging learning curve because a more trained performance within these systems resulted in repeatable responses (prepotent, implicit memory). These responses worked against the tasks of inhibiting learned responses, taking in new sources of information, and producing fresh responses with awareness while performing that PGS generally involve. As performers, participants were attracted to the "comfort zones" of learned responses and began to experience score sections or tasks that felt less familiar as barriers. In addition to the inherent challenge of multitasking, which all the systems entail, the meta-challenge of addressing such barriers required the development of problem-solving and strategies for redirecting attention.

These strategies were arrived at through multiple cycles of reflexivity about experiences from the practice, analytical reflection about patterns of response, development of solutions, operational experimentation with them, new reflexivity about experiences, and so on. In other words, the demands on executive functions of PGS were not limited to the working memory span of the performance present. It was extended into the conscious development of operational strategies over longer durations and through cyclical exchange between high-level processing of problems and fully embodied experimentation with solutions.

These findings confirm and deepen our understanding of the benefits of conscious analysis, strategic reflection, and problem-solving in the context of improvisation practices (Hansen and House, 2015; Hansen and Oxoby, 2017). The results furthermore support the critique of an over-emphasis on presence in classical improvisation approaches, voiced by contemporary improvisors and PGS creators (Drinko, 2013; Sarco-Thomas, 2014; Midgelow, 2015; Hansen, 2018). Without the PGS-specific tasks and rules that restrict responses, performers would have the option of staying within their comfort zones and repeating responses already arrived at. PGS clearly drive performers to become aware of such tendencies and to counter them by adding new tasks, rules, and strategies that produce novel performance. In PGS, performance fluency is not reflected in repeatability, but rather in the ability to apply a complex and changing set of rules and attention-shifting/problem-solving strategies during continuous performance.

Integrated Perspective on Results

In summary, the quantitative results support the theory that PGS have a significant effect on specific EFs, whereas the qualitative results help us understand why. The participants' continuous qualitative observation of external perceptions, which registered while working on physical tasks, indicates that the practice placed high demands on basic cognitive skills measured by the D-KEFS: visual attention, visual perception, motor speed, and simultaneous processing. This indication supports the finding of a strong effect in condition 2 of the DF Test. The need to not only advance through implicit learning and fluid performance of multitasking skills, but also to remain reflexive about how those skills affect the performance and develop strategies to refresh responses, placed an additional layer of demands on executive functions.

Combined, the strategies participants developed effectively ensured that they continued to rely on inhibition (blocking learned responses), initiation of problem-solving (reflecting on challenges and adapting the system), and flexibility (redirecting attention in search of new responses, shifting between modes of attention, shifting between rules) while multitasking with fluency during performance. These demands explain the respectively strong and trending effects measured on higher-level executive capacities in condition 2 and in the composite score of the DF test.

Limitations

As with any intervention research, a number of limitations are noted. In particular, it is noted that the sample size is small, therefore limiting the number and type of quantitative analyses that could be carried out. As well, one participant did not complete the quantitative measures, resulting in an uneven sample size. There was heterogeneity within both the control and intervention groups (e.g., presence of mental health or attentional concerns) that could not be further explored given the sample size; it is possible that the presence (or absence) of a mental health condition could impact results in this type of intervention.

It should also be noted that the smaller sample size may limit the generalizability of these findings. However, the artistic practice of PGS cannot be taught to larger groups as the integrity of the practice may be compromised. As such, while the current sample size is small, it allowed for a detailed overview of the intervention. This overview reflects the short-term effects of the intervention as long-term effects have not been measured.

Implications

The results indicate that simple PGS interventions designed for different populations could potentially help strengthen and maintain EF abilities over and beyond performing arts interventions focusing on structured or memorized material (e.g., Meng et al., 2019). It is also possible that introduction of PGS components to simple or classical improvisational interventions (such as the interventions of Karakelle, 2009; Thaut et al., 2009; Coubard et al., 2011; Biasutti and Mangiacotti, 2018) can increase

their effect on key EFs. However, further studies are needed to determine range of transferability.

Understanding the EF demands of PGS can help creators and teachers of these systems calibrate tasks and rules to their performers' problem-solving and set-shifting abilities, ensuring that the systems neither become so easy that performers begin to repeat themselves nor so difficult that barriers become insurmountable. Insight into the barriers, problem-solving, and strategies involved in performers' learning curve as they practice can also be beneficial when developing systems and planning rehearsals.

The combined quantitative and qualitative results of this study provide evidence of the higher-level cognition involved in PGS and how important it is for the performers' learning curves. These findings can be extended to other forms of improvisation that are complex and structured and thus likely to involve set-shifting and inhibition. The results may encourage teachers of such approaches to reevaluate the discourse of presence and teaching methods that aim to suppress reflexivity, problem-solving, and strategy.

The combined findings also point to the importance of closely considering the specific cognitive demands of performing arts interventions. This is both relevant when studying the cognitive effect of such praxes and when aiming to apply them for educational or therapeutic purposes. EFs are not typically affected when interventions involve imitated and structured performance for memorization and recall, and different EFs are affected depending on whether interventions include simple improvisation tasks, open forms of improvised creation, or more complex and demanding improvisation tasks. By taking such considerations one step further and analyzing participants' behavior during the interventions as mediating processes, the cognitive demands of interventions and the behaviors they generate are better understood. It is this more interdisciplinary and integrated level of insight that renders findings applicable to both psychology and the performing arts.

To further investigate or apply our findings we make the following recommendations:

1. *Examination of interactions between mental health and PGS-demands:* Complete a detailed qualitative case study to better understand interactions between mental health and the PGS-demands that we now know affect executive functions.
2. *Development and determination of scientific/therapeutical transferability:* Integrate PGS features in improvisation interventions, which can be delivered to larger groups, and test whether they result in comparable short-term effect as well as long-term effects on higher-level cognition across different population groups.
3. *Application to performing arts education:* Integrate reflexivity, problem-solving, and strategy discourse and tasks in the teaching of complex improvisation in the performing arts to support the students' learning curve.
4. *Developmental application to professional performing arts praxis:* Complete Practice-as-Research experiments with the development of PGS, matching levels of cognitive

demands, such as task complexity and energy sources, to the performers' capacity and gradually increasing these levels.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because the data is confidential, as required by our ethics protocol.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Conjoint Faculties Research Ethics Board, University of Calgary (REB17-2145). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

PH led the study and intervention, performed the qualitative analysis, and wrote the first draft of the manuscript. PH and EC completed the literature review, performed the cross-disciplinary analysis, and contributed to manuscript revision. RO performed the statistical analysis. EC and RO wrote sections of the manuscript. All authors contributed to the conception and design of the study and read and approved the submitted version.

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Emotional and Cognitive Responses to Theatrical Representations of Aggressive Behavior

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Representation of human conflict is central to theater performance. In our study, we have used self-reported measures of emotional experience and a word recall task, in order to assess the effects of theatrical representations of violence. Forty participants were randomly assigned to the role of performer or spectator, in either a realistic representation of a script or in a version that recollected the same actions of the script in a series of intertwined monologs. The script represented an aggressive interaction between two work colleagues. Our results show both statistically significant differences in the levels of depression and positive emotions reported after enacting the script, as well as differences in the performance on the word recall task containing aggressive related and non-related stimuli. The results point to stronger effects for performing theatrical representations of violent actions, as compared to recollecting or watching such actions. The fact that actors experienced higher positive emotions is in line with the two-pedal model of aggressive behavior. This model suggests that negative emotions toward aggressive behavior might change to positive emotions due to the repetition in performing violent behaviors, as a key for the transition from reactive aggression to appetitive aggression. Other implications for the study of aggression in theatrical representations are discussed.

Keywords: theater, violence, aggressive behavior, emotion regulation, embodiment, theater therapy

INTRODUCTION

Representation of human aggressive behavior is central to theater since its inception. Almost always, dramatic action is based on the representations of conflict. In dramatic theater, the confrontation of two entities is almost always violent, either at the physical level or, very often, at the psychological level. The antagonist acts as an opposing force and prevents the protagonist from attaining his goal (Aristotel, 1957). Aggressive behavior refers to behavior meant to injure or irritate another person (Berkowitz, 1993). One of the main models for human aggressive behavior is the frustration–aggression model, where frustration arises from an obstacle to reach a goal and elicits an aggressive behavior (Dollard et al., 1939; Berkowitz, 1990, DiGiuseppe and Tafrate, 2007). From the perspective of the frustration–aggression model, we can see the development of the theatrical action into violent behavior as arising from the frustration of the protagonist and the antagonist. The social function of violence representation was stated in antiquity by Aristotle through catharsis

and in modern times by René Girard through his concept of the scapegoat (Girard, 1995). Taking into account Bandura's theory on vicarious learning (Bandura, 1983, 2001), strong questions arise around the social benefits of theatrical representations of violence.

Nowadays, violence is an attraction just as much as it was in the past. For many performative productions, from commercial ones to performances addressed to a highly specialized public, exposure to violence is a constant. From an evolutionary perspective, the ordeal hypothesis regards the representation of violent acts in fiction as a simulation ability developed through natural selection, which enables humans to learn behaviors required in dangerous situations, without the risk of facing their consequences through direct exposure (Morin et al., 2019). While readers experience violent actions only through vicarious imagination, spectators watch violent actions and actors perform them.

Theatrical Representation as Experimental Tool in Exploring Violent Behavior

Theater offers ecological conditions for studying aggressive behavior while at the same time providing controlled and ethical conditions, as well as spontaneity and realism. Moreover, role playing has been previously used as an efficient instrument for inducing aggressive-like behaviors (Moran et al., 2014). Theater play offers an immersive perspective for actors, which makes it suitable as a highly experiential tool for interventions. Some schools of psychotherapy (e.g., psychodrama) have a long history of using theater-inspired experiences for treating psychological problems (Baim, 2007; Baim et al., 2007).

One of the main reasons for which theater has not yet become a common focal point for scientific research is the innate complexity of theatrical actions, which causes difficulties in manipulating specific variables in order to isolate components, such as role play, imaginary action, physical action, etc. There are a lot of different approaches in theatrical representation that bring multiple stances of self, action, and reality. In Grotowski's perspective on the body as an instrument (Grotowski, 2002), there is a complete overlap between the actor's biological being and the fictional body. In the case of puppet performance, there is a strong separation between the actor and the body that performs the action. Studies show that agent perspective on the performed action triggered by role play is accompanied by differences at the functional level of the brain (Brown et al., 2019) and has effects on opinion change (Janis and King, 1954; King and Janis, 1956).

Actors might enact a scene of violence multiple times. Playing a successful Othello, one could perform the strangulation of Desdemona more than 100 times. While the ordeal hypothesis indicates a social function of experiencing violence through fiction, the emotional consequences for the performers of such scenes are largely unknown. Lucy Nevitt states that simulated violence, while producing no physical harm, is so connected to reality that it cannot be easily assigned as "not real" (Nevitt, 2013).

Theatrical Representation Type and Level of Immersion

In this study, we focus on how violence affects spectators and performers of violent acts in two types of representations: performed violence (PV) and suggested violence (SV). This is a long-standing dividing line in the esthetics of theatrical representation in the European theater tradition, with two extreme positions. In the Greek tragedy, the actual violent acts were not represented on stage, while in Roman spectacles, you could have actual killings happening on stage (Heinrichs, 2000; Sommerstein, 2010; Peachin, 2011). In our study, the actors performed the violent actions of the script in the PV condition in a realistic representation. In the SV condition, they performed intertwined monologs recollecting the same actions in a dyadic interaction. Each representation was watched by two student actors.

We can assume that the two types of representations have a different impact on actors, as the two types of immersion in fiction that they promote are very different: in SV, actors rely mainly on imagination and autobiographical memory, while in PV, they rely on imagination, autobiographical memory, as well as sensations and emotions driven by the real stimuli from rehearsals. Since there are strong differences in the processes involved in the two types of theatrical performances, we think that the emotional experience of an actor performing an action should be of a different kind from the one recollecting the action. The experience for the actor actually performing the action might be more immersive, resulting in a stronger emotional response. Similarly, spectators of PV would have a more immersive experience observing aggressive acts than spectators of SV. In our study, we want to investigate if the two different types of theatrical representations of aggressive actions, PV and SV have different effects on performers and spectators at the emotional and cognitive levels.

MATERIALS AND METHODS

In order to assess the effects of theatrical representations of violent actions on performers and spectators based on the type of representation, SV vs. PV, we developed a script based on a violent interaction in a work conflict between two colleagues. The script was especially designed for the experiment, and it followed the same units of action and timing both in SV and PV.

Script

Dan and Victor are colleagues sharing the same office. Dan forces Victor to stay at work after hours, in order to finish an important project for the company. Dan bullies Victor verbally, psychologically, and physically, finally locking him in the room. While alone, Victor destroys the project they were working on by deleting the file from the computer. Dan is outraged and destroys Victor's brand new laptop. Victor attacks Dan and stabs him with a pencil and then throws hot coffee on him. The script provided obstacles for each of the characters in attaining a goal that seemed reachable, gradually building the escalation of conflict

to aggressive behavior, in accordance with the frustration–aggression model. The script was adjusted to performers gender performers by changing the names accordingly.

The script had a wide range of violent actions: verbal humiliation, verbal aggression, aggressive behavior oriented toward objects, and physical assault. Due to the gradual escalation of conflict, the overall perspective of the script is ecological, providing the participants with a realistic setup.

Objectives

Our study aimed to investigate how the two different types of theatrical representation of violence, PV and SV affect performers and spectators at the emotional and cognitive levels, based on the different levels of immersion they provide. Understanding the effects of theatrical representations of violence will contribute to further developing theater-based interventions for regulating aggressive behavior and to establishing an ecological and ethical approach to studying human aggressive behavior.

The very first goal of this study was to investigate how assuming different agency stances in an aggression-related event could impact emotion and memory. Subjects directly performed an aggressive behavior (performer, PV), talked about an aggressive behavior (performer, SV), observed an aggressive behavior (spectator, PV), or heard somebody talking about an aggressive behavior (spectator, SV). The notion of embodiment refers to the assumption that thoughts, feelings, and behaviors are grounded in bodily states and sensory experiences (Niedenthal et al., 2005; Barsalou, 2008). In accordance with the concept of *embodiment*, we expected that a different level of physical involvement in the representation of aggressive action would be accompanied by differentiated effects at emotional and cognitive levels.

Our hypothesis is that, overall, the representation of aggressive actions will have a stronger impact on the subjects in PV condition than on those in SV, as well as on the subjects in performer condition compared to the ones in the spectator condition, at emotional and cognitive levels.

From an information processing point of view, the role of cognition in aggressive behavior can be explored considering the notion of cognitive schemas: self-schemas, normative beliefs, world schemas, and scripts (Huesmann, 1998). The more extensive and primed the networks are, the more accessible they become (Huesmann, 1998). In addition, self-schemas (i.e., the terms in which one defines oneself) and world schemas (i.e., the terms in which one defines the world around) can facilitate or inhibit further activation of aggression-related scripts. The scripts and schemas one has developed are shaped and reinforced into one's long-term memory through observational and enactive learning (Huesmann, 1998). Semantic priming can be used to investigate the impact or accessibility of a word preceded by another semantically related word or situation (Neely, 1991; McNamara, 2005).

In our study, we investigated the impact of activating violence-related cognitive schemas on word recall in an explicit memory task. Word recall tasks can be used to investigate the ways in which the activation and selection of cognitive schemas and scripts impact information retention and retrieval

(Eysenck and Byrne, 1994; White et al., 2014). The activation of an aggression-related schema can facilitate the retention and retrieval of aggression-related verbal material. In addition, an active aggression-related schema may lead to the false recall of aggression-related, previously non-studied words. Thus, the activation of violence-related schemas was operationalized as the efficient learning and processing of violence-related material and the precarious learning of violence irrelevant material. Results in word recall list tasks were previously associated with trait aggressive behavior scores, as well as with different types of priming over cognitive schemas, through various types of exposure to aggressive behavior (Vannucci et al., 2012).

Participants

Forty undergraduate students of different expertise levels (first, second, and third year of study) participated in our study (30 female, 10 male). All were acting students from two different Romanian theater universities. All of them were native Romanian speakers. The two groups from the two universities were not mixed during the experiment. Participation in the study was voluntary, with no financial or educational incentives. The procedure was approved by responsible ethics committees.

After signing informed consent forms, participants were assigned through block randomization to a role in the experiment (performer or spectator), a type of representation (either PV or SV), and a part in the script (Victor or Dan/Victoria or Dana). Separate randomizations procedures were performed in the two universities where the experiments took place. The lines of the script were adapted to the gender of the actor. This procedure resulted in 10 actors in the PV condition, 10 actors in the SV condition, and 20 spectators, 10 in each type of representation.

Design

After block randomization, students in "actor" roles had 2 days of rehearsals. On the third day of the experiment, subjects assigned as "actors" performed the rehearsed scene, and the subjects assigned as "spectators" watched the performance (either SV or PV). Just before the performance, both actors and spectators filled a pretest questionnaire asking about their current mood. Just after the end of the performance, subjects filled posttest questionnaires, including the same scale asking about current mood and items investigating emotional reactions to the performed script. Finally, they performed the word recall task (see section "Instruments").

Rehearsals and Presentation

All actors had the same amount of time for rehearsals: day 1–20 min reading, blocking for 1 h; day 2–rehearsal of two run-throughs of ∼20 min each; day 3–subjects in the performer condition performed rehearsed pieces (SV or PV) for subjects in the spectator condition; each pair of actors was watched while performing by a pair of spectators. Blocking rehearsal provided main movements requested by the script to be done by the actors.

Actors in the PV condition were presented with the blocking and then rehearsed it. Suggestions in changing the blocking were accepted if they were suitable for the progression of the action.

Blocking was limited to the minimum necessary for the action to advance (e.g., getting up, locking door, hitting laptop). Actors in SV had the same props as actors in PV on their desk. Actors in the SV condition were seated at a long table facing each other and were instructed to relate through eye contact during monlogues. We believe that this type of interaction serves at comparing the two conditions, PV and SV, as actors in both were part of a dyadic interaction.

The same daily schedule was used for SV and PV. All actors had the same directing notes, with actors in PV also having blocking directions. All participants were asked not to disclose the subject of the play to their colleagues. The actors only participated in their own rehearsals and were asked not to give feedback to their partners. There was no qualitative feedback given to the actors, and no evaluation of the characters in the play was made. The approximate duration for all performances was ~10 min, in both SV and PV.

During the presentation, some of the actors in the SV condition told parts of the monologs in the audience's direction. None of the presentations were stopped, and they all succeeded to go through. Most of the performances followed the script; however, some of them missed some lines or actions in the performance, but were not asked to redo the action. Differences from the script were not considered significant with regard to the duration and importance of the performed actions by an external and an internal evaluator.

Instruments
The Profile of Affective Distress PDA
The Profile of Affective Distress (Opris and Macavei, 2007a) is a 39-item questionnaire consisting of words that describe positive and negative emotions. The questionnaire was based on the shortened version of the Profile of Mood States (POMS, DiLorenzo et al., 1999). The construction of the questionnaire was based on a previous study (Opris and Macavei, 2005) that investigated the qualitative differences between functional and dysfunctional negative emotions, providing evidence in support of the binary model of distress (Ellis, 1994). The instrument allows the calculation of separate scores for negative and positive emotions, negative functional and negative dysfunctional emotions, as well as distinct emotions, namely, sadness, depression, worry and anxiety, anger, and annoyance (Opris and Macavei, 2007a,b). Four additional items were added, in order to comprise the entire hostility scale from the Positive and Negative Affective Schedule (PANAS; Watson and Clark, 1999), which was also used as an individual scale in our study. All items are scored on a 5-point Likert scale, with higher scores indicating higher levels of experiencing a particular emotion. The questionnaire is reported to have good psychometric properties. Internal consistency is high, with a Cronbach's alpha of 0.94 (Opris and Macavei, 2007b). Content and construct validity were also assessed, proving that the questionnaire is a valid measure of affective distress, as well as negative and positive emotions (Opris and Macavei, 2007a,b). The hostility scale of the PANAS has also shown very good psychometric properties, with a Cronbach's alpha of ~0.80 or above (Watson and Clark, 1999).

Presence Questionnaire
The presence questionnaire (PQ) (Witmer and Singer, 1994) was originally developed to assess the experience of presence in virtual environments, defined as the subjective experience of being in one place or environment, even if one is physically situated in another (Witmer and Singer, 1994, 1998). The presence questionnaire has 28 items on eight dimensions. We adapted the questionnaire to the context of a theater performance. Participants indicated on a 0–7 Likert type scale from "not at all" to "very much," the degree to which they felt the experience of being in the place and context described by the play. The questionnaire items check for realism of action, visual aspects, sounds, involvement, distraction, time awareness, and distancing/closeness from action and characters.

Word Recall Task
To assess the activation of violence-related schemas, we created a word recall task. The task was administered at ~5 min after the end of the representation, at the same time for both spectators and performers. The task consisted of intentionally memorizing a list of 45 words from three lexical families: violence/aggression (15 words), peacefulness (15 words), and neutral words that did not fall into any of the previous categories (15 words). Each subject was asked to read the list of words at a normal pace (the words from the three lexical families were presented in a mixed order) and to try to remember as many as possible. Immediately afterward, the participants were required to perform a set of simple mathematical calculations for 2 min (e.g., 20 + 32=; 24 − 32=). The distraction procedure was meant to interfere with working memory, so that the effects of active cognitive schemas could be observed. After the distraction task, the subjects were asked to write down all the words they could recall from the initial list, in no particular order. This procedure allowed us to explore the effects of the role and the type of play on the activation of cognitive schemas related to violence. We subsequently counted the number of words recalled from each category, as well as words that were not previously presented (i.e., falling into a false memory category).

Assessing the Actions in the Script That Elicited the Most Intense Emotions
Three items were created to estimate which actions from the script elicited the most intense emotions. The first item asked the subject to name the action or the moment in the script/play that had elicited the most intense negative emotion. Subsequently, a list of 13 negative emotions was provided (fear, anger, guilt, shame, embarrassment, hurt, sadness, annoyance, depression, worry, envy, jealousy, contempt) on which the respondent could check the identified emotion and rate its intensity on a 0–10 Likert type scale. A 14th position was left empty for the subject to fill in, in case he/she felt something else. A second item was created to give the subjects the possibility to name the most important moments during the play when they experienced the most intense negative or positive emotions. The respondents had to describe the top 5 relevant moments, to name the emotion associated with each one, and to rate the intensity of that emotion on a 0–10 Likert scale. The third item described seven of the most

relevant aggressive moments in the script and asked the subjects to rank them from the most to the least intense. The seven moments were (1) Dan repeatedly slaps Victor's face, (2) throwing hot coffee on Dan's face, (3) locking Victor in the room against his/her will, (4) destroying the laptop, (5) verbally humiliating Victor, (6) stabbing Dan's arm with a pencil, and (7) grabbing and eating Victor's food. For each of these moments, the participants had to name the main emotion they felt and rate its intensity on a 0–10 Likert type scale.

These three items were created to help estimate the moments during the play at which the participants felt the most intense emotions. In addition, the items allowed respondents to express both negative and positive emotions in relation to aggressive behaviors.

The choice of statistical methods we used in our analysis was guided not only by the type of data that we collected but also by the degree to which our data met the statistical assumptions required for a particular analysis. For continuous and normally distributed data, we preferred parametric analysis. However, if normality assumptions for our distributions were not met, we reported the results of non-parametric statistics. To reduce type I error due to multiple comparisons between groups and subgroups, and across multiple dependent variables, we used the procedure described by Benjamini and Hochberg (1995) to control the false discovery rate (FDR). For each family of hypotheses, we only considered as statistically significant the results of those tests with an associated p-value smaller than the largest p falling below the critical value calculated with the Benjamini and Hochberg (1995) procedure (B–H). This critical value was calculated as $(i/m) \times Q$, where i is the rank of the p-value in an ascending ordered list of all p-values, m is the total number of comparisons, and Q is the value of the chosen FDR, which, in our case, was 0.05. All p-values smaller than the largest one that fell below the corresponding B–H critical value were considered significant, even if they were larger than their specific critical values. For non-parametric statistics, in order to analyze the interaction between type of play and role in the experiment (performed vs. simulated play X actor vs. spectator role), we first performed an omnibus test comparing all four subgroups of the interaction term. We performed pairwise comparisons of the subgroups only if the probability associated with the omnibus test was below the standard two-tailed $\alpha = 0.05$. The p-value for the omnibus test was not taken into account in the B–H procedure, but the values for subsequent pairwise comparisons were considered together with the results for the main effects for type of play and role in the experiment.

RESULTS

Impact of Play on Emotional Experience

We looked at the impact that the type of play (performed vs. simulated) and role (actor vs. spectator) had on the emotional experience of the participants, by analyzing mood changes on the standardized items of the PDA + and the additional one for assessing hostility from PANAS. Change scores for each scale (depression, sadness, fear, worry, anger, annoyance, hostility, and positive affect) were computed as posttest *minus* (-) pretest scores and compared using non-parametric tests. The B–H procedure, as described above, was applied to all pairwise comparisons, across all emotion scales.

Non-parametric between-groups comparisons using the Mann–Whitney test on the change scores identified a significant difference on depression, when comparing the type of play (main effect of performed vs. suggested violence; see **Figure 1**). Higher ranks (indicating higher scores) were identified for the performed play, $U = 87.00$, $Z = -2.90$, $p = 0.004$, B–H critical value (c.v.) = 0.005. The analysis also indicated significant overall differences for depression change scores between the four cells that emerged from the interaction between type of play and role in the experiment (performed vs. simulated play X actor vs. spectator role), Kruskal–Wallis H (3) = 10.21, $p = 0.017$. Pairwise comparisons indicated a single difference that reached the statistical threshold, between the actors in the performed play and the actors in the simulated play, Mann–Whitney $U = 8.00$, $Z = -3.06$, $p = 0.00222$, B–H c.v. = 0.00227. Higher ranks were present for actors in the performed type of play (see **Figure 2**). No other difference emerged when comparing changes in emotional experience for all the other scales (ps > 0.05 or above B–H c.v.).

Next, we identified the most intense emotions that the participants experienced and the moments in the play that had generated them (using the three items we developed in this study).

First, we looked to see if the frequency of the most intense emotion reported by the participants during the artistic performance varied by the type of play or by the role assigned in the experiment (item 1). Non-parametric χ^2-tests comparing the frequency of four categories of emotions (anger, fear, depression, and positive emotions), as reported across the types of play, the two roles, and the four cells resulted from their combination, showed no significant differences for any of these emotions (all ps > 0.05).

Item 2 asked participants to describe the moments in the play that had led to the most intense emotional experiences and the emotions that they have experienced. Emotions listed by participants were grouped under five categories: anxiety, depression, anger, disgust, and positive emotions. Non-parametric between-group comparisons and the B–H procedure applied to this outcome indicated no significant rank differences for the role in the experiment, type of play, and their combination (all ps > 0.05 or above B–H c.v.).

When asked to report on the emotions generated by a prespecified list of moments selected from the plot (item 3), the actors more frequently reported that they experienced positive emotions, and this difference was statistically significant based on a Mann–Whitney non-parametric analysis, $U = 122.00$, $Z = -2.41$, $p = 0.016$, B–H c.v. = 0.025 (**Figure 3**). No differences were found for the type of play or the interaction effect (ps > 0.05 or above B–H c.v.).

Effects of the Play on Presence

In order to assess the presence that the participants experienced during the play, we conducted a two-way analysis of variance
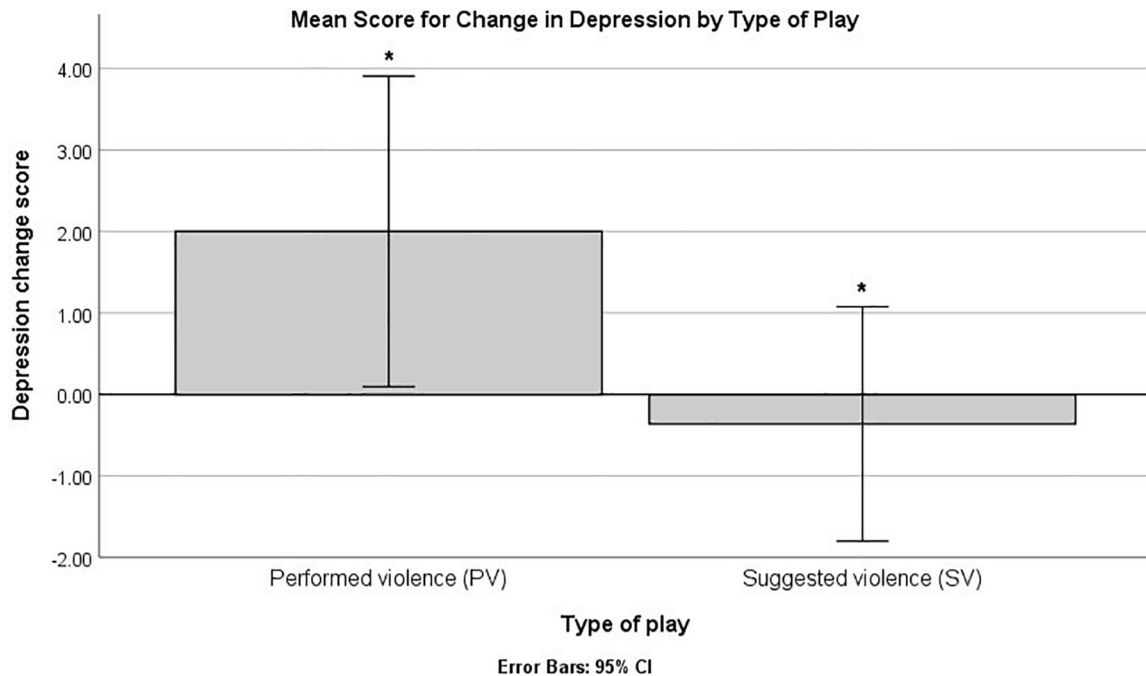
FIGURE 1 | Mean scores for depression change scores by type of play. The bars marked by "*" indicate statistically significant differences based on a non-parametric analysis and B–H procedure for controlling false discovery rate (FDR).
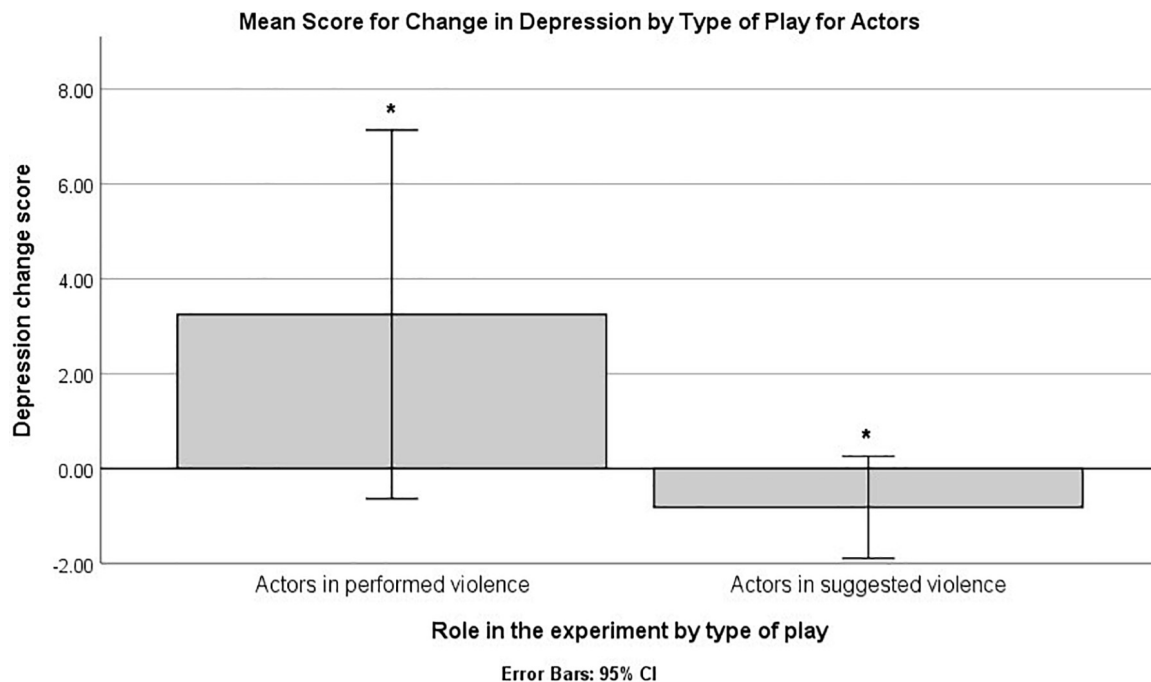

FIGURE 2 | Mean scores for depression change scores by type of play for actors in the experiment. The bars marked by "*" indicate statistically significant differences based on a non-parametric analysis and B–H procedure for controlling false discovery rate (FDR).

(ANOVA), using the type of play, role in the experiment, and their interaction as between-subject factors in the model. The results indicated a significant main effect for the type of play, $F(1,$ 36) = 6.38, $p = 0.016$, $\eta^2_p = 0.15$, B–H c.v. = 0.025, but not for the role in the experiment, $F(1, 36) = 3.56$, $p = 0.067$, $\eta^2_p = 0.09$, B–H c.v. = 0.05, or for the interaction term, $F(1, 36) = 0.82$, $p = 0.371$,

FIGURE 3 | Mean frequency for positive emotions by role in the experiment (item 3). The bars marked by "*" indicate statistically significant differences based on a non-parametric analysis and B–H procedure for controlling false discovery rate (FDR).
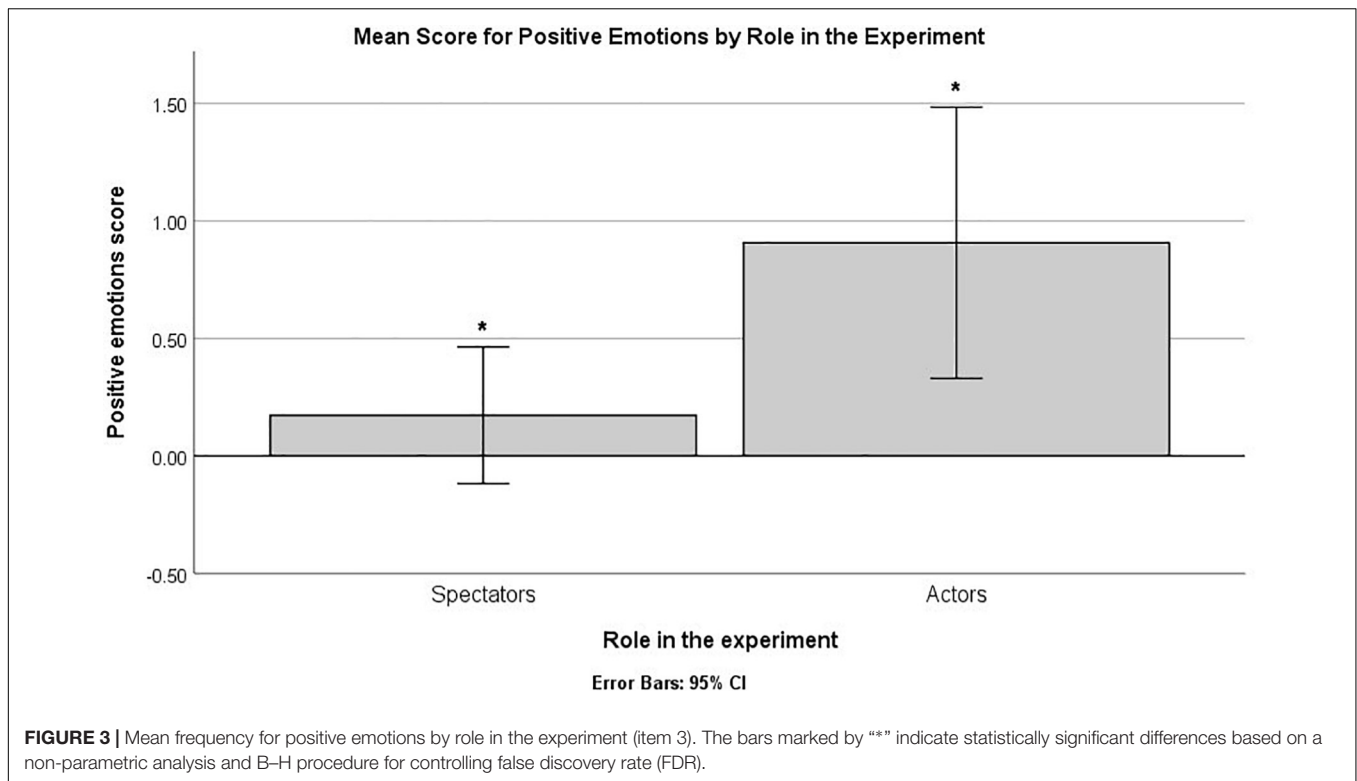
$\eta^2{}_p = 0.02$. The comparison of the estimated marginal means indicated that the significant effect was due to higher scores in the performed violence group, as compared to the simulated violence group (see **Figure 4**).

Effects of the Play on Cognitive Processes

In order to assess the effects on cognitive processes, we analyzed the effects of the type of play, role in the experiment, and their combination, on performance in the word recall task. The dependent variables that we introduced in the analysis were the number of words under the violence category, the number of words opposed to this category, and the number of neutral words (not falling under any of the previous categories). We conducted a separate analysis for both true words recalled from the list, as well as for erroneous recalls (words falling under one of the above categories, but which were not on the list). This strategy yielded six dependent variables: real targets for violence-related words, real targets for words opposed to violence, real targets for neutral words, and fake recalls for each of them. The B–H procedure was applied across all these outcomes.

A significant overall difference emerged for neutral words when comparing all four cells representing the interaction between type of play and role in the experiment, Kruskal-Wallis $H(3) = 14.08$, $p = 0.003$. Comparing each pair of cells, we found (Mann–Whitney test) that spectators in the simulated play had a significantly higher ranks (correctly recalled more neutral words) than spectators in the performed violence play $U = 16.50$, $Z = -2.69$, $p = 0.007$, B–H c.v. = 0.005, actors in the simulated

play, $U = 22.50$, $Z = -2.65$, $p = 0.0080$, B–H c.v. = 0.0083, and actors in the performed violence play, $U = 10.50$, $Z = 3.16$, $p = 0.002$, B–H c.v. = 0.002 (**Figure 5**). No other comparison for neutral words was significant ($ps > 0.05$ or above B–H c.v.). In addition, no effect of type of play, role in the experiment, or omnibus comparison between all cells reached statistical significance for any of the other dependent variables (all $ps > 0.05$ or above B–H c.v.).

## Association Between Emotional Experiences and Cognition

We examined whether there is an association between the emotional experience of the participants and cognitive variables. Namely, we were interested to see if their emotional state at the end of play was associated with their performance in the memory recall task. For this analysis, we used the posttest score on all the PDA + subscales and the one extracted from the PANAS, and all the six scores derived from the memory task. None of the correlations reached the statistical threshold (all $ps > 0.05$ or above B–H c.v.).

DISCUSSION

Our hypothesis was that the representation of aggressive actions will have a stronger impact on the subjects performing a realistic theatrical representation of a violent action PV than on those involved in SV, and it was partially confirmed by our results. Subjects in the PV group reported significantly larger increases of scores on the depression scale of PDA, compared
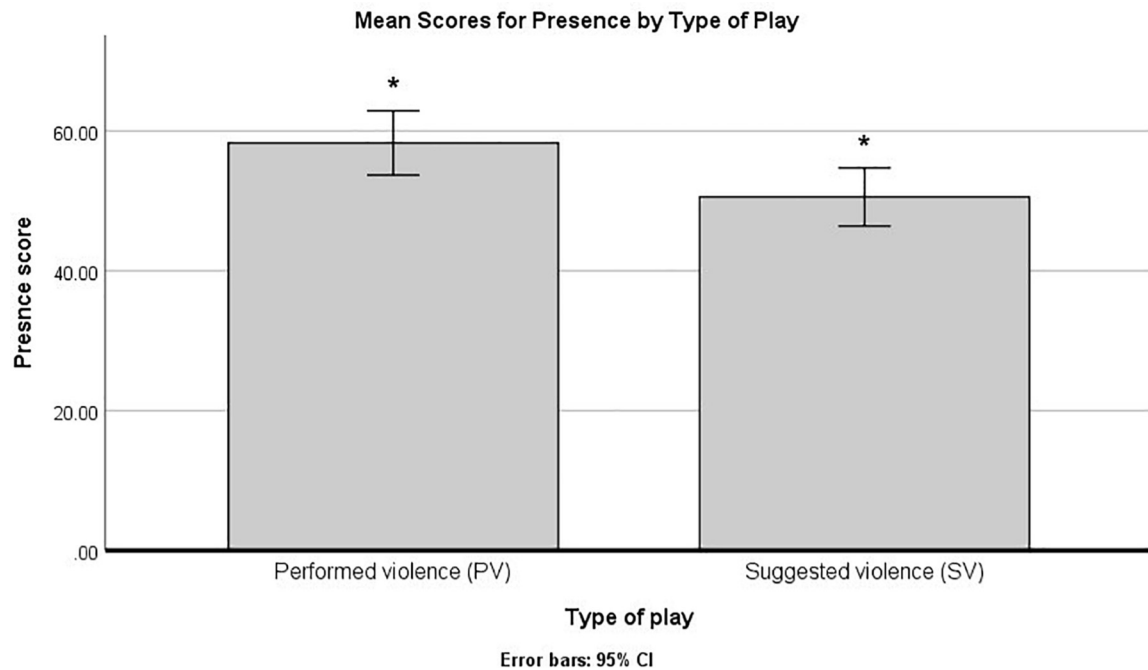
FIGURE 4 | Mean scores for presence by type of play. The bars marked by "*" indicate statistically significant differences and B–H procedure for controlling false discovery rate (FDR).
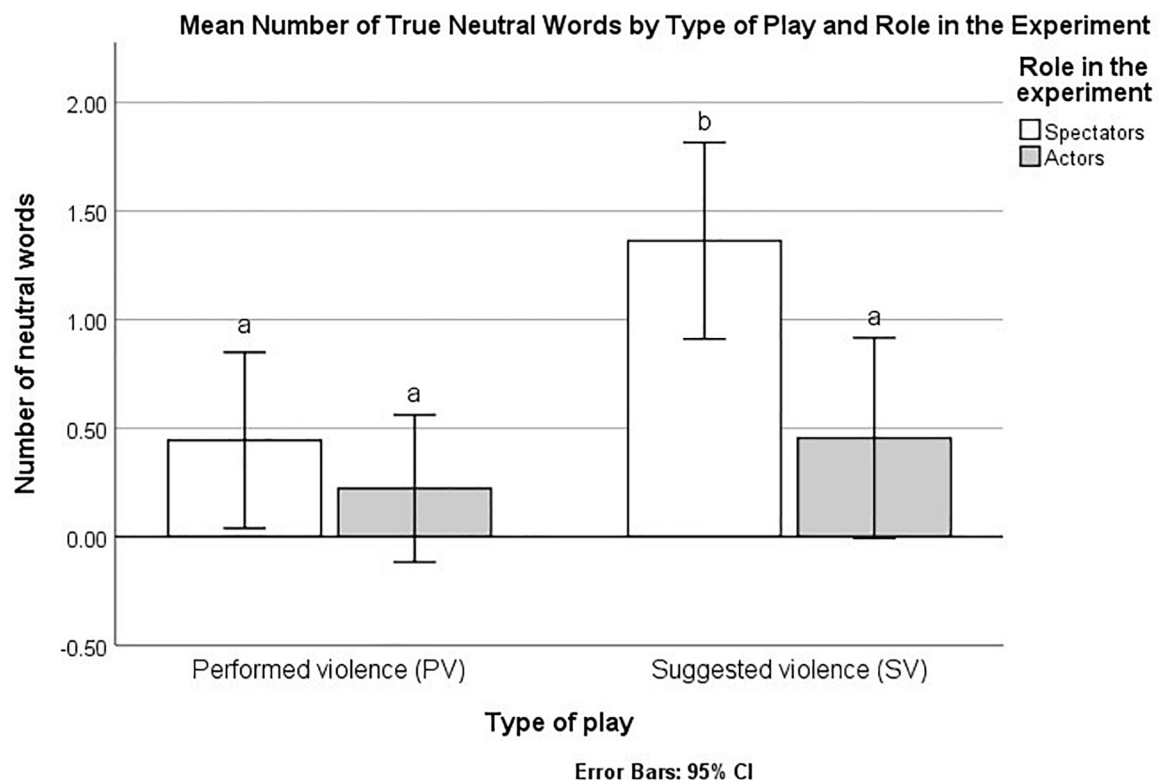
FIGURE 5 | Mean frequency of true neutral words recalled by type of play and role in the experiment. Bars marked by different letters indicate statistically significant differences based on a non-parametric analysis and B–H procedure for controlling false discovery rate (FDR).

to subjects in the SV group. Moreover, performers in the PV group had a significantly larger increase on the depression scale than performers in the SV condition. A surprising result was that actors reported more positive emotions toward violent actions of the script.

Exhibiting aggressive behaviors in a performed-violence scenario influenced the emotional experience of actors more than that of the spectators and differentially activated the cognitive structures related with violence and aggression, with spectators in the SV condition remembering significantly more neutral words than actors in the experiment, both in the PV and SV conditions. In addition, the memory recollection of neutral words was associated with the type of performance, with SV spectators remembering more neutral words than PV spectators. Based on this result, we can assert that watching the recollected experience of violence has a lower effect in activating the cognitive schema related to violence than performing the aggressive action, seeing it, or recollecting it.

These findings suggest that the embodiment of perceptions and sensations associated with the actual representation of aggression might have a major impact at emotional and cognitive levels. Differentiated emotional and cognitive outcomes of PV and SV correspond to different levels of perceived immersion, with more realistic representations having a stronger impact on the participants. This explanation is supported by the results indicating that participants in PV were more immersed in the performance than participants in SV.

In addition, our findings point to an often disregarded issue of the effects of performed actions on performers. While extensive studies are dedicated to the effects of watching violence, very few explore the effects of performing fictional violence. Some previous data states the importance of this direction of research. A study with a cohort of 800 actors found that they are more affected by depression than the mean population (Maxwell et al., 2015). Some qualitative accounts attribute at least part of this effect to fictional experiences of violence, with actors reporting posttraumatic stress disorder (PTSD)-like symptoms in connection to their work, particularly with the repeated embodiment of scenarios involving rape, physical violence, grief, and suicide (Robb et al., 2018).

The most striking result is that actors reported the presence of positive affect in relation to aggressive actions in the representation. We can consider this result as an experimental support of the two-pedal model of aggression (Elbert et al., 2017, 2018). Qualitative observations point out that reactions of disgust and amazement would accompany the first readings of the most violent actions during rehearsals. After several cycles of rehearsals, actors would end up finding them amusing. Laughter can be seen as a coping mechanism employed to change negative emotions into positive ones. Laughter is cited as very present at rehearsals of texts with high levels of violence such as "Blasted" by Sarah Kane (Kane, 1995). The actress performing Cate states in her recollection of the rehearsals (Ashfield, 2015) that despite rape, cannibalism, and sadistic actions, laughter was a common presence: "*At the read-through, some people at the Court were saying that it would be so dark and hard to do. But it was*

the opposite in rehearsals: we were all laughing all the time" (Ashfield, 2015).

Reactive aggression is described as the response to a threat, which leads to a level of high arousal accompanied by negative affect valences. Appetitive aggression describes violent actions accompanied by positive affect (Fontaine, 2007; Weierstall and Elbert, 2011). In the two-pedal model of aggression, Elbert states that through the repetition of aggressive behaviors, reactive aggression can change under the influence of coping mechanisms in appetitive aggression. Interviews with former war combatants offer support for the effects of repetitive aggressive acts. Former fighters describe how their initial repulse toward killing changed, after a habituation phase, into an increasingly positive affect (Elbert et al., 2017, 2018). Reactive aggression is determined by high levels of emotional arousal with a negative valence, such as fear, hostility, anger, and rage. Negative emotions driven by the aggressive act can be replaced by feelings of satisfaction, enjoyment, and thrill. Elbert proposes a biological substrate for this change, a possible release of endorphins, to compensate for negative states driven by a high arousal situation (Elbert et al., 2017, 2018).

The actors in the PV condition had significantly higher depression scores at the end of the representation, but they also experienced significantly more positive emotions toward the violent actions in the script. Positive emotions toward aggressive behavior might be attributed to a combined effect of the role in the experiment and to the repetition of the violent actions. While further experiments are needed to elucidate if these changes could have long-term effects on performer behavior, our experiment shows that some of the subjects report positive emotions toward performed aggressive actions. Further control would be needed to assess a direct link between repeating the actions and the occurrence of positive emotions.

The fact that the PV condition and being an actor had an overall higher impact on our participants across all outcomes (as compared with SV and being a spectator) is consistent with the idea that the observed effects are related with the embodiment of aggressive behavior. The more participants embodied aggressive behaviors (e.g., performing the action instead of just talking about it or seeing it), the stronger the consequences they experienced.

Our study is not without limitations. First of all, the small sample size meant that our statistical power was generally low, and thus, many relevant effects might not have been identified. Second, we mainly relied on self-report measures, which did not allow for exploring other relevant effects of the representation on the experience of the participants (e.g., psychophysiological reactions). Third, our script was complex and included several violent actions, together with other elements that might have altered the emotional responses of the participants (e.g., being bullied, not just being aggressive), and it is hard to point at the exact components responsible for the effects we observed. Moreover, despite our efforts to make the two types of play as equivalent as possible, the fact that the actors in one condition interacted physically and those in the other one just through eye contact might have altered the correspondence between the two conditions. Future

CONCLUSION

Given its constant presence across human civilization, violence has taken its place in all artistic and cultural forms of expressions. As such, theater has a long history of representing violence, from antiquity to present times, and while it is supposed that the cathartic function of representing violence through tragedies would have a beneficial effect on spectators, there is little empirical evidence on the positive or negative impact of artistic representations of violence for the audience (Przybylski and Weinstein, 2019). While in most countries there are public restrictions consisting in ratings of violence in movies or depiction of violent acts on TV, we are still very far from understanding the impact that violence representations have on the human brain and how we should deal with it at societal and personal levels. Strong data points to effects of media violence, including video games (Bushman and Anderson, 2001; Anderson et al., 2010) in determining increased aggressive behavior, but theatrical representations of violence could have therapeutic effects at individual and societal level. Theater practice is a very important form of complex human communication, based on cooperation. While dramatic theater has action at its core, and consequently representation of conflict, in the second half of the last century, new forms of postdramatic structures turned away from conflict (Heim, 2016). Shifting form conflict representation to postdramatic structures enhances the social functions of theatrical representation, like empathy development, community building, experience sharing, and collective thinking.

Regarding the theatrical esthetic traditions of representing or not representing violence, corresponding to the Greek and Roman theater, respectively, our data suggest that each of them has differentiated effects at emotional and cognitive levels, for both spectators and performers. Recollecting violence on stage might have a minimal effect, suggesting the possibility of distancing by both performers and spectators. The explicit depiction of violent actions in a realistic manner has a stronger emotional load. Moreover, performing violent acts might even increase positive emotions toward aggression, as our actors experienced positive emotions toward such acts. This result could be explained by the two-pedal model of aggressive behavior developed by Elbert et al. (2017, 2018). While our experiment does not provide information on the long-term effects of representing violent actions, further studies are required to analyze this phenomenon.

The practice of theater therapies seems to acknowledge that performing aggressive behavior is a dangerous game. Most interventions aimed at reducing aggressive behavior work with symbolic actions and imaginary objects – as in Bergman's drama therapy method (Bergman and Hewish, 2015). Using dramatic metaphor in the therapeutic process lies at the core of drama therapy practice (Emunah, 2009; Landy, 2009). Brecht (1949) introduced the concept of distance in his political theater. The concept was further developed by Landy in his roleplay drama therapy system (Landy et al., 2003; Landy, 2009). The idea of distancing from fictional action is present in philosophers' thoughts on theater, from Plato to Rancière (2008), and this points to the need for an active form of spectatorship, while showing philosophers', theater makers', and therapists' constant preoccupation for separating action from its emotional load.

Anthropological studies on many societies have documented highly sophisticated performative scenarios for regulating aggressive behavior, sometimes performed in highly ritualized theatrical setups, like the courts of Kogu, song duels of the indigene populations of Greenland and Alaska, and all sorts of battles, which forbid killing or harming (Schechner, 2003). While generating new social rituals is beyond a realistic scope, by using the intrinsic power of theatrical play, grounded in scientific research, we could have a strong impact at the individual and perhaps societal level, by providing tools for promoting the self-control of aggressive behaviors. Theater has a long history of therapeutic interventions in modern times, starting with Moreno's psychodrama. The idea of using theater for promoting adaptive behaviors, especially for regulating violence and aggression, spans a history of more than 30 years, with examples such as the Geese Theater Company that works with offenders. However, strong empirical evidence is still needed in order to prove the beneficial effect of using theatrical representations for this purpose (Bergman, 2009). Our study is a starting point for an empirical and experimental research program that would investigate the use of theater to understand and manage violent behavior.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Clinical Psychology and Psychotherapy, Babeş Bolyai University, Cluj-Napoca, Romania. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individuals for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

AB, BM, and SM participated in designing the experiment and conducting the experiment. AB wrote the text for the experiment and conducted the rehearsal process. SM analyzed the data. All authors participated in interpreting results and writing process.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.01785/full#supplementary-material

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Could Acting Training Improve Social Cognition and Emotional Control?

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Acting is fascinating from psychological and neuroscientific perspectives, as it involves an individual creating an endogenously generated, accurate physical and verbal performance of another's emotional and cognitive states. However, despite the popularity of acting, the practice has received limited interest from cognitive neuroscience (Goldstein and Bloom, 2011, although see Brown et al., 2019), while other art forms have raised much greater attention, including music (e.g., Koelsch, 2014), visual art (e.g., Bolwerk et al., 2014), literature (e.g., Jacobs, 2015), poetry (e.g., Zeman et al., 2013), and dance (e.g., Karpati et al., 2017). Nevertheless, acting requires a range of social, cognitive and affective skills of concern to neuroscience, including memory, verbal ability, emotional control and social cognitive processes like empathy and Theory of Mind (ToM; Noice and Noice, 2006; Goldstein and Winner, 2012; Winner et al., 2013).

Two questions are of particular interest: (i) What are the neural mechanisms that allow actors to produce realistic performances of characters other than themselves? (ii) What long-term impact does acting training have on (social) neurocognition? Following Goldstein and Winner (2012), we explore how neuroscientific research into ToM, empathy, and emotional processing, is beginning to illuminate how actors manifest characters. Additionally, we propose that engagement with acting may in turn improve social competencies by inducing changes in the neural networks underlying social cognition.

APPROACHES TO ACTING

Debate over which techniques allow actors to produce realistic performances has a long history, with numerous schools theorizing and prescribing methods for acting practice (for review see Noice and Noice, 2013; Gallagher and Gallagher, 2019). These include debates surrounding whether an actor should (i) understand/elaborate on a character's mental life, draw on personal experience and replicate the emotions of the character during performance (Stanislavski, 2013), (ii) remain detached, perfecting and portraying the character's outward behaviors (Diderot, 1957), or (iii) actively embody the character, truthfully experiencing emotions within the imaginary world of the performance (Meisner and Longwell, 1987). Importantly, the approach an actor takes to create and perform a character will likely influence the cognitive and affective processes involved. As our intent is to provide a brief commentary on neuroscience's role in understanding acting, we avoid committing to any specific approach, instead understanding acting in the broadest sense as the art or practice of representing a character for the purpose of performance (Merriam-Webster., 2018). However, it is worth keeping in mind that many approaches to acting exist and that future neuroscientific research on acting must take this into account.

THEORY OF MIND AND EMPATHY

The ability to represent others' mental states, referred to as ToM or cognitive empathy, plays a critical role in understanding and navigating social situations (Frith and Frith, 2006). ToM represents a socio-cognitive phenomenon, involving abstract, propositional knowledge about another's mental state (Happe et al., 2017; Kanske, 2018; Preckel et al., 2018). Depending on the actor's approach to character performance, reflection into the character's mental life may be important part of the character creation process, involving exploration of the history, motivations, beliefs and values of the person to be portrayed, often going well beyond the information contained within the script (Noice and Noice, 2013). In other words, for many actors, creating a character involves the complex application of ToM. Brain regions involved in ToM include superior temporal sulcus, temporal poles, medial prefrontal cortex, temporoparietal junction, and posterior cingulate/precuneus (Schurz et al., 2014). Additionally, ventromedial prefrontal cortex and temporoparietal junction are implicated in self/other processing and judgments (Denny et al., 2012) and it has been suggested that overcoming self–other interference and ToM are deeply integrated processes (Qureshi et al., 2020). Moreover, simulating others has been shown to influence self-knowledge, with trait and memory measures becoming similar to a simulated other after adopting their perspective (Meyer et al., 2019). In relation to acting, a recent neuroimaging study demonstrated that when trained actors answered questions from the first-person fictional perspective of a character, in contrast to their own perspective, dorsomedial prefrontal cortex/superior frontal gyrus and ventromedial prefrontal cortex are deactivated, suggesting acting may involve the suppression of self-processing (Brown et al., 2019). Concurrently, increased activation was found in the precuneus, a region belonging to the brain's dorsal attentional network, involved in episodic retrieval, attentional orienting, and visual imagery (Fletcher et al., 1995; Cavanna and Trimble, 2006; Spreng et al., 2010). Interestingly, a similar pattern of deactivation in prefrontal regions was observed when the actors were asked to respond to questions in their own perspective while adopting a British accent compared to no accent; however, no precuneus activation was observed for this contrast. Brown and colleagues interpret this finding by suggesting that the pretense of adopting an (unspecified) other's attributes may require suppression of the self, while acting out a specified character could require an additional dispersion of self-related attentional resources. Interestingly, they relate this proposed dispersion to the idea of *split* or *duel consciousness,* an important concept in acting theory (Diderot, 1957; Stanislavski, 2013), describing the constant shifting of an actor's attention between the conscious awareness of the self during the performance and the perspective of the character existing in the world of the play. Brown et al. thus argue that precuneus activation may reflect the attentional maintenance of the actor's identity as a conscious self while adopting the fictional character's perspective.

In contrast to ToM, empathy (also referred to as emotional or affective empathy) has been defined as sharing or mirroring the feelings of another, while being aware that the emotion originates from another person (De Vignemont and Singer, 2006). Neurally, empathy involves activation of the same brain networks during the shared emotion as would be active during a first-hand experience (Gallese, 2003; Wicker et al., 2003; Singer and Lamm, 2009). For example, the experience of pain and witnessing another experiencing pain results in the activation of a core network consisting of the anterior insula and anterior cingulate cortex (Singer et al., 2004; Jackson et al., 2005; Corradi-Dell'Acqua et al., 2016). Importantly, neuroimaging evidence has demonstrated that the underlying neural mechanisms involved in empathy and ToM are distinct and separately contribute to social competencies (Blair, 1995, 2005; Kanske et al., 2015, 2016). The role of empathy in acting practice has long been an important point of theoretical discussion (for review see Gallagher and Gallagher, 2019). Moreover, empirical work suggests that acting training may improve behavioral measures of empathy (Goldstein and Winner, 2012). However, the means by which the neural networks underlying empathy are recruited/altered during acting remain unknown. Given the perceived importance of empathy in acting practice, a neuroimaging approach may offer novel insight into the role socio-affective phenomena play during dramatic performance.

EMOTION REGULATION AND GENERATION

During performance an actor must portray a character, including facial expressions, vocal inflection, movement, and body language. In addition, the actor often has to reflect and respond to other performers on stage. Under these conditions, an actor must not only empathize with and take the perspective of the character, but also regulate and spontaneously generate appropriate emotional states. The process of emotion regulation involves altering ongoing emotional states by employing regulatory cognitive processes; including producing changes in attention and applying cognitive control strategies (Gross, 1998, 2002; Ochsner and Gross, 2005; Kanske et al., 2011). Importantly, and depending on circumstance, there are more or less adaptive/dysfunctional ways of regulating emotions (e.g., acceptance or suppression of an emotional experience) and successful emotion regulation is linked to a range of psychological, social and physical health outcomes (Gross, 2002, 2008). For example, Gross and Levenson (1993) demonstrated that the sympathetic nervous system activity of individuals instructed not to show emotion through facial expressions when presented with disgusting stimuli was higher than in individuals allowed to display disgust through their face, thus suggesting that acceptance of negative emotions may be more beneficial than emotional suppression. Additionally, studies have begun to demonstrate that affective responses may be modified by consciously taking the perspective of other people (i.e., ToM; Gilead et al., 2016; McDonald et al., 2020). For example, Gilead and colleagues showed that activity in the medial prefrontal cortex and amygdala of participants taking the perspective of either a sensitive/squeamish or tough/resilient individual

differentially simulated the expected negative affective state of the target. This finding suggests that taking another's perspective impacts our own ability to regulate and experience emotions. Given that actors must regulate their emotions when rehearsing and performing a character, we propose that they may be more proficient in adopting and utilizing emotion regulation strategies. In a similar vein, Goldstein et al. (2009) has suggested that actors are likely to be more accepting of their emotions and less likely engage in emotional suppression. Goldstein et al. (2013) found that a year of acting practice decreased the use of emotional suppression in children aged 7–10, while adolescents majoring in acting at high school (compared to other art majors e.g., music) used less suppression. Additionally, 4–5-years olds randomly assigned to an 8-week drama condition (compared to block building or reading) showed increased emotional control (i.e., inhibition of affective responses to observed or discussed distress; Goldstein and Lerner, 2018).

Complementary to the process of emotion regulation is the process of endogenous emotion generation, which involves emotions being experienced by an individual as a result of internal cognitive and affective processes, often in the absence of external stimuli. In the context of acting, emotion generation is usually a very deliberate, voluntary process occurring in the specific contexts of a performance, often with other actors present (Noice and Noice, 2013). Engen et al. (2017) examined participants endogenously generating emotions during functional neuroimaging and found that the brain's salience network (involved in detecting and filtering task-relevant stimuli; Seeley et al., 2007), including the anterior insula and dorsomedial prefrontal cortex, as well as basal ganglia and midbrain structures, were implicated in initial affect generation. In contrast, default mode and frontoparietal control networks (implicated primarily in non-task related, resting states and cognitive control processes, respectively; Spreng et al., 2010) were involved in elevated affect even after active generation had ceased, with the emotional states only being deactivated when suppressed by the participants. These findings thus demonstrate that people are in principle capable of spontaneously generating emotional states, as well as manipulating and regulating their emotions by adopting another's perspective.

Importantly, however, actors vary in the techniques used to portray the emotions of a character. If an actor is inclined to actively embody the character's emotional state this will likely require different emotion regulation/generation strategies and neural processes (e.g., De Gelder, 2006; Niedenthal, 2007; Nummenmaa et al., 2014) than an actor that uses simulation to portray the emotional behaviors (e.g., Decety and Grèzes, 2006). Thus, any comprehensive understanding of emotion regulation and generation in actors must take into account the actor's approach to performing emotions. Based on this, a goal of future research should be to examine the neural underpinnings and overall impact of emotional processing across the acting experience. Finally, acting could also present a means to examine the complex interplay between bottom-up empathic mirroring of emotions and top-down emotional regulation, which partially share underlying neural circuitry (Singer and Lamm, 2009; Ochsner et al., 2012) and may be deeply interconnected processes.

THE IMPACT OF ACTING

A growing body of evidence shows that socio-affective and socio-cognitive brain networks are principally plastic, with interventions such as mental training practices (e.g., affect- or metacognition-focused meditation) inducing changes in cortical morphology (Valk et al., 2017; Trautwein et al., 2020). With respect to acting, Schellenberg (2004) showed that 6-year-old children assigned with 6 weeks of acting training had improved behavioral ToM measures compared to children assigned to 6 weeks of music practice. Similarly, Goldstein et al. (2009) showed that adolescent and adult actors have above average skill in ToM tasks, but not above average levels of empathy. Somewhat contrasting with this result, Goldstein and Winner (2012) followed children and adolescents receiving 1 year of either acting or other arts training (i.e., visual arts, music) and assessed empathy and ToM before and after training. In both groups, those receiving acting (but not other arts) training showed significant gains in empathy and ToM. Additionally, Nettle (2006) demonstrated that actors score slightly higher levels of empathy than non-actor controls. These findings suggest that both ToM and empathy may be amenable to improvement through acting training, however, a goal of further research should be to tease apart the conditions (e.g., age, acting experience, acting techniques, personality measures) under which such improvements occur.

Based on these initial findings, we propose that actors, by repeatedly engaging the first-person fictional perspective required to produce a character, may induce changes to the cortical networks underlying social cognition. Such changes could occur as the result of Hebbian learning mechanisms which involve the strengthening of neural network functional and effective connectivity due to frequent network engagement (Keysers and Gazzola, 2006). Moreover, specific strengthening of these social networks may crucially contribute to improvements in an actor's ability to portray a particular character. Finally, by engaging in different characters on a regular basis, an actor is exposing the networks underlying ToM, empathy and emotional processing to a broad variety of novel social stimuli. It is via repeated exposure that, we contend, generalized improvements in social cognitive abilities arise from prolonged engagement with acting.

Taken together, these initial behavioral studies suggest that engagement in acting training may indeed improve aspects of social cognition. Given that many mental disorders involve impairments in social cognition (Gallagher and Varga, 2015) and that social abilities are important in both educational and business settings (Blakemore, 2010; Hülsheger and Schewe, 2011), we suggest that future research into acting's psychological impact may offer new avenues to understand and improve social skills. For example, there is a burgeoning literature exploring theatrical techniques as a possible intervention for autism spectrum disorders (Corbett et al., 2011, 2019; Gabriel et al., 2016), while a recent study showed 6 weeks of improve theater training produced increased creativity and psychological well-being in participants (Schwenke et al., 2020). Finally, we promote a broader discussion between the fields of acting theory/pedagogy

and cognitive neuroscience, as we believe exchange between these disciplines will provide both a deeper understanding of the actor's craft as well as motivate novel insights into the neural networks underlying ToM, empathy and emotional processing.

AUTHOR CONTRIBUTIONS

BM, TG, and PK contributed to the conception and writing of this review. BM prepared the draft for submission. All authors contributed to the article and approved the submitted version.

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Feeling for the Other With Ease: Prospective Actors Show High Levels of Emotion Recognition and Report Above Average Empathic Concern, but Do Not Experience Strong Distress

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Differences in empathic abilities between acting, dance, and psychology students were explored, in addition to the appropriateness of existing empathy measures in the context of these cohorts. Students (N = 176) across Higher Education Institutions in the United Kingdom and Europe were included in the online survey analysis, consisting of the Reading the Mind in the Eyes (RME) test, the Interpersonal Reactivity Index (IRI), the Empathy Quotient (EQ), and the E-drawing test (EDT), each measuring particular facets of empathy. Based on existing evidence and our understanding of the discipline practices, we predicted that acting students would perform the best at identifying people's emotional expressions but might lack other cognitive or affective empathy skills, particularly those related to emotional reactions. This cohort thus provides an opportunity to evaluate different empathy measures. While actors showed significantly higher RME scores than dancers, the difference between actors and psychologists was marginal. Moreover, actors' scores did not differ significantly on other empathy measures, such as their concern for others' emotional wellbeing or fantasy, both measured by IRI subscales. Psychology students scored highest in the IRI perspective taking subscale and the data supported anecdotal evidence that psychologists were more concerned for others' emotional wellbeing than dancers or actors. Dancers seemed the least concerned with others' perspectives and emotional states, which we explained through a somatosensory 'inward' focus required by their art form. Nevertheless, compared to the general population, our groups reported higher empathic abilities on all IRI subscales except for personal distress. Altogether, our study shows that the RME, the IRI, and the EDT vary in their susceptibility to different facets of empathic abilities in acting, dance, and psychology students whereas the EQ does not. Emotions can be expressed and perceived through language, facial expressions, or

behavior. As many empathy tests focus on one type of signal they might miss other strategies. Where empathy tests are applied to individuals that have a predominance to read or respond to others in a particular way, as we showed through these three disciplines, they might not capture these empathic strategies. We thus propose that empathy tests must evolve by means of integrating varied forms of communication.

INTRODUCTION

Empathy is understood to describe the ability to recognize the emotional and mental states of others and can involve the sharing of their feelings or be limited to a cognitive understanding (e.g., Decety and Meyer, 2008). Empathy is crucial for social interaction. Indeed, when empathic abilities are impaired, such as in severe forms of autism spectrum disorders, social interactions are difficult (DSM-IV-TR, American Psychiatric Association, 2000). Whilst inter-individual differences in some forms of empathy may be stable (Leiberg and Anders, 2006), there is strong evidence for possible improvements (e.g., Lam et al., 2011). Empathic abilities of individuals on the spectrum, for example, have been targeted successfully through specific training from theater and physical practices, such as participatory play and theater interventions (Corbett et al., 2016; Beadle-Brown et al., 2018) or dance and yoga (Koehne et al., 2016a; Litchke et al., 2018, respectively). Moreover, theoretical- and knowledge-based empathy training forms were also found to be effective for this cohort (Beaumont and Sofronoff, 2008; Holopainen et al., 2019). These intervention choices are not by coincidence. Among various artistic and academic disciplines, three stand out as especially focused on empathic processes: acting, dance, and psychology. In each practice, empathy plays a pivotal and distinct role; achieved through the use of language, the body and the mind.

Theater is particularly involved with the complexities of human emotions and reasoning (Noice and Noice, 2013; Gentzler et al., 2020), which are the cornerstones of empathy (Decety and Meyer, 2008). Moreover, feeling with or for actors is recognized as a part of theater audiences' engagement (McConachie, 2008). In dance, audiences report experiencing empathy as well as cognitive reasoning, varying not only in form but also in intensity, based on their personal background (Reason and Reynolds, 2010). This is in line with the observation that the level of sensorimotor engagement of visually experienced dance spectators watching their preferred style of dance correlates with their ability to fantasize, a specific facet of empathy (Jola et al., 2012). Finally, psychologists, both practice-based and research-based, must understand how other people feel in order to draw valid conclusions (Elliott et al., 2018). In the human service and social science disciplines, didactic empathy training is most popular and highly effective (Lam et al., 2011). It is therefore reasonable to suggest that individuals with different practical and cultural experiences show distinctive empathic patterns. Yet, if all three disciplines employ empathy in various forms, its definition

becomes unclear. Indeed, despite ongoing extensive research into empathy, there is a lack of agreement on its theoretical conceptualization.

Whether basic empathic abilities are inborn or not, whether empathy is one concept that entails several dimensions, or whether empathy solely compromises affective components, is still debated (Heyes, 2018). The review of Cuff et al. (2016) concluded that there is increasing evidence to suggest that affective and cognitive empathy are two separate although complementary constructs. Accordingly, affective empathy refers to the person's experience of emotion as evoked by an external emotional stimulus and cognitive empathy refers to the ability to understand the feelings of another person. Thus forth, several authors situate this latter ability within the concept of theory of mind, whereby one mentalises about others' states, thoughts, and feelings without being emotionally affected by them (e.g., Blair, 2005; Goldstein and Winner, 2012). Nevertheless, theory of mind and empathy rely on overlapping neuronal processes (Völlm et al., 2006). Moreover, whilst some authors propose that motor simulation is required for empathy in order to experience someone else's emotions (Thioux and Keysers, 2010), others suggest that empathy is predominantly an affective experience, located in the insula (Bernhardt and Singer, 2012), or can in fact rely on cognitive understanding alone (Hodges and Myers, 2007). In addition, authors who discuss embodied accounts of empathy propose that empathy has a proprioceptive dimension, whereby kinaesthetic empathy describes the ability to experience empathy in response to merely observing movement, such as when watching a dance performance (Reason and Reynolds, 2010). Moreover, at times, even the form of measurement itself is used to define the type of empathy, as in behavioral empathy (Cuff et al., 2016; Teding van Berkhout and Malouff, 2016). Consequently, depending on the tests used, different facets of empathy are assessed. Here, we consider empathy as a multidimensional construct and explore interindividual differences in acting, dance, and psychology students in their abilities across a multitude of facets assigned to empathy as assessed by a variety of tests. Notably, to this day, the question has remained open as to which measurement reflects empathic abilities most accurately while remaining easy and quick to administer.

The most widely used empathy tests are the Reading the Mind in the Eyes test (RME; Baron-Cohen et al., 2001) measuring primarily cognitive empathic ability and the Interpersonal Reactivity Index (IRI; Davis, 1983) measuring also other empathy facets. Another commonly used measure is the self-reported Empathy Quotient (EQ; Baron-Cohen and Wheelwright, 2004),

which provides an overall score of empathy without dividing between affective and cognitive empathy. There are many more empathy measures in use, such as the Questionnaire Measure of Emotional Empathy (Mehrabian and Epstein, 1972) or the Toronto Empathy Questionnaire (Spreng et al., 2009). Notably, Yu and Kirk (2009) identified 20 different empathy measurement tools in the nursing literature over two decades alone. Here, we focus on the RME, IRI, and the EQ plus the less commonly used E-drawing task (EDT) because over the years, they have been repeatedly used in acting, dance, and psychology studies with each measure arguably addressing specific aspects prevalent in these three disciplines.

The RME consists of a set of pictures of the eye regions, taken from Hollywood films, and participants are asked to identify from a selection of four emotions, which one is expressed in the still. The revised version of the RME is considered a valid measurement focusing on social intelligence and social sensitivity (Baron-Cohen et al., 2001). As the RME focuses on the recognition of emotional expressions in the eye region, it could be a useful test to differentiate individuals with a particular empathic faculty in recognizing facial expressions, such as actors, from individuals that excel in other forms of empathy, as for example measured by the IRI. The IRI examines empathy as a multidimensional construct and consists of four subscales, where empathic concern (IRI-EC) corresponds to the emotional or affective dimension of empathy or the feeling of warmth or compassion for others, while perspective taking (IRI-PT) and fantasy (IRI-FS) correspond to the cognitive dimension (Davis, 1983). Personal distress (IRI-PD) also corresponds to the emotional (or affective) dimension of empathy. In contrast to empathic concern, which refers to the feelings toward others, personal distress refers to a person's own feelings of unease and anxiety in response to another's negative experience (Davis, 1983). The IRI has been employed in all three disciplines most recently, not least because its broad approach to empathy (e.g., Poorman, 2009; Gujing et al., 2019; Panero and Winner, 2021). In fact, Baron-Cohen and Wheelwright (2004) developed the EQ in response to the criticism that the IRI may measure abilities broader than empathy, such as imagination and self-control. The final empathy measurement tool employed here, the EDT, is a measure of passive perspective taking, designed by Hass (1984). It is a very quick but less common measure in the realms of empathy. In the EDT, participants are asked to draw an E on their forehead, and the orientation they draw it in determines what perspective they were taking when performing the task. Drawing the E viewed from 'within,' renders the E mirrored for the outside viewer, and vice versa. Though perspective taking, as measured also by the IRI subscale, plays an important role in empathy as well as theory of mind, in the EDT, it is considered a form of empathy linked to active perspective taking and self-awareness (Hass, 1984). Active perspective taking was shown to encourage people to change deeply held beliefs, such as views on abortion (Tuller et al., 2015), and to stimulate short-term prosocial behavior (Adida et al., 2018). Whilst other perspective-taking measures have been criticized for requiring the experimenter to ask the participant directly to adopt other perspectives (Erle and Topolinski, 2017), this is not a problem the EDT does run into.

In general, objective measures (e.g., RME and EDT) are considered more reliable than self-reported measures (e.g., IRI and EQ). Whilst the RME is widely criticized for its gender bias, outdated images, and its use of static stimuli in a non-fixed world, it is together with the EDT considered as a naturalistic, intuitive measurement of empathic abilities. Therefore, the RME and EDT are of particular interest. The IRI, on the other hand, has been found to be useful as it allows to measure empathy by four subscales. Furthermore, earlier research has found it to be a reliable and sensitive measurement, which shows subtle differences in individual's emphatic approaches (e.g., Jola et al., 2012). Thus, comparing the IRI with the RME, for example, one would expect a counselor to have excellent capacity to empathize without experiencing high levels of personal distress (i.e., IRI-PD). A similar prediction was confirmed for actors (Gentzler et al., 2020). In their study, acting majors were expected to show high abilities in recognizing the emotional expression of others as well as having high emotional regulatory skills. For the latter, only the ability to modulate emotions in intensity was significant, which may, however, be related to the experience of personal distress. This regulatory ability is important, considering that actors often perform contexts of conflict where they have to be able to dissociate the performed aggression from their own feelings (Berceanu et al., 2020). Lastly, evidence for outstanding empathic abilities in response to dance training are less consistent in regard to the IRI, with partial affirmation for enhanced scores in personal distress and perspective taking (Gujing et al., 2019). In order to assess whether these discipline specific observations are inconclusive based on the type of tests used, they can be complemented by other measures such as the EQ or EDT. Moreover, dance is infamous for its various styles and training techniques that pose very specific demands on the performer, which consequently affects empirical research (Christensen and Jola, 2015). To some degree, this is congruent in acting with its seemingly conflicting practices (Noice and Noice, 2013). In this context, it is important to note that when considering existing training regimes, the focus should not only be on whether empathy can be enhanced through specific interventions, but which facets of empathic abilities are responsive to which type of training.

To our knowledge, most empathic training interventions employ experiential training based on theater practices, such as role play (e.g., Brunero et al., 2010). This makes sense, based on the understanding that for theater audiences to have an emotional experience, actors presumably have to be experts in emotional expression and affective processing, both of which are elements of empathy. The assumption that actors have advanced empathic skills is partly based on actors' applied acting training in techniques such as Method acting. This form of acting encourages actors to experience their characters' emotions in real time and through actual memories (Goldstein and Bloom, 2011), thereby sensitizing and enhancing emotional experiences and responsiveness in practitioners. Another important aspect of actors' training and performance is the ability to execute and retain movement. Importantly, movements in a play can be considered as a

choreographical score, as they rarely match the content of the verbal material. Dance classes therefore constitute a part of actors' training and many actors continue to engage in movement-related practices. Notably though, the focus of actors' movement practice is generally not to achieve technical perfection of actions that can only be executed through highly skilled physical training (as in dance). The actors' emphasis is on executing actions in an experiencing way that allows feelings to emerge spontaneously within the movements as well as to respond 'naturally' (see Noice and Noice, 2013). For this, actors engage in a multitude of acting methods and role-play exercises. Most of these focus on enhancing their awareness and control of their own emotional experiences and expressions, which allows actors to effectively inhabit the characters they are expected to perform and consequently enables them to affect the feelings of other actors and audiences (Lippi et al., 2016). Indeed, empathy training through role-play exercises found empathy improvements, such as in nursing students' empathy skills (e.g., Bas-Sarmiento et al., 2017).

Empathy training through acting practices has been found to be effective across the development. Goldstein and Winner (2012), for example, found that in their first study, children's participation in 1 h weekly improvisation games over 10 months enhanced their empathic abilities more compared to children who enrolled in visual arts classes, whereas the scores in theory of mind did not differ between the two groups. This finding corresponds to what would be expected by the two-system theory of empathy proposed by Heyes (2018), whereby empathy, comprising empathic understanding, involves controlled processing and thus develops later in life, whilst empathy often described as 'emotional contagion' operates automatically and develops early. Notably though, children in Goldstein and Winner's (2012) were self-selecting the courses and the data was not distinguished between children who had previously engaged in acting classes from those who had signed up for the first time. It is thus possible that self-selection and previous experience contributed to their findings. Importantly, in their second study, the authors found an effect of theater training on theory of mind at later stages in life. Compared to the control cohort in the visual arts and music, High School acting students showed higher scores in theory of mind before the intervention and improved further after 10 months of intense acting training. One can thus conclude that not only is empathy malleable, but that engagement in acting training that often involves imitating others shows higher levels in theory of mind during adolescence and is therefore already present at the onset of training. In addition, these studies highlight that acting practice impacts facets of empathic abilities differently at different stages of their career. In considering the findings of Goldstein and Winner (2012), it is to be noted, however, that the authors employed the RME to measure theory of mind. Also, the authors did not acknowledge the different interrelated dimensions of empathy as suggested by recent research (e.g., Thompson et al., 2019; Decety, 2020) and herein, but were aligning the term theory of mind with cognitive empathy and considering the term empathy to affiliate closer to affective empathy. We thus predict that acting students may

show a significant advantage in the RME, but not in other cognitive or affective empathy dimensions, such as measured by the IRI subscales.

Similar to actors, dancers need to be prolific in perceiving and expressing emotions. The difference is that dancers start their training at a young age in order to become experts in action execution and observation of body movements (Bläsing et al., 2012). It is unclear, however, whether their empathic abilities are related to their physical, observational, or communication abilities. Based on the genetic profile of dancers, Bachner-Melman et al. (2005) hypothesized that dancers' phenotype is determined by social communication; over and above other characteristics related to sensorimotor execution. Others have suggested that dancers' action observation and execution skills can be expected to be reflected in better recognition of mental, and especially emotional, states of others as well as better perspective taking skills (see Sevdalis and Keller, 2011). However, the argument exists that these arise primarily and preferably through somatic practice and enhanced embodied simulation (Batson, 2014). To add to the complexity, a study on Hip Hop dancers by Bonny et al. (2017) confirmed that dance experience was related to better recognition of facial emotion expressions as measured by the RME. Yet, Horwitz et al. (2015) found that whilst higher dance engagement is related with better communications of feelings with the environment, the identification of others' emotions is not. Notably though, the authors employed a measurement out with the standard empathy measures, designed for assessing alexithymia, a construct that describes the difficulty in finding words for emotions and feelings.

Irrespective of the specific factors that may enhance empathic abilities through dancing, dancers' skills in different facets of empathy are ambiguous, in particular their perspective taking skills. Dancers engage extensively in egocentric body transformation tasks during training. Egocentric body transformation is a cognitive process, whereby an individual mentally changes their own perspective without moving their physical position in space (Kessler and Thomson, 2010). This process takes place for example, when a dancer copies a movement from a teacher or dance partner. As empathic perspective taking is related to the tendency and ability to take on the position of another, it is plausible to assume and empirically supported by Erle and Topolinski (2015), that mechanisms involved in empathic perspective taking and egocentric body transformation are closely related. Hence, based on the frequent changes in perspective through embodiment, dancers are expected to outperform others on perspective taking tasks as was confirmed through a dance intervention in school children by Jansen et al. (2013). However, compared to non-athletes, dancers neither consistently show better perspective taking skills nor an enhanced object-based spatial manipulation performance (e.g., Jola and Mast, 2005; Voyer and Jansen, 2017). We thus predict that whilst dancers may perform better than actors on perspective taking skills through their extensive physical embodied practice, they are less skilled than psychologists, who have previously been found to excel in perspective taking tasks. Importantly, though, these latter

studies employed cognitive perspective taking tests that do not directly relate to perspective taking as a facet of empathic ability. Moreover, the lack of dancers' perspective taking skills might be related to the type of non-dynamic stimuli used. For instance, when non-professional dancers watch dance, depending on their frequency of dancing, their self-reported empathy scores are correlated with their accuracy in recognizing the emotion intensity expressed in dance movements in dynamic stimuli, but not in stills (Sevdalis and Keller, 2012).

It has also been suggested that the ability to mirror movements is linked to empathic behaviors (McGarry and Russo, 2011). Mirroring is indeed frequently practiced in dance training and dance movement therapy - a psychotherapeutic approach, yet statistical evidence of the effect of mirroring on empathy is mixed (Bekkali et al., 2020). Moreover, to our knowledge, there is no evidence of professional dancers themselves showing enhanced empathic abilities with the exception of one recent study by Gujing et al. (2019). The authors found higher self-reported empathic abilities in the form of perspective taking, personal distress, and empathic concern in the dance group compared to the control cohort, as measured by the IRI. The authors suggested that dance training enhanced neurofunctional connectivity, which facilitates the integration of intero-/exteroceptive information and results in better affective sensitivity. Yet, whilst this might underly individuals' enhanced empathic abilities, the authors did not discuss that a higher PD score is not desirable. One could thus argue that dancers' practice enhances their affective empathy indicated in empathic concern (IRI-EC) yet social interactions with distressed individuals affect their own emotional wellbeing (IRI-PD).

For psychologists, empathy is fundamental. Psychology students train to help others, regardless of the path they choose after graduating (Harton and Lyons, 2003). As a result, they are on average more empathic than students from other academic disciplines (Harton and Lyons, 2003). The importance of affective empathic abilities is particularly evident in psychologists, counselors, and across the healthcare sector, where a high level of empathic concern and perspective taking capacity is desired, while low levels of personal distress responses can be a means to manage one's own mental health. As noted by Teding van Berkhout and Malouff (2016), studies show that higher empathic ability of health care professionals contributes to better outcome from the therapeutic interventions. Their meta-analysis confirmed that empathy training is particularly effective in health professionals and university students, whose training showed a larger effect size than that of children, teenagers, and other adults. Further studies suggest that even theoretical learning about the neurobiology of emotions can have a positive impact on patient-rated empathy ratings for physicians (Riess et al., 2012) and that empathy training enhances the professional-patient relationship and its ability to aid better diagnoses (Riess et al., 2012; Petrucci et al., 2016; Bas-Sarmiento et al., 2017). Considering that high empathic abilities are also related to better patient outcomes in physical and mental health (Gladstein and Feldstein, 1983; Hojat et al., 2011; Watson et al., 2014, respectively), the role of empathy training is crucial in medical as well as counseling professions.

Despite strong evidence for the effectiveness of empathy training through experiential practices (e.g., games or role-play), didactic-theoretical training, practical skills training, or a mix of these, it is evident from the above that the findings are mixed (e.g., Lam et al., 2011). Lam and co-authors emphasize in their review that whilst some success has been reported for increasing cognitive empathy and behavioral responses, the existing evidence is insufficient to conclude that the emotional elements of empathy were altered across different professions in the social science disciplines and human services. Here, we have three professional pathways, with a different emphasis on empathic skills and training forms: Theater (a mix of theoretical and practical skills training), dance (predominantly practical skills training), and psychology (in early years predominantly didactic skills training). Whilst existing literature has studied empathic abilities in each of these disciplines, to our knowledge no study has yet provided a comparison of a set of specific empathic abilities across these groups.

It is important to remember that firstly, as outlined above, the effectiveness of empathy training differs across different age groups with children benefitting more than adults do. Moreover, studies that tracked individuals' progression in empathic abilities during their professional education found conflicting evidence (e.g., Andersen et al., 2020). Secondly, methods of professional training vary even within one profession. It is thus important to first understand whether aspects of empathic abilities differ before individuals intensively practice one particular method. Thirdly, as mentioned earlier, a particular challenge in comparing existing studies is that they all use different measures of empathic abilities and a more comprehensive test-battery is thus needed.

The present study therefore set out to investigate specific facets of empathic abilities in young adults that have engaged in some form of recreational empathy training during their adolescence, such as acting, dance, or psychology but that are at the starting point of their professional pathway. If indeed several types of empathy exist, as research suggest (e.g., Cuff et al., 2016), the RME, IRI, EQ, and EDT used in combination with each other, seem ideal to explore differences between groups. This is particularly pertinent for our prediction of the actors' empathic abilities, which is that they differ for cognitive empathy and other facets of empathy. We thus recognized the need to compare individuals' natural inclination for specific facets of empathy that might have attracted them to their field due to existing abilities. To our knowledge, no study has yet compared these differences in empathic abilities between actors, dancers, and psychologists at the start of their professional pathways.

Acting, dance, and psychology students are expected to differ between the types of empathic abilities that they bring to their course and therefore differ in their empathy test scores at the start of their training. Identifying empathic abilities between acting, dance, and psychology students will also highlight which empathy tests might be particularly sensitive to differences between these groups. For example, if the RME and the subcategories of the IRI are indeed measuring distinct empathic abilities as previously suggested, individuals that specialize in one of the three disciplines are expected to show unique patterns of empathy scores.

MATERIALS AND METHODS

Participants

We targeted Higher Education Institutions (HEI) to participate in this study across the United Kingdom and abroad. Higher Education Institutions encompass Universities, Colleges, and profession-oriented applied institutions. They are governmentally accredited organizations that provide special education at higher, postsecondary, tertiary, or third-level education. Overall, we contacted over 40 individuals that were either personal contacts with links to HEI or administration personnel working at selected HEI (27 dance, 13 psychology, and 11 acting). Of those, HEI in the United Kingdom, France, Germany, Malta, Belgium, Switzerland, Netherlands, and Norway agreed to cooperate. Of those 17 responses, 6 HEI with the core discipline of dance, 4 acting and 2 psychology included our study into their curriculum, to ensure students' full engagement with the questionnaires. Two HEI with dance and three with acting curricula sent the link out to students to complete in their own time which led to only a small number of participant responses (<10). All participants had the choice to complete the questionnaires in either English or French. This study was reviewed and approved by the School of Social Health and Sciences Research Ethics Committee, Abertay University and formed part of a larger survey. Participants could only take part if they provided informed consent to participate.

A total of 372 participants started the online survey. Of these, 215 competed at least one empathy measure (57.79%). We then removed participants who were not in their first year of a graduate degree course in acting, dance, or psychology, and only studied one of the three disciplines, leaving 208 participants. As all questionnaires were language based, we excluded 12 female and 6 male participants who identified as Dyslexic (2 acting students, 11 dance students, and 5 psychology students). A further 10 dancers' special needs data points were missing, and we thus

excluded these participants. Of all included participants, 38 identified as male and 138 as female. Four participants did choose not to identify as either male or female and were excluded for statistical reasons only; leaving 176 participants; i.e., 29 acting students (17 females; overall age 20.76 ± 2.70), 82 dance students (64 females, overall age = 20.39 ± 2.55) and 65 psychology students (57 females, age = 19.83 ± 3.53) in the dataset for the analyses. However, not all participants completed the full set of questionnaires.

All participants completed the RME with the exception of 28 dance students, for whom the test failed due to an institutional firewall protection. After criteria-based exclusion, the EDT was completed by 165 participants (29 acting, 73 dance, and 63 psychology), the IRI by 138 (20 acting, 60 dance, and 58 psychology) and the EQ by 104 (12 acting, 44 dance, and 48 psychology). We then removed outliers for all measures within each discipline according to the interquartile range procedure (1.5 × IQR) with a maximum of three iterations, which identified five cases in RME (2 acting ≤ 20, and 3 psychology ≤ 19). For EQ, we identified one psychology case (≤ 24). See **Table 1** for the final set of scores and participant numbers across the measures, discipline and gender (see **Table 1**).

Questionnaires and Procedure

Demographic information was collected first (i.e., information on participants' education, age, gender, and training). Thereafter, we asked participants to respond to a context-based questionnaire (not included here) before completing four empathy measurements, namely, the E-drawing test (EDT), the Reading the Mind in the Eyes test (RME), the Interpersonal Reactivity Index (IRI), and finally the Empathy Quotient (EQ).

In the EDT, participants were asked to draw an E on their forehead (with their index finger or a pen which was randomly assigned), and report in which way it had been drawn (readable for themselves or for another person facing them). Since the EDT

TABLE 1 | Average scores ± Standard Deviation for each test after outlier removals.

	Acting	Dance	Psychology	Overall
E-drawing "E"				
Males	50.00% (12)	47.06% (17)	0.00% (7)	38.89% (36)
Females	23.53% (17)	50.00% (56)	33.93% (56)	30.91% (129)
Total	34.48% (29)	49.32% (73)	30.16% (63)	39.39% (165)
RME				
Males	27.68 ± 2.33 (11)	22.90 ± 3.41 (10)	27.29 ± 3.25 (7)	25.50 ± 3.24 (28)
Females	26.73 ± 2.05 (16)	26.50 ± 3.20 (44)	27.36 ± 2.93 (55)	27.08 ± 2.98 (115)
Total	27.30 ± 2.23 (27)	25.83 ± 3.41 (54)	27.35 ± 2.94 (62)	26.77 ± 3.08 (143)
IRI				
Males	65.50 ± 12.47 (8)	60.60 ± 8.73 (10)	62.63 ± 8.80 (8)	62.73 ± 9.85 (26)
Females	72.50 ± 13.11 (12)	71.12 ± 11.00 (50)	77.02 ± 11.37 (50)	73.90 ± 11.64 (112)
Total	69.70 ± 13.00 (20)	69.37 ± 11.30 (60)	75.03 ± 12.07 (58)	71.80 ± 12.11 (138)
EQ				
Males	44.75 ± 17.54 (4)	40.89 ± 8.43 (9)	43.50 ± 6.98 (6)	42.52 ± 9.96 (19)
Females	39.88 ± 14.07 (8)	45.31 ± 11.43 (35)	47.73 ± 7.42 (41)	45.98 ± 10.10 (84)
Total	41.50 ± 14.68 (12)	44.41 ± 10.95 (44)	47.19 ± 7.43 (47)	45.34 ± 10.12 (103)

Participant numbers are provided in brackets. Drawing E are the percentage and counts as in drawing the E in form of 'E,' so that the signer can read it.

is an unusual test and there is a tendency to not do it but instead click to the next slide. Before being asked to assess the direction of their E with the help of two example images, we thus had in in-between section were we asked participants for their compliance and only continue to the next page if they have done so.

In the 36-item revised RME test (Baron-Cohen et al., 2001) participants were asked to look at pictures of eyes from film excerpts and identify which emotional expression is shown by selecting one out of four emotion descriptions. Participants were provided with two exemplars before starting the RME proper. In addition, participants had the option to check the meaning of the words on a separate glossary of all mental state terms, available via a web-link.

The next questionnaire was the 28-item Interpersonal reactivity index (IRI, Davis, 1980) which measured empathy on four subscales of perspective taking (IRI-PT), empathic concern (IRI-EC), personal distress (IRI-PD) and fantasy (IRI-FS) with seven questions for each subscale. IRI-PT was measured with questions such as "I believe that there are two sides to every question and try to look at them both" or in reversed forms such as "I sometimes find it difficult to see things from the "other guy's" point of view." Previously reported internal consistency for IRI-PT is $\alpha = 0.61$ in males and $\alpha = 0.62$ in females. The fantasy subscale entailed questions such as "After seeing a play or movie, I have felt as though I were one of the characters" or in reversed form "Becoming extremely involved in a good book or movie is somewhat rare for me" (Internal consistency was previously reported as $\alpha = 0.79$ in males, and $\alpha = 0.81$ in females). Personal distress was assessed through questions, such as "I tend to lose control during emergencies" or in a reversed form "When I see someone get hurt, I tend to remain calm" (Previously reported internal consistency in males was $\alpha = 0.68$, and in females $\alpha = 0.76$) and empathic concern with "I am often quite touched by things that I see happen" or in reversed form "Other people's misfortunes do not usually disturb me a great deal" (Internal consistency reported previously was $\alpha = 0.72$ in males and $\alpha = 0.70$ in females).

The last questionnaire was the 40-item Empathy Quotient (EQ), which consisted of questions answered on a four-point Likert scale ranging from "strongly agree" to "strongly disagree" (Baron-Cohen and Wheelwright, 2004). The EQ was used to measure the state component of empathy with questions such as "I am quick to spot when someone in a group is feeling awkward or uncomfortable" and "I don't tend to find social situations confusing" (Internal consistency was previously reported as $\alpha = 0.89$) (Baron-Cohen and Wheelwright, 2004). According to the authors, the EQ is understood to measure the state of empathy well and is frequently employed because of its good validity. EQ was used to provide an overall score of empathy without diving between affective and cognitive empathy. The questionnaire was shortened to forty questions by removing the 20 control questions included in the original questionnaire.

Analysis

Based on the number of dropouts across the survey, we calculated analyses for each empathy measure individually. Our main interest is on the effect of discipline. However, as it is well known that males and females differ in their empathic abilities, we first conducted univariate ANOVAs to confirm the validity of our dataset (i.e., that gender does show predicted effects). When there was no interaction between gender and discipline in the univariate ANOVA, we removed gender as a random effect from the model by running a mixed linear model based on Restricted Maximum Likelihood Estimate of Variance Component (REML) with the fixed effect discipline. For those analyses where discipline showed a strong trend for a significant effect, we conducted Bonferroni *post hoc* t-tests to identify differences between the three disciplines. A REML is preferable for unbalanced datasets like ours. Finally, as some of our participant numbers are low, we ran Bayesian ANOVA on JASP to verify the predictability strength of discipline. Finally, as we were interested in the relationships between the different tests, we ran correlation analyses across the empathy measures.

The IRI is regularly reported for the subscales. As these are of great value for our comparisons as discussed in the introduction, we conducted the analyses for each individual subscale. Lastly, the EDT test was analyzed using a chi-square, to evaluate whether the task completion varies for discipline and gender.

RESULTS

Descriptive data (**Table 1**) and inferential statistics for each empathy measure are reported in order of completion. The EDT was analyzed using Chi-Square which showed a very strong trend for a non-normal distribution for either drawing the E to be able to read by the signer (i.e., 'mE') or the mirror version of 'E' to be read by another across the disciplines, df(2), Pearson Chi-Square $= 5.55$, $p = 0.062$. In both, acting and psychology students, 2/3rd of participant draw the E so that the other can read it (65.5 and 69.8%, respectively) whereas only half of the dancers drew the E so that the other can read it (50.7%). The distribution across genders does not deviate from a normal distribution, Pearson Chi-Square $= 0.005$, $p = 0.944$.

Univariate ANOVA on RME scores with the between-subjects factors discipline (acting, dance, and psychology) and gender (female vs. male) showed a significant main effect of discipline as well as gender, $F(2,137) = 7.72$, $p = 0.001$ and $F(1,137) = 5.80$, $p = 0.017$, respectively. The interaction of the two factors did not reach significance but showed a very strong trend for a significant interaction, $F(2,137) = 2.91$, $p = 0.058$. Females scored significantly higher than males (Cohen's $d = 0.52$). Independent t-tests showed that the main effect of discipline is based on dancers' significant lower scores compared to acting and psychology students, $t(73.15) = 2.31$, $p = 0.023$ equal variances not assumed, and $t(114) = 2.58$, $p = 0.011$, respectively (Cohen's $d = 0.48$, and 0.48, respectively). The RME scores between acting and psychology students did not significantly differ ($p = 0.927$). We then calculated a REML based mixed linear model (MLM) to address our specific interest on discipline and in consideration of the unbalanced design. The MLM with discipline as a fixed factor and gender as a random factor showed a significant effect at the same level as the Univariate ANOVA, $F(2,139.67) = 4.65$, $p = 0.011$. Therefore, albeit the design is unbalanced, the

differences in the RME scores across the disciplines are strong enough to show an effect. Bayesian ANOVA with discipline as fixed and gender as random effects shows that this model is 29.16 times more likely than the null model including gender. There is anecdotal evidence for significant effect of discipline on RME scores ($BF_{10} = 1.00$). The Null model including gender is in weak support of no difference ($BF_{10} = 0.034$). Bayesian *post hoc* independent t-tests showed that there is a strong evidence for a difference between dance and psychology students ($BF_{10} = 14.93$) and moderate evidence for significant differences between dance and acting students ($BF_{10} = 2.98$). There is moderate support for no difference between acting and psychology students ($BF_{10} = 0.24$), all uncorrected.

Applying the same univariate analysis for IRI-PT showed a trend for a main effect of discipline, $F(2,132) = 2.44$, $p = 0.092$. Neither gender nor the interaction between the two factors showed a significant effect (both p's ≥ 0.498). Employing a MLM by removing gender as a random factor from the model, discipline showed the same level of significance, $F(2,135) = 2.432$, $p = 0.092$. Based on our directional prediction for PT (i.e., psychology > dance > acting students), we conducted one-tailed independent t-tests. These showed that as predicted, psychology students score significantly higher than acting students, $t(76) = 1.99$, $p = 0.025$ (Cohen's $d = 0.52$), 75.03 ± 12.07 vs. 69.70 ± 13.00. None of the other comparisons reached significance with dancers scoring 69.37 ± 11.30 [psychology > dance = $t(116) = 1.46$, $p = 0.073$, dance > acting = $t(78) = 1.08$, $p = 0.142$]. Bayesian ANOVA indicates that the data is inconclusive and does not go beyond anecdotal evidence for accepting the null model including gender ($BF_{10} = 1.00$) or rejecting the H1 hypothesis on the basis of discipline ($BF_{10} = 0.558$) with the former being 1.8 times more likely. *Post hoc* comparisons confirm that that the supporting evidence for psychology students scoring higher than acting students compared to the alternative hypothesis (acting > psychology) is moderate ($BF_{10} = 2.63$). The supporting evidence for psychology > dance as well as dance > acting is weak/inconclusive ($BF_{10} = 1.07$, and $BF_{10} = 0.73$, respectively).

The univariate analysis for IRI-EC, IRI-PD as well as IRI-FS showed a significant main effect of gender only, $F(1,132) = 9.27$, $p = 0.003$ (Cohen's $d = 0.78$), $F(1,132) = 16.66$, $p \leq 0.001$ (Cohen's $d = 0.84$), and $F(1,132) = 5.87$, $p = 0.017$ (Cohen's $d = 0.53$), respectively. In all subscales, females ($N = 112$) scored higher than males ($N = 26$), IRI-EC (21.61 ± 4.69 vs. 17.85 ± 5.24), IRI-PD (12.71 ± 5.05 vs. 8.78 ± 4.15), IRI-FS (20.96 ± 5.15 vs. 18.23 ± 5.18). Neither discipline alone nor the interaction with gender was significant on IRI-EC (both p's ≥ 0.138), IRI-PD (both p's ≥ 0.304), or on IRI-FS (both p's ≥ 0.267). Neither IRI-PD nor IRI-FS showed a significant effect of discipline after removal of gender from the model; $p = 0.595$ and $p = 0.160$, respectively. Based on the strong indication of gender as a relevant factor in the model of IRI-PD as well as IRI-FS, no further between discipline analyses were performed on these.

However, removing gender from the IRI-EC model, the effect of discipline reached significance $F(2,134.57) = 3.072$, $p = 0.050$. Independent t-tests showed that dancers scored significantly lower on IRI-EC than psychology students, $t(116) = 2.58$,

$p = 0.011$ (Cohen's $d = 0.47$). Acting students' IRI-EC scores were on average lower than those of psychology students, however, the difference did not reach significance, $t(76) = 1.81$, $p = 0.075$. No significant difference between acting and dance students could be observed ($p \geq 0.96$). Bayesian analysis on IRI-EC showed that the data is nevertheless inconclusive and does not go beyond anecdotal evidence for either accepting the null model including gender ($BF_{10} = 1.00$) or rejecting the H1 hypothesis on the basis of discipline ($BF_{10} = 0.68$) with the former being 1.5 times more likely than the latter. Based on the inconclusiveness of either model, no further analyses were conducted.

EQ did not show any significant differences in the ANOVA (all p's ≥ 0.399) nor the MML ($p = 0.165$).

For the correlation analysis (see **Table 2**), we only included those 85 participants who had data points for all questionnaires, which consisted of 12 acting students (8 females), 25 dance students (21 females), and 48 Psychology students (42 females). The overall scores were REM (26.89 ± 3.34), IRI-PT (18.95 ± 4.89), IRI-EC (21.14 ± 5.13), IRI-FS (20.49 ± 5.38), IRI-PD (11.84 ± 5.21), and EQ (44.73 ± 10.40). The RME scores did not significantly correlate with any of the other empathy measures, except for a significant but weak 1-tailed correlation with EQ, Pearson's correlation = 0.194, $p = 0.037$. The EQ on the other hand, correlated significantly with all measures except for IRI-PD as indicated in the **Table 2**. As for the IRI subscales, EC significantly correlated with all other IRI subscales as indicated in the same table, whereas the only other significant but also weak correlation is between PD and FS, with Pearson's correlation = 0.199, $p = 0.034$.

DISCUSSION

We investigated specific facets of empathic abilities in young adults at the starting point of their professional careers in either acting, dancing, or psychology; and who are thus expected to have a preponderance for particular aspects of empathy. Under this premise, we predicted that actors are good at identifying others' emotional expressions as measured by the Reading the Mind in the Eyes test (RME) but potentially less so in tasks related to other cognitive or affective empathy. In our study, acting students did indeed provide significantly more correct answers in the RME than dance students; and so did psychology students. Additionally, RME scores were dependent on the gender of participants, with females showing a significantly higher emotion recognition performance than males.

Based on numerous evidence for females' superior empathic abilities that also led to the Empathizing-Systemizing theory of sex differences (Greenberg et al., 2018) and the extreme male

TABLE 2 | One tailed Pearson's correlations between tests.

	RME	IRI-PT	IRI-FS	IRI-EC	IRI-PD
IRI-EC	0.058	0.368***	0.351***		0.245*
EQ	0.194*	0.323***	0.278**	0.606***	0.027

***p \leq 0.001, **p \leq 0.01, *p \leq 0.05.

brain theory of autism (Baron-Cohen, 2010), we did expect females to show responses that indicate higher empathic skills. The former concept suggests a sex-based classification based on the drive to either empathize (females) or systemise (males), whilst the latter states that males with autism – due to their below average empathy – have an extreme male brain. In our study, females did indeed show overall higher empathy scores than males, which reached significance not only in the RME but also the IRI subscales of Empathic Concern (IRI-EC), Personal Distress (IRI-PD) and the Fantasy Scale (IRI-FS). Notably, the Perspective Taking (IRI-PT) and the E-Drawing Task (EDT) did not show significant gender differences but showed a trend for significant differences across disciplines. Once gender was removed from the IRI-PT model as a between-subjects' factor, acting students scored significantly lower than psychology students in the cognitive empathy measure of IRI-PT as predicted. Also, the frequency at which acting and psychology students drew the E readable from someone else's viewpoint (65.5 and 69.8%, respectively) was higher than for dancing students who did so in only 50.7% of the cases.

We suggested that the RME would be particularly suited to measure actors' prolific empathic abilities and thus predicted that actors would show high scores. Notably, the RME consists of stills taken from actors' faces in films, thus constitutes a task that is very close to actors' professional interest. As expected, actors showed significantly higher scores than dancers in the RME, however, there is moderate evidence that the scores do not differ between acting and psychology students. Both acting and psychology students are showing similar proficiency in reading emotions from others' eyes. The RME asks participants to choose 1 out of 4 terms that best describe the emotional expression of a character's eyes. As it is important that participants understand the vocabulary at hand they are regularly given access to an accompanying glossary. Nevertheless, verbal skills are evidently a requisite for the RME and several studies show a correlation between drama classes and verbal skills (see Podlozny, 2000). One could therefore argue that our acting and psychology student cohort performed better in RME based on enhanced verbal abilities. We argue that verbal skills do not explain the higher RME scores of our acting cohort. Firstly, it is important to remember that our participants are students in their first year of study. Therefore, our participants can be assumed to have gone through equivalent levels of verbal training. Secondly, whilst it is likely that acting students might have participated in drama classes for some time in advance of their professional training, evidence suggests that neither elementary (Köksal Akyol, 2018) nor middle School drama education (Rickard et al., 2012) were found to significantly enhance verbal skills. In addition, whilst Podlozny's (2000) meta-analysis showed a strong relationship between verbal skills and engagement in drama classes, the relationship between drama and vocabulary development per see is not reliable. Thirdly, verbal skills components of the RME can be expected to benefit psychology students most profoundly. However, our psychology students did not outperform actors in the RME. In line with behavioral evidence for effects of drama on empathy, emotion regulation and perspective-taking (Winner et al., 2013) and the observation that verbal skills alone

predict less than 25% of the variance of RME performance (Peterson and Miller, 2012), we suggest that the acting students' RME scores were not determined by their verbal abilities *per se* but related to their emotion recognition abilities at least to some degree. This is consistent with the finding of Goldstein and Winner (2010–2011) who observed that verbal ability did not influence REM scores in children participating in acting classes.

Yet as the RME revealed particularly low scores for dance students, it indicates that the RME measures a particular form of empathy, which does not capture other strategies for social interaction. Several studies show support for the assumption that dancers are more focused on the body and its movements than the head. For example, Jola et al. (2011) found that dancers rely more on sensory information from proprioception, even when vision is available. In addition, observational strategies are considered to be individual in nature, with some individuals looking predominantly at upper body parts including the head, and others at lower body parts - depending on the level of expertise as well as the type of sport (Petrakis, 1986). Nevertheless, it is clear that dancers do not frequently look at the face during their learning. In her subsequent dance-specific study, Petrakis (1987) found that undergraduate dance students show a tendency to focus on lower body parts compared to expert dance teachers, who focus more consistently on the upper body parts when watching performers. Yet, overall, the foci on the upper body parts were more prevalently found to consist of eye fixations on the arms than on the head of the model. Further, Stevens et al. (2010) found that dancers' eye movement patterns indicate that their attention is to predict the movement trajectory of performers' body, not the head or face. We can thus conclude that psychology and acting students are in general more likely to be focused on the eye region when assessing others' emotions and thus perform better in this task. Dancers, however, are trained to attend to the body which likely explains the difference in RME scores.

Although dancers' RME scores are lowest in the present study, this does not imply that dancers would generally be low in their empathic abilities. As the RME is considered to measure cognitive empathy, it is important to highlight that when dancers' general empathy was measured with the EQ, their scores did not significantly differ from the other two disciplines. In fact, albeit not significant, dance students' average EQ scores were higher than those of acting students. Moreover, findings by Bonny et al. (2017) suggest that there are differences in cognitive empathy between dancers of different dance styles. The authors found that when controlling for dance styles, dancers with greater Hip hop dance experience have a greater ability to recognize emotions from gaze (RME). Further studies regarding the performing arts found an advantage of acting over dancing: According to Goldstein (2010), children (8–10 years) who did acting, showed higher theory of mind compared to same age children doing dancing. Thus, existing data for dancers' RME performance remains ambiguous.

As for the IRI, results from all subscales indicated that only Perspective Taking (IRI-PT) and Empathic Concern (IRI-EC) showed moderate differences between the disciplines. The IRI-PT scores indicate that psychology students are more likely to take

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someone else's point of view compared to acting and dance students. For IRI-EC we found a significant difference between scores of psychology and dance students, with psychology students showing higher empathic concern for others than dance students. We also found a trend for psychology students scoring better than acting students in IRI-EC. Our findings are in line with previous research, suggesting that acting in young adolescents is not associated with heightened empathy as measured with IRI-EC (Goldstein et al., 2010). Further research on adults comparing actors to psychologists has concluded that actors score lower in IRI-EC (Goldstein et al., 2010), which would indicate that they express less concern for others or are less sympathetic (Davis, 1983). We can imagine that this has benefits for actors' professional career, as they often need to portray narratives including a variety of positive and negative emotions. Thus, a certain level of dissociation from the character they are playing could help them dealing with negative emotions.

However, a recent study has found contradicting evidence. Panero and Winner (2021) examined the ability of actors to immerse themselves in a role and found that actors scored higher than psychology students in all IRI measures. Whilst these results merit further investigation – it is important to highlight that their design differed from ours. For instance, psychology students were recruited through convenience sampling and incentivised to participate through the use of study credits, whereas actors were recruited through snowball sampling and a financial incentive. The population sampled also differed from our study, whose participants were all at the beginning of their respective careers. Moreover, in the Panero and Winner study, psychology students were recruited from a narrower age range (18–22) than the actors (18–30). Lastly, it's possible that cultural differences, such as training styles, were partly responsible for the difference in results. The combination of these factors might have caused the apparent contradiction between the empirical evidence of both studies. Consequently, these factors, together with the relationship between acting and IRI scores, would benefit through further investigations.

Another notable result in our study is the lack of significant differences between the disciplines in the other IRI subscales, the IRI-FS and the IRI-PD, which is surprising. The fantasy scale seems to measure traits typical to actors, such as an inclination to empathize with fictional characters (Kaplan and Iacoboni, 2006). Previous research has suggested a trend for higher neuroticism in actors (Nettle, 2006), which supports Davis' (1983) association between fantasy scale and shyness, loneliness, and social anxiety, especially among males. However, Guilera et al. (2019) did not find a significant correlation between IRI-FS and neuroticism. To clarify why our IRI-FS and IRI-PD scores do not show any discipline differences, we compared our IRI subscale scores with those from the general population. Whilst our scores are in a comparable range to those originally reported by Davis (1980, 1983) but only separately for males and females; one-sample t-tests of our sample's means in comparison to mean scores across gender, available from a larger sample of 651 participants pooled from eight other studies (De Corte et al., 2007), showed that our cohort ($N = 138$) scored significantly higher in IRI-FS [20.45 ± 5.24 vs. 16.48 ± 5.91, $t(8.89)$, $p \leq 0.001$], IRI-PT

[18.52 ± 4.91 vs. 17.29 ± 4.30, $t(2.94)$, $p = 0.004$], and IRI-EC [20.90 ± 5.00 vs. 18.05 ± 4.23, $t(6.69)$, $p \leq 0.001$] but not IRI-PD [11.93 ± 5.14 vs. 11.92 ± 4.87, $t(0.017)$, $p = 0.986$]. We can therefore conclude that acting, dancing, and psychology students do stem from a similar cohort that does engage in fantasizing, perspective taking, and empathic concern over and above the general population. This is in line with the findings for perspective taking and empathic concern by Gujing et al. (2019), which showed that dancers self-reported empathic abilities are higher compared to a general cohort. In contrast, we did not find that our cohorts' personal distress scores differ from the general population. The level of personal distress our participants report to experience in response to others' disadvantages does indeed seem to be specific for gender only and not affected by other characteristics, such as engagement in the performing arts or psychology.

The EDT, on the other hand, showed that half of the dancers draw the E from their own perspective. The relationship between EDT, perspective taking and prosocial behavior (Adida et al., 2018) would suggest that psychology students, whose academic performance was found to improve with prosocial behavior (Hassall et al., 2015), should be the most oriented toward taking others' perspective. The relationship between the other two disciplines and prosocial behavior is, however, understudied. Actors, who also showed a tendency to take others' perspective compared to dancers, might also be prosocially inclined. The lack of a tendency toward other-centered perspective by the dancers could be explained by dancers' inherent focus on their own body and their own performance. While actors and psychologists are more likely reliant on others with regards to their own performance, dancers need to master their own point of view, first and foremost. Besides, their form of communication relies much more on the spectator taking the dancer's perspective. It is likely, however, that as with other empathy measures, that there are notable differences between different dance styles.

EQ scores are comparable across all three participant groups and correlated moderately with three of the IRI subscales (IRI-PT, IRI-EC, and IRI-FS), yet not with IRI-PD. EQ scores further showed a weak correlation with the RME data. Given that EQ predicts subjective kinaesthetic feelings (Seiryte and Rusconi, 2015), and that actors have shown high scores in the EQ task in Baron-Cohen and Wheelwright's (2004) study, it is surprising to see that there was no effect of profession on EQ scores in our study. Though this may be a by-product of the subjective nature of the measure (Baron-Cohen and Wheelwright, 2004). Furthermore, the fact that our EQ scores did not correlate with PD, and that the PD scores of our cohort are not different from the general population, the correlation found by Khajeh et al. (2014) between EQ and psychological wellbeing is of relevance. It would be of interest to further investigate this matter with regards to the relationship between PD and wellbeing. Finally, while EQ was shown to predict performance in a face perception task (Penton-Voak et al., 2007), this did not result in an increased RME score for participants high in EQ. Perhaps individuals with high EQ focus on other parts of the face instead of the eyes and are therefore disadvantaged when only the gaze is presented.

It is important to understand that our study cannot distinguish whether individual differences in empathic abilities are based on training, education or whether they denote an inborn characteristic. Moreover, whilst it would be beneficial to identify if specific facets of empathy are inherited or acquired through training, this was not the aim of our study. We set out to identify (1) whether different facets of empathy are prevalent at early stages in three self-assigned student groups and (2) whether certain empathy tests are susceptible to these differences. We argue that it is not feasible to match the physical and theoretical training for these disciplines, since they inherently follow specific professional trajectories: Actors, dancers, and psychologists require different levels of preparation. For example, dancers often start their training as early as the age of five in order to gain sufficient experience to start full time professional training. Psychology students, however, might have had personal life experiences that activated their level of social responsibility wanting to help others deal with their emotions or that developed their need to study psychology in order to be in a better position to deal their own emotions. Finally, acting students might have practiced their social interaction skills through everyday life improvised actions.

Asking participants to complete four empathy surveys as part of one study can lead to response fatigue. We found that of those participants who completed the first empathy measure, over 2/3rd of participants (72%) completed the full set of questionnaires, which is a good adherence. Nevertheless, we suggest that future research that aims to compare measures of empathy facets across a set of questionnaires would benefit from evaluating the use of shorter versions, such as the B-IRI (Ingoglia et al., 2016) or the EQ-Short (Wakabayashi et al., 2006). In line with this, it is notable that our groups were unbalanced in numbers with the smallest being the acting students. This is unfortunate yet not surprising, as actors are generally underreported in empirical research, compared to other performing art cohorts. We remain hopeful that this will change with the recently increased efforts in experimental studies on actors' perception and cognition (see Noice and Noice, 2013; Lippi et al., 2016).

Another limitation is that empathy is considered to consist of three components, i.e., cognitive, affective, and behavioral (Lam et al., 2011). Whilst we did include two indirect measures of empathy and ensured that we test for cognitive and self-reported affective facets, we did not actually measure participants empathic or pro-social behavior. Notably, only a small number of studies have done so (e.g., Chen et al., 2010; Martínez-Velázquez et al., 2020). It would be good to get a better understanding of the relationship between different empathy facets for different cohorts, as well as the effects of their professional interests on actual pro-social behavior.

Probably the most stringent conclusion of our findings is the support for the argument that actors, dancers, and psychologists do *perform* in everyday life. This is indicated for example through this cohorts' IRI scores which are higher compared to the general population in all subscales but personal distress. Hence, they have learnt about empathy and can act upon it (i.e., see also Lam et al., 2011), without above average personal suffering. One way to achieve this can be through creating a mental state

for performance that has a high level of constructive conscious control, as in the Alexander technique, practiced by many actors and dancers (Alexander, 2004). As our cohort was at the start of their training, it would be of great interest to explore whether such a conscious control is more prevalent in individuals that seek a profession which requires specific aspects of empathy, such as actors, dancers, and psychologists.

Yet, it is possible that some findings are based on how well the empathy measure matches the actual practice of the discipline. For example, actors might have high RME scores because the task is close to their everyday interests rather than their cognitive empathy skillsets. This is supported to some extent in that they do not score higher than psychology students on other cognitive empathy scores, such as perspective taking. Similarly, dancers are internally focused and their empathy scores are therefore less prone to cognitive empathy (RME, EDT, and IRI-PT) but also lower in affective empathy (IRI-EC). This could be interpreted in that either the tests were least suitable in identifying dancers' empathic abilities due to their focus on faces and their static characteristics, or because dancers are in fact not very empathic. The latter would have significant implications since many studies used dance as a form of intervention to enhance empathic skills. Notably though, whilst several studies have used dance training with the aim to enhance empathic abilities (e.g., Zazulak et al., 2017; Mastrominico et al., 2018), there is only sparse evidence for dancers having better empathy skills or for the effects of dance interventions to increase empathy. In fact, several studies did not find evidence for enhanced empathy: Mastrominico et al. (2018) found no effect of dance intervention through mirroring or imitation/synchronization on adults' empathic abilities with ASD and Zazulak et al. (2017) found no effect of mindfulness dance intervention in medical students' empathic ability scores. Moreover, whilst Koehne et al. (2016a) found that a dance intervention focusing on interpersonal movement imitation and synchronization, enhanced facets of empathy skills in adults with ASD with participants showing enhanced emotion inference abilities, the authors did not find an increase in empathic feelings. Henceforth, to date, dancers might have increased internal awareness (Jola et al., 2011; Christensen et al., 2018), yet empathy enhancements that also require increased external awareness in response to dance training is limited to anecdotal evidence (Hahn, 2015; Gallagher and Flint, 2016). One explanation could be that different dance styles are linked with different levels of inter-personal synchronization, which is considered an important aspect of empathy (Koehne et al., 2016b). It is thus important that first, we understand better which kind of dance practice increases empathic skills before it is employed with that aim. Furthermore, our findings suggest that acting interventions may be more beneficial than dance interventions: our acting cohort showed higher levels of emotional recognition than dancers did while also reporting empathic concern above the average population, without getting too distressed about it. Therefore, acting training can be considered to build emotional resilience; or in other words, to enhance the ability recognize another's emotional expression with some feeling for them, but to do so from an emotional distance. The ability to regulate one's own emotions

in social-interactions is a crucial ability in general (Thompson et al., 2019) and for actors in particular (Berceanu et al., 2020). Importantly, individuals who show an interest and engagement in acting practice do already show higher cognitive empathy skills (here RME and EDT) at the start of their career.

To conclude, whilst acting, dance, and psychology students score higher than the general population in all IRI subscales, including empathic concern but not personal distress, shows that these cohorts 'know' how to feel yet manage to keep an emotional distance. This in turn suggests that those individuals who study acting, dance, or psychology have empathic tools available at the start of their training that allows them to experience empathic concern without strong emotional distress. However, as our acting students showed significantly higher RME scores than the dancers and are significantly more often accounting for the other's perspective (according to the EDT), future studies should explore whether acting training might be better suited for developing cognitive empathy or Theory of Mind than dance. Nevertheless, the impact of theoretical empathy training should not be underestimated, considering that psychology students' performance in the RME and EDT did not significantly differ from actors. We did not expect psychology students to perform so well across the different empathy tests. However, we did not measure general levels of intelligence, which may have had an impact on these scores. Importantly, since empathic concern measures a person's ability to "tune in" to other people's emotional states, a high sensitivity would normally become overwhelming. Whether it is through indirectly trained resilience, general levels of intelligence, or an ability to compartmentalize, actors, dancers, and psychologists might be able to moderate this often-overwhelming sensitivity, and thus do not report above average personal distress. Future research should investigate whether people from the general public, who do not undergo any sort of empathy training, but score high on affective and cognitive facets of empathy, do experience high personal distress or not.

DATA AVAILABILITY STATEMENT

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by School of Health and Social Sciences Research Ethics Committee (today School of Applied Sciences). Participants could only take part in this online study if they provided informed consent to participate.

AUTHOR CONTRIBUTIONS

CJ designed and implemented the study, analyzed the data, and wrote the manuscript. IS, RSL, and TR contributed to the data collection and analysis and the writing of the manuscript. IS, RSL, and CJ provided critical feedback on the manuscript and aspects of the rationale. All authors contributed to the article and approved the submitted version.

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