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Abstract

In two studies based on Stanley Milgram's original pilots, we present the first systematic examination of cyranoids as social psychological research tools. A cyranoid is created by cooperatively joining in real-time the body of one person with speech generated by another via covert speech shadowing. The resulting hybrid persona can subsequently interact with third parties face-to-face. We show that naïve interlocutors perceive a cyranoid to be a unified, autonomously communicating person, evidence for a phenomenon Milgram termed the "cyranic illusion." We also show that creating cyranoids composed of contrasting identities (a child speaking adult-generated words and vice versa) can be used to study how stereotyping and person perception are mediated by inner (dispositional) vs. outer (physical) identity. Our results establish the cyranoid method as a unique means of obtaining experimental control over inner and outer identities within social interactions rich in mundane realism.

Keywords: cyranoid, Milgram, embodiment, person perception, mundane realism, stereotyping

Revisiting Milgram's cyranoid method: Experimenting with hybrid human agents

In Edmund Rostand's play *Cyrano de Bergerac,* Christian, a handsome yet inarticulate young cadet, woos the love of Roxane by speaking to her the graceful prose of Cyrano, a man whose unremarkable physical features instil in him a paralyzing sense of self-doubt. Through Christian's body, Cyrano achieves a means of vicariously fulfilling his unrequited love for Roxane, while Christian is in turn the beneficiary of ghost-written words that garner affection. This well-known story is but one of the many examples of a fantasy that has appeared in the arts and mythology throughout history – that of the fusion of separate bodies and minds. Other illustrations include *The Wonderful Wizard of Oz,* in part the tale of a fraudster who is able to attain great power by presenting himself to the world through an intimidating artificial visage. The film *Big* entertains the folly that ensues when an adolescent boy awakens to find himself in the body of a middle-aged man. More recently, films such as *Avatar* and *Surrogates* have imagined hypothetical futures in which mind can be operationally detached from body, allowing individuals to operate outer personae constructed to suit their social goals. Fiction though they may be, these stories illuminate the power façade has over how we are perceived by ourselves and by others, and how we and others in turn behave in accordance with these perceptions.

Stanley Milgram, perhaps best known for his obedience to authority experiments (Milgram, 1974), operationalized the *Cyrano de Bergerac* paradigm in a series of pilot studies conducted shortly before his death. In these pilots, he explored constructing hybrid social agents, whom he called "cyranoids" (in reference to Cyrano), via a vocal technique known as "speech shadowing," a procedure in which a person immediately repeats auditory stimuli originating elsewhere. Milgram's idea was to have one person (the "shadower") replicate the spontaneous speech of another (the "source") via a covert audio-relay apparatus while socially engaging with research subjects (the "ineractants") naïve to the subterfuge, and

his findings suggest that interactants will fail to detect that their interlocutor is a cyranoid. This "cyranic illusion" persisted in cases of extreme identity incongruity between source and shadower, such as when he sourced for child shadowers being interviewed by groups of teachers, none of whom believed following these interactions that they had been talking to anything other than an autonomous (albeit unusually bright) child. Milgram never formally reported the results of these studies, though descriptions of them can be found in a speech he prepared for an APA convention in 1984 (Milgram, 1992) as well as in a biography authored by Blass (2004). In his APA speech, he expressed optimism that the cyranoid method could evolve into a powerful means of researching the social self and person perception. Despite this enthusiasm, no experimental validation of the method has to-date been reported, rendering cyranoids a largely dormant part of Milgram's legacy.

Our goal in the present work is to resurrect the cyranoid method by exhibiting its utility as a social psychological research tool. In two studies based on Milgram's original pilots, we examine the robustness of the cyranic illusion and demonstrate how with the method one can explore various aspects of person perception and the role of stereotypes in social behavior. The aim is to stimulate further research into the wide range of social and cognitive phenomena that lend themselves to investigation by-way-of cyranoids.

Background

Speech Shadowing

A functioning cyranoid is a synchronized performance between two or more people and depends upon the shadower reliably and rapidly repeating the words of their source without revealing the true nature of the communication to interactants. This, however, is not as difficult a task as one might suspect, as studies have shown speech shadowing to be a surprisingly simple undertaking. Marslen-Wilson's (1973) early work exploring speech shadowing latencies influenced Milgram's conceptualization of the cyranoid, and the

technique has since been used to investigate phenomena ranging from secondary language acquisition (e.g., Murphey, 2001) to speech pathology (e.g., Harbison, Porter, & Tobey, 1989; Healey & Howe, 1987) to cognitive linguistic processing (e.g., Fowler, Brown, Sabadini, & Weihing, 2003). Native language shadowers can track the continuous familiar prose of a source at latencies as low as 70 milliseconds (Bailly, 2003), and continuous unfamiliar prose at latencies as low as 250 milliseconds (Marslen-Wilson, 1985). Shadowers tend to reflexively mimic gestural elements of their source (Fowler et al., 2003; Goldinger, 1998; Mitterer & Ernestus, 2008; Shockley, Sabadini, & Fowler, 2004), while listeners tend to perceive more acoustic-phonetic similarity between persons A and B when A is shadowing for B than when A is speaking non-shadowed speech (Namy, Nygaard, & Sauerteig, 2002; Pardo, Jordan, Mallari, Scanlon, & Lewandowski, 2013), evidence for a phenomenon known as "phonetic convergence." Thus, in addition to replicating pure syntax at low-latency, shadowers instinctively mirror sources' idiosyncratic speech qualities.

Schwitzgebel and Taylor (1980) explored speech shadowing as a social psychological experimental tool when investigating aspects of third party impression formation. Their shadowers were able to effectively convey both verbal and nonverbal cues necessary for positive impression formation while replicating the words of others. While experimental stimuli in these studies were short videos of shadowers, the authors do report piloting the shadowing procedure *in vivo*. Milgram (1992) referenced Schwitzgebel and Taylor's study as an example of how speech shadowing could be used in social experimentation, but his ambition was to employ the method in interactive settings where research subjects freely dialogued with shadowers face-to-face.

Milgram's pilot studies

In the first pilot described in his APA speech, Milgram (1992) reports having 20 naïve participants engage in one-on-one conversations with various adult cyranoids for whom he

sourced, and following these interactions no participant agreed with a questionnaire item suggesting that their interlocutor had been merely repeating messages received via radio. Upon learning the true nature of these interactions, some participants "felt the loss of a person," having had quite an engaging experience with their interlocutor, who, as it turned out, was merely a "synthetic creation of the experimental procedure and had no existence apart from the hybridization which the experiment created" (Milgram, 1992, p. 340). Notably lacking from this study were control groups (specifically, non-cyranoid dyads) capturing participants' baseline experiences with the shadowers.

Milgram suspected that interactants would still be inclined to see a cyranoid as autonomous even in cases where a source and shadower were quite dissimilar from one another. Accordingly, he tested the robustness of the cyranic illusion by conducting the aforementioned interview-panel study wherein he separately sourced for 11- and 12-year-old shadowers while being interrogated by groups of teachers. The teachers were asked to assess their interviewee's intelligence during the interviews, so in effect were unknowingly evaluating a child producing the words of a university professor. Rather than provide a systematic analysis of these interactions, however, Milgram reports select anecdotes from teachers' post-interview written evaluations highlighting how the deception went undetected despite the conversations being very incongruous.

Cyranoids after Milgram

Despite being largely ignored within the scientific community, the cyranic technique has recently been picked up by artists who have used cyranoids as parts of social installations within which participants experience breaches of social norms (Mitchell, Gillespie, & O'Neill, 2011; Pawlak, 2009) and that create conditions under which people unknowingly encounter familiar others (e.g., friends and spouses) through the bodies of strangers (Mitchell, 2009). The cyranoid has also been used as a metaphorical device within societal and media

analysis to describe public perception of highly visible social actors (e.g., the movie star, the news anchor, the politician, etc.), whose relationships with the masses are often mere performance and whose messages are often carefully crafted and scripted by unseen speechwriters (McCarthy, 2006, 2011). Despite these developments, which touch upon phenomena fundamental to social psychology, experimental scenarios involving human cyranoids have not yet been formally investigated.

Creating a cyranoid

There are many combinations of gadgetry that might facilitate a functional cyranic interaction. However, a researcher attempting to construct a cyranoid must make considerations based on the level of mobility and covertness they hope to attain. Various technologies enable low-latency audio transfer between source and shadower (e.g., radio transmitters, Wi-Fi, mobile phone devices, etc.), each with certain benefits and drawbacks. Inner-ear radio receivers similar to those used in the current work provide perhaps the greatest degree of mobility and stealth as they are wireless and not readily perceivable at close distances by interactants. Audio relay from shadower to source can easily be accomplished using wireless microphones. Though video relay from shadower to source is not necessary, providing the source with a feed of their shadower's field of vision gives a richer sense of the intersubjective phenomena occurring between shadower and interactant. Live video relay can be accomplished via overt gadgets (e.g., subcams; see Lahlou, 2011) or covert recorders. Further descriptions of the types of gadgetry that can constitute a "cyranic contraption" are discussed by Mitchell et al. (2011).

Methodological and theoretical implications of the cyranoid

The cyranoid method holds particular promise as a means of constructing and controlling the inner (dispositional, non-visible) and outer (physical, visible) identities of human stimuli in experiments that approximate real-world scenarios (e.g., unscripted, face-to-

face interlocution). The methodological advances in social psychology that followed Milgram's era established experimental norms that prioritized internal validity and replicability generally at the expense of mundane realism and Milgram-esque experimental flair (Adair, 1991), and as such, most modern substantiations of the field's major theories (e.g., the dual processing models of information processing; Chaiken, 1980; Petty & Cacioppo, 1986) have relied upon static experimental stimuli (e.g., vignettes and cognitive tasks) in which research participants are largely isolated from anything resembling an actual *social* context. Where methods do involve dynamic human-human interaction, potential confounds are often reduced by physically distancing participants from human stimuli (e.g., via computer-mediation) or by restricting dialogue within strict parameters by-way-of role-playing and/or scripting. As social psychological methodologists point out, the de-socializing of experimental stimuli has arisen largely due to the need to control confounds and preserve independence among observations of dependent variables – prerequisites for standard analytical techniques such as ANOVA (see Kashy & Kenny, 2000; Willard, Madon, Guyll, Scherr, & Buller, 2012).

The cyranoid method enables specific forms of experimental control to be introduced into research scenarios involving participants more or less freely associating with human stimuli (cyranoids) face-to-face and in close-proximity. This affords researchers the opportunity to achieve levels of mundane realism not possible with traditional stimuli (e.g., "paper people" and the like; see Murphy, Herr, Lockhart, & Maguire, 1986). A well-trained shadower can spontaneously replicate the prose of a large variety of source-types, constituting a controlled outer identity (or "body") across experimental conditions differentiated by inner identity. Likewise, a single source can serve as a controlled inner identity (or "mind") across experimental conditions differentiated by shadower-type. In fact, this logic has recently inspired researchers operating in the overlap between social

psychology and computer science to develop an experimental practice that makes use of immersive virtual environment technology (see Bailenson, Beall, Loomis, Blascovich, & Turk, 2004; Bailenson, Yee, Blascovich, & Guadagno, 2008; Blascovich et al., 2002). These researchers argue that this technology offers a means of achieving high levels of mundane realism and experimental control, and often cite Milgram's cyranoid method as an analogue. In immersive virtual environments, participants control human avatars (the digital equivalents of cyranoids) in three-dimensional simulated social worlds as researchers observe how users' behaviors and perceptions change in relation to the characteristics of the avatars they ostensibly control and interact with (see "the Proteus effect": Yee, Bailenson, & Ducheneaut, 2009; "walk a mile in digital shoes": Yee & Bailenson, 2006).

The cyranoid method also presents a means for social psychologists to examine a number of core theoretical paradigms. One such paradigm, which we consider in Study 2 of the present work, involves the role of appearance cues (e.g., age, gender, height, ethnicity, etc.) in mediating person perception. For instance, it has been well documented that people tend to implicitly perceive unity between outer appearance and inner disposition (e.g., attractiveness ↔ competence: Dion, Berscheid, & Walster, 1972; Eagly, Ashmore, Makhijani, & Longo, 1991; race ↔ aggression: Duncan, 1976; Sagar & Schofield, 1980; youthfulness ↔ naivety; Berry & McArthur, 1986). Using the cyranoid method, one may investigate how interactants' perceptions of a cyranoid interlocutor change when the identity of the shadower is manipulated (e.g., by age or gender) and the source is kept constant. We can thus come to understand the components of a target source's disposition that are perceived as more or less stable irrespective of outer identity (i.e., which elements "cut through" the exterior), and those that are susceptible to change according to outer identity.

Connecting these issues with related literature addressing social behavior, there has been well-established research on stereotypes and their often self-fulfilling nature - how a

perceiver's biased expectations regarding a target on the basis of their appearance may actually elicit stereotype-confirming patterns of behavior from targets (Snyder & Stukas Jr., 1999; Snyder, Tanke, & Berscheid, 1977) as well as jointly influence behavioral confirmation by perceivers (Chen & Bargh, 1997). These issues can be investigated in highly dynamic and interactive contexts using cyranoids, as the identities of sources, shadowers, and interactants can be manipulated to test, for example, how the intersubjective phenomena that arise between cyranoids and interactants change on account of the dispositional and physical makeup of a cyranoid. Though Milgram had in fact alluded to stereotype phenomena in describing the outcomes of his pilots, he never couched his observations within a broader theoretical framework (Blass, 2004).

Overview of studies

Studies 1 and 2 are modelled off of the pilots Milgram (1992) conducted, though each goes beyond Milgram in terms of scope, control, and breadth of analysis. Both studies investigate the robustness of the cyranic illusion using a number of approaches, including post-interaction interviewing, survey-response, and video/transcript review. Study 2 examines aspects of person perception in relation to inner vs. outer identity and associated behavioral phenomena. In both studies, confederates were trained to function as sources and shadowers across various experimental conditions while participants served as naïve interactants. Each study was separately approved by an ethical review board at a major British university. Studies were conducted in a behavioral research laboratory and participants were recruited from a major metropolitan area via internet advertisement.

The aspect of identity we manipulate in Study 2 is age-group (child vs. adult) on the basis of it being the trait dimension explored by Milgram. It has been shown that age is a characteristic with which individuals reflexively categorize others into person-types (Brewer & Lui, 1989), and that people tend to define themselves and others relative to prototypes

representative of discrete age-groups (e.g., infant, young-adult, middle-aged, etc.; Giles & Reid, 2005). Based on a target's overt age, people instinctively make judgements concerning a variety of socio-personal dimensions, such as social status and competence (see Berry et al., 1986; Brewer, Dull, & Lui, 1981; Fiske, 2010; Krueger, Heckhausen, & Hundertmark, 1995). In particular, people are more likely to ascribe intelligence to a target if the target shows certain signs of aging (see Montepare & Zebrowitz, 1998; Muscarella & Cunningham, 1996). We use interactions involving cyranoids composed of age-discrepant source/shadower types to observe how interlocution behavior and person perception align with age-based stereotypes.

Cyranoid notation

The terms "source," "shadower," and "interactant" have meanings in contexts outside of cyranoid research that may obfuscate their usage herein. Therefore, we have devised a notation scheme for illustrating cyranic interactions that we shall employ in conjunction with the terminology.

There are three essential components to a cyranic interaction: the source (the agent who relays communication to the shadower), the shadower (the agent who shadows speech provided by the source), and the interactant (the agent who physically encounters the shadower). The hybrid persona that results from merging a source's words with a shadower's body is called a cyranoid. We use braces ("{}") to distinguish what is visible to an interactant (namely, the body of either a cyranoid or an autonomously communicating interlocutor), and square brackets ("[]") denote the source of the body's communicated words (which can be either their own if speaking autonomously or that of a third party when shadowing):

{[Joe]Joe}	Joe speaking self-authored words
{[Joe]Ben}	Ben shadowing Joe's words (forming a cyranoid)

General descriptors and subscripts can be used to describe the makeup of an agent:

{[Adult]Adult}	An adult speaking self-authored words
{[Adult]Child}	A child shadowing for an adult
{[$Female_1$]$Female_2$}	$Female_2$ shadowing for $Female_1$

The addition symbol ("+") can be used to describe multiple sources and multiple shadowers:

{[A + B]C}	C shadowing for both A and B
{[A]B} + {[A]C}	B and C both shadowing for A

Left-right arrows ("↔") are used to distinguish communication with interactants:

{[A]B} ↔ Group C	B shadowing for A in dialogue with Group C
{[A]B} ↔ C + D	B shadowing for A in dialogue with C and D

Finally, general descriptors and subscripts can signify type-similarity/dissimilarity:

{[$Female_{USA}$]$Male_{UK}$}	Male (British) shadowing for Female (American)

Study 1: Exploring the cyranic illusion in dyadic interactions

The goal of our first study was to validate the cyranic illusion through a simple experiment designed to gauge whether participants would detect a speech shadower during face-to-face, close-proximity, unrehearsed, dyadic interlocution. Aside from Milgram's (1992) pilots, there was no precedent for studying such a phenomenon in the psychological literature, so the techniques we used to investigate the illusion borrowed principally from Milgram.

Method

Subjects and confederates. 40 adults participated in the study (22 female; mean age = 30.25; *SD* = 9.95). Two confederates partook in the study: a 23-year-old female graduate student and a 26-year-old male graduate student. Participants were randomly assigned to experimental conditions. Both confederates engaged in numerous mock trials of the experimental procedure so as to become familiar with the apparatus and achieve a consistent degree of accurate, low-latency speech replication.

Conditions. The experiment featured two conditions: Cyranoid (n = 20 participants),

and Non-cyranoid (n = 20 participants). In the Cyranoid condition, participants individually engaged in a 10-minute face-to-face dialogue with the male confederate who participants were led to believe was another research participant when in fact the male confederate was speech shadowing for the female confederate for the entirety of the interaction: {[Female]Male}↔ Participant. The Non-cyranoid condition mirrored the protocols of the Cyranoid condition, albeit this time the male confederate spoke autonomously with participants: {[Male]Male} ↔ Participant.

Instructions and materials. Participants were informed that the study involved holding a 10-minute conversation with another research participant. In order to convey the notion that the interactions were not scripted, participants were told that during the conversation they could speak with their interlocutor about whatever subject they wished. Following these interactions, participants completed a brief questionnaire that included three items designed to gauge their suspicions as to whether or not they believed their interlocutor was (a) simply repeating messages received via radio, (b) giving scripted responses, and (c) speaking their own thoughts. Participants were asked to either "agree" or "disagree" with each statement. Participants were also asked to provide a brief written evaluation of the person with whom they communicated, the purpose of which was to capture subjective, spontaneous impressions of the interlocutor.

Apparatus. The male confederate sat roughly six feet apart from participants in an interaction room. Video cameras were placed at eye-level behind each interlocutor so as to capture approximations of their fields of vision. Adjacent to the interaction room was a sound-proof source room (used for Cyranoid trials) which housed devices that enabled the female confederate to source for the male confederate. The video camera capturing audio and the field of vision of the male confederate was broadcast to a video monitor in the source room so that the female confederate could observe activity between the male confederate and

the participant. For a diagram of the rooms used in the study, see Figure 1.

The cyranoid contraption consisted of a series of connected devices. The female source spoke into a microphone connected to an FM transmitter that relayed to a small radio worn in the pocket of the male confederate. Connected to the radio was a neck-loop induction coil worn under the confederate's clothing. The male confederate wore a discreet, flesh-colored, wireless, inner-ear audio device (not noticeable at close distances) that received an audio signal from the induction coil. This apparatus allowed the male confederate to hear the words of the female confederate in the source room in real-time.

<Figure 1 here>

Procedure. Following informed consent and instruction, the participant was led to the interaction room. The male confederate then entered the room and sat facing the participant. The researcher left the room and participant-confederate dialogue commenced. After 10-minutes, the researcher returned to the interaction room, instructed the male confederate to leave, and delivered the post-interaction questionnaire to the participant. Following completion of the questionnaire and written evaluation, the participant was interviewed by the researcher and asked verbally whether they detected anything unusual regarding their interlocutor's verbal and nonverbal communication. Following all attempts to extract their suspicions, the researcher disclosed the full nature of the study in a debrief session.

Results

Using Stata, participants' agree/disagree questionnaire responses were analyzed using exact logistic regression, an alternative to binary logistic regression that provides a more accurate model of small samples (Hirji, Mehta, & Patel, 1987; for procedure see UCLA Statistical Consulting Group, 2014). In relation to the Non-cyranoid condition, participating in the Cyranoid condition did not significantly affect the odds ($\pi_{agree}/\pi_{disagree}$) of a participant agreeing with the questionnaire statement: "My interlocutor spoke their own thoughts," OR =

0.31, *SE* = 0.37, 95% CI [0.01, 4.24] (CI spanning 1 signifies non-significance). Overall, 19 of 20 participants in the Non-cyranoid condition indicated agreement with this item compared to 17 of 20 participants in the Cyranoid condition. Participating in the Cyranoid condition did not significantly affect the odds of agreeing with the statement: "My interlocutor gave scripted responses," OR = 0.31, *SE* = 0.37, 95% CI [0.01, 4.24]. Three of 20 participants in the Non-Cyranoid condition indicated agreement with this item compared to only one of 20 participants in the Cyranoid condition. No participant in either condition agreed with the questionnaire item that read: "My interlocutor spoke by receiving radio messages and repeating them."

No participant stated that their interlocutor was behaving unusually or in a pre-prescribed manner during post-interaction interviews and debriefing. Moreover, none of the written evaluations provided by participants in the Cyranoid condition gave any indication that the cyranic illusion was detected, and when the deception was revealed during the debrief session, responses were a positive mixture of astonishment and amusement. As further evidence of the illusion, a review of the video recordings and dialogue transcripts showed that at no point during any of experimental trials did participants raise the possibility that their interlocutor was talking via assistance or using a script.

Study 2: Exploring interpersonal biases with incongruent cyranoid

Study 2 was modelled off of Milgram's (1992) second pilot and featured two age-discrepant male confederates (a child and an adult) interviewed by panels of participants both autonomously and interchangeably as sources and shadowers for one another. Whereas the sole focus of Study 1 was to demonstrate the cyranic illusion, our second study included the additional goal of examining how verbal behavior confirms age-group stereotypes. To this end, we considered three components of cyranoid-interactant interlocution: (a) the duration of utterances spoken by confederate interviewees, (b) the difficulty of questions posed by

participants, and (c) the sophistication of responses given by confederate interviewees in reply to participants' questions. Our interest resided in whether or not confederates would produce equivalent amounts of content across conditions, whether participants would ask more difficult questions of an adult-bodied interviewee independent of which confederate was actually generating responses to their questions, and also if self-stereotyping would occur, whereby confederates would alter the sophistication of their responses on account of the body they were interviewed through. Furthermore, we assessed participants' written evaluations of the person they interviewed to gauge whether participants' explicit impressions were mediated by the age-group of the body they encountered.

Method

Subjects and confederates. 72 adults partook in the study (43 female; mean age = 23.33; *SD* = 2.80). A 12-year-old male actor and a 37-year-old adult male social psychology professor served as confederates. Participants were randomly assigned to interview-panels nested within experimental conditions. As with Study 1, the confederates rehearsed Study 2's procedure in numerous mock trials so as to achieve consistency with the cyranoid technique.

Conditions. Each of four experimental conditions consisted of 18 participants divided among four interview-panels, and panels varied in size between three and five participants. Conditions followed an identical protocol wherein interview-panels interrogated a confederate for 20-minutes. In the {[Adult]Adult} condition, interview-panels interacted with the adult confederate speaking autonomously: {[Adult]Adult} ↔ $\text{Panel}_{1\text{-}4}$. The {[Adult]Child} condition featured the adult confederate sourcing for the child confederate shadower: {[Adult]Child} ↔ $\text{Panel}_{5\text{-}8}$. The {[Child]Child} condition consisted of interview-panels interacting with the autonomously-speaking child confederate: {[Child]Child} ↔ $\text{Panel}_{9\text{-}12}$. Finally, the {[Child]Adult} condition featured the child confederate sourcing for the adult confederate shadower: {[Child]Adult} ↔ $\text{Panel}_{13\text{-}16}$. Experimental trials alternated

so as to counterbalance sequencing effects.

Instructions and materials. Participants received instruction forms individually and were given verbal instructions by the researcher as an interview-panel. Participants were asked to interview an individual in order to gain a sense of "what they're like and what they know." They were told to focus their questions on the domains of (a) science, (b) literature, and (c) current and historical political events, these being quite similar to those Milgram (1992) had instructed his participants to follow. The researcher emphasized that they were free to interpret these domains as broadly as they wished. As with Study 1, the emphasis on allowing participants to generate their own questions was intended to undermine the possibility of participants assuming their interviewee's responses were rehearsed. Participants were asked not to speak to each other during the interview nor respond to any question or comment posed by another panel member (so as to reduce their influence over one another and to keep dialogue directed toward the confederate interviewee).

A post-interview questionnaire completed by participants contained the same three agree/disagree items from Study 1 designed to gauge whether participants succumbed to the cyranic illusion. As with Study 1, participants were also asked to provide a brief written evaluation of their interviewee before being interviewed by the researcher.

Apparatus. The apparatus used was similar to that of Study 1, except that the interaction room contained five chairs positioned opposite the confederate such that each interviewer sat facing their interviewee at a distance of roughly six feet. The contraption of devices that allowed the source confederate to deliver speech to the shadowing confederate in cyranic conditions was identical to that utilized in Study 1.

Procedure. Following informed consent and instruction, the confederate (either the adult or the child) was brought into the interaction room and seated opposite the interview-panel. In all conditions the confederate went by the name "Stanley." Participants were given

no background information on Stanley nor were they given any indication that this person was a confederate. The researcher then left the room and interviews commenced.

The researcher returned after 20-minutes to halt the interview. The confederate left the interaction room and participants were led to an evaluation room, seated at individual desks, and handed the post-interaction questionnaire. Following completion of questionnaires and written evaluations, participants returned to the interaction room where they were interviewed and debriefed by the researcher as a group akin to Study 1.

Interlocution measures. Dialogue from each interview was transcribed and a survey containing all main interviewer question threads extracted from each interview-panel was compiled using survey software and presented to six coders (4 female, mean age = 24.00) blind to the research objectives. Only questions which introduced a new topic or concept were assessed, while follow-up questions and comments made by the interviewers that did not significantly change the topic or introduce a new concept were excluded from the analysis. Coders independently rated each question (condition-blind, randomized) in terms of "how difficult to answer the average person would find the question" using a five-point rating system (1 = not at all difficult; 5 = very difficult). The composite variable *Question Difficulty* was derived by averaging the difficulty scores provided by coders for each question and was used to assess whether or not the questions posed by participants varied in terms of difficulty across experimental conditions.

Confederate interviewees' full responses to the question threads posed by participants (including responses to follow-up questions) were extracted from each experimental trial and presented to five coders (3 female, mean age = 24.00) blind to the research objectives. Coders independently rated each response (condition-blind, randomized) in terms of its sophistication (1 = not at all sophisticated; 5 = very sophisticated). The composite variable *Response Sophistication* was then computed by averaging coders' sophistication ratings for

each response and was used to assess whether or not the sophistication of confederate interviewees' responses differed across experimental conditions. We also computed the total number of words spoken by the confederate interviewee during each full response in order to generate the variable *Response Length*. This variable was calculated in order to assess the degree to which *Response Sophistication* varied in relation to the length of responses provided by confederate interviewees, as well as to gain a sense of whether or not perceptions of sophistication varied more as a function of the quantity of words spoken vs. the quality of the words (i.e., content, reasoning, lexicon, phrase structure, etc.).

Finally, the variable *Utterance Length* was generated by calculating the quantity of words articulated during each unique conversational turn spoken by confederate interviewees. This variable was used to determine the extent to which confederates produced similar amounts of turn content when speaking autonomously compared to when sourcing for a shadowing confederate.

Person perception measures. Following all trials, participants' post-interaction written evaluations were transcribed and anonymized. Two independent reviewers (1 female, mean age = 28.50), blind to the research objectives, developed a coding frame comprised of seven dichotomous trait dimensions which emerged from the corpus of written evaluations, these being: (a) *Intelligence* (intelligent vs. unintelligent), (b) *Confidence* (confident vs. unconfident), (c) *Maturity* (mature vs. immature), (d) *Extraversion* (extraverted vs. introverted), (e) *Friendliness* (friendly vs. unfriendly), (f) *Opinionatedness* (opinionated vs. not-opinionated), and (g) *Honesty* (honest vs. dishonest). Six coders (4 female, mean age = 23.00) then independently rated each participant's written evaluation (condition-blind, randomized), assigning to each a score for each trait dimensions: +1 for positive attributions, -1 for negative attributions, and 0 for attributions that did not appear in the written evaluation (e.g., if a participant remarked that their interviewee was intelligent, confident, mature,

introverted, unfriendly, and opinionated, but did not comment on their honesty, a coder would score their evaluation as follows: *Intelligence* = 1, *Confidence* = 1, *Maturity* = 1, *Extraversion* = -1, *Friendliness* = -1, *Opinionatedness* = 1, *Honesty* = 0). For each written evaluation, seven person perception measure variables (*Intelligent, Confident, Mature, Extraverted, Friendly, Opinionated,* and *Honest*) were generated by averaging coders' trait dimension scores.

Results

Detecting the cyranic illusion. We again used exact logistic regression to analyze participants' post-interaction questionnaire agree/disagree responses. The dummy variables *Cyranoid* and *Adult* were used to signify both the type of interaction experienced by the participants (cyranoid vs. non-cyranoid) and the confederate present in the room with participants (adult vs. child), respectively. Neither *Cyranoid*, OR = 0.71, *SE* = 0.59, 95% CI [0.08, 5.02], *Adult*, OR = 3.29, *SE* = 3.93, 95% CI [0.23, 188.78], nor the interaction between these factors, OR = 0.47, *SE* = 0.65, 95% CI [0.01, 13.05] significantly affected the odds of a participant agreeing with the statement: "The person I interviewed spoke their own thoughts." Likewise, neither *Cyranoid*, OR = 1.58, *SE* = 1.53, 95% CI [0.16, 21.40], *Adult*, OR = 1.00, *SE* = 1.05, 95% CI [0.06, 15.39], nor the interaction between these factors, OR = 1.00, *SE* = 1.31, 95% CI [0.03, 29.60] significantly affected the odds of agreeing with the statement: "The person I interviewed gave scripted responses." A model was not calculated for the item stating: "The person I interviewed spoke by receiving radio messages and repeating them," as exactly one participant (n = 1) in each experimental condition agreed with this item while the remaining participants (n = 17) in each condition disagreed.

An assessment of the post-interaction written evaluations, interview statements and debriefing remarks revealed strong evidence for the success of the illusion. No participant commented that they suspected that their interviewee had been merely ventriloquizing for

another individual, and although a small number of participants suggested that their interviewee might have prepared answers, none felt strongly that the interviewee was behaving in an inauthentic manner. Furthermore, assessments of the video footage and transcripts from each trial showed that not once during any of the 16 interview sessions did participants openly question the interviewee's autonomy.

Interlocution. Following Shrout and Fleiss' (1979) guidelines on computing intraclass correlation, high agreement was found among coders who scored the difficulty of questions posed by participants: ICC(2,6), absolute = 0.85, 95% CI [0.80, 0.89]. Similarly, high reliability was found among coders who rated the sophistication of confederate interviewees' responses: ICC(2,5), absolute = 0.90, 95% CI [0.87, 0.92].

We used procedures demonstrated by Field (2009) and Judd (2000) to build multilevel mixed effects linear regression models in order to assess the contrasts between the experimental conditions with respect to *Utterance Length*, *Question Difficulty*, and *Response Sophistication*. As observations of these interlocution measures were drawn from interview-panels nested within experimental conditions (and therefore non-independent in nature), the random effects of each interview-panel were considered in our models while the dummy variables *[Adult]* and *{Adult}* were used to indicate fixed factor levels pertinent to each experimental condition. *[Adult]* took the value of 1 in conditions where the adult confederate generated responses to interview-panel questions and 0 in conditions where the child confederate generated responses. *{Adult}* took the value of 1 when the adult confederate was physically present in the interaction room and 0 when the child confederate was physically present in the interaction room. Thus, the factor levels for each experimental condition were as follows: {[Adult]Adult}: *[Adult]* = 1, *{Adult}* = 1; {[Adult]Child}: *[Adult]* = 1, *{Adult}* = 0; {[Child]Child}: *[Adult]* = 0, *{Adult}* = 0; {[Child]Adult}: *[Adult]* = 0, *{Adult}* = 1.

***Utterance Length*.** Our final model in which *Utterance Length* was designated as the

response variable revealed a significant interaction between *{Adult}* and *[Adult]*, $F(7.92) = 9.52$, $p < 0.05$. There were no significant main effects of either *[Adult]*, $F(7.68) = 2.01$, $p = 0.20$, or *{Adult}*, $F(7.72) = 0.03$, $p = 0.87$. See Table 1 for final model estimated effect sizes, standard errors, and confidence intervals, and Table 4 for pooled means and standard deviations.

Two separate multilevel models were used to further explore the significant interaction between *{Adult}* and *[Adult]* with respect to *Utterance Length*. We first considered only observations from experimental conditions in which participants engaged with the adult confederate's words (*[Adult]* = 1) and fit a modified version of our final model that excluded *[Adult]* and the interaction between *[Adult]* and *{Adult}* as fixed factors. This model showed that the adult confederate's utterances were significantly longer when spoken through their own body (*{Adult}* = 1) than when shadowed by the child confederate, $b = 66.67$, $SE = 20.70$, $t(3.99) = 3.22$, $p < 0.05$. We then considered only participants who engaged with the child confederate's words (*[Adult]* = 0) and found that the child confederate's utterances were not significantly different when being shadowed by the adult confederate (*{Adult}* = 1) than when spoken through their own body, $b = 2.12$, $SE = 2.54$, $t(7.72) = 0.83$, $p = 0.43$.

Question Difficulty. Our final model predicting *Question Difficulty* showed significant main effects of both *{Adult}*, $F(11.97) = 9.18$, $p < 0.05$, and *[Adult]*, $F(15.46) = 6.15$, $p < 0.05$. The interaction between these two fixed factors was not significant, $F(17.92) = 1.61$, $p = 0.22$. We included in our final model the fixed factor predictor *Previous Response Sophistication* as a control variable in order to examine the relationship between the difficulty of questions posed and the sophistication (*Response Sophistication*) confederate interviewees demonstrated in the preceding question thread. *Previous Response Sophistication* was found to have no significant effect on *Question Difficulty*, $F(362.97) = 1.35$, $p = 0.25$. Estimated

effect sizes, standard errors, and confidence intervals for both our final and partial models are shown in Table 2, while Table 4 shows pooled means and standard deviations.

***Response Sophistication*.** Our final model with the response variable *Response Sophistication* revealed a significant main effect of *[Adult]*, $F(15.25) = 102.59$, $p < 0.001$, a non-significant main effect for *{Adult}*, $F(13.05) = 0.08$, $p = 0.78$, and a non-significant interaction between these factors, $F(29.73) = 0.37$, $p = 0.55$. The fixed factor predictor *Question Difficulty*, included as a control variable, was found to have a significant main effect on *Response Sophistication* in a partial model, $F(381.36) = 21.70$, $p < 0.001$. However, when the fixed factor predictor *Response Length* was included in our final model as a control variable it was shown to have a significant main effect upon *Response Sophistication*, $F(331.68) = 320.34$, $p < 0.001$, while the effect of *Question Difficulty* proved non-significant, $F(363.96) = 2.60$, $p = 0.11$. Estimated effect sizes, standard errors, and confidence intervals for both our final and partial models can be found in Table 3, while Table 4 shows pooled means and standard deviations.

<Tables 1, 2, 3, and 4 here>

Person perception. Inter-rater reliability analyses showed high agreement for each of the seven coded trait dimensions derived from participants' post-interaction written evaluations (*Intelligence*: ICC(2,6), absolute = 0.92, 95% CI [0.88, 0.94]; *Confidence*: ICC(2,6), absolute = 0.86, 95% CI [0.80, 0.91]; *Maturity*: ICC(2,6), absolute = 0.83, 95% CI [0.76, 0.88]; *Extraversion*: ICC(2,6), absolute = 0.80, 95% CI [0.72, 0.87]; *Friendliness*: ICC(2,6), absolute = 0.82, 95% CI [0.74, 0.88]; *Opinionatedness*: ICC(2,6), absolute = 0.80, 95% CI [0.72, 0.87]; *Honesty*: ICC(2,6), absolute = 0.84, 95% CI [0.77, 0.89]).

***{[Adult]Adult} vs. {[Adult]Child}*.** To gain a sense of how participants' perceptions of the autonomously communicating adult confederate compared to perceptions of the adult confederate speaking through the body of a child, we computed pooled means for each

person perception measure (*Intelligent*, *Confident*, *Mature*, *Extraverted*, *Friendly*, *Opinionated*, and *Honest*) and conducted independent samples means tests contrasting {[Adult]Adult} with {[Adult]Child}. For *Mature*, scores from the {[Adult]Child} condition were significantly greater than those from the {[Adult]Adult} condition, $t(34) = 2.25$, $p < 0.05$, signifying that participants in the {[Adult]Child} condition commented on their interviewee's maturity in their post-interaction written evaluations significantly more so than participants in the {[Adult]Adult} condition . No significant differences were found with regard to *Intelligent*, $t(34) = 1.72$, $p = 0.09$, *Confident*, $t(34) = -0.62$, $p = 0.54$, *Extraverted*, $t(34) = 0.19$, $p = 0.85$, *Friendly*, $t(34) = 0.16$, $p = 0.88$, *Opinionated*, $t(34) = -1.51$, $p = 0.14$, and *Honest*, $t(34) = 0.68$, $p = 0.50$. Pooled means and standard deviations for each person perception measure are shown in Table 5.

<Table 5 here>

The following are excerpts from participants' post-interaction written evaluations of {[Adult]Adult}. In general, participants found the autonomously speaking adult to be intelligent and engaging:

> "Stanley was obviously very intelligent, at many points I couldn't even follow his well thought-out arguments which tended to be quite philosophical. He obviously had at least a basic knowledge of all 3 subject areas, if not a very deep understanding of the issues surrounding them." ({[Adult]Adult}, panel 1, participant 3; person perception measure scores: *Intelligent* = 1.00, *Confident* = 0.50, *Mature* = 0.50, *Extraverted* = 0.17, *Friendly* = 0.00, *Opinionated* = 0.17, *Honest* = 0.00).

> "Stanley is a very knowledgeable person. He is very aware of current political and historic issues. In addition, he is capable of expressing deep expertise in a friendly manner. I would definitely consult him for advice in economics and history." ({[Adult]Adult}, panel 2, participant 8; person perception measure scores: *Intelligent*

= 1.00, *Confident* = 0.67, *Mature* = 0.33, *Extraverted* = 0.17, *Friendly* = 1.00, *Opinionated* = 0.50, *Honest* = 0.17).

"I think he is an honest person and talkative. Sometimes even if he doesn't know for sure about the answer he can still find something to talk about to get the conversation going." ({[Adult]Adult}, panel 4, participant 18; person perception measure scores: *Intelligent* = 0.33, *Confident* = 0.67, *Mature* = 0.50, *Extraverted* = 1.00, *Friendly* = 0.50, *Opinionated* = 0.17, *Honest* = 1.00).

The following are excerpts from participants' post-interaction written evaluations of {[Adult]Child}. It is interesting to note that while participants were largely impressed by the intelligence of the person with whom they interacted, some qualify their evaluations by suggesting that their interviewee may not have fully understood what they were communicating (see second and third excerpts below):

"Very intelligent. Eloquent and charming. He is obviously very bright and has a very high level of knowledge for his age. He was very polite and well-mannered. He handled a slightly odd social situation very maturely." ({[Adult]Child}, panel 8, participant 32; person perception measure scores: *Intelligent* = 1.00, *Confident* = 0.67, *Mature* = 1.00, *Extraverted* = 0.33, *Friendly* = 0.67, *Opinionated* = 0.50, *Honest* = 0.50).

"Clearly very bright. His ability to connect patterns and think in a more expanded way than some the questions implied was more impressive than his name-dropping of the classics (although I don't doubt that he read and understood them). He was articulate, with a lot of intellectual potential, especially regarding linkages between language and knowledge. I thought he'd enjoy discourse analysis at some point." ({[Adult]Child}, panel 5, participant 19; person perception measure scores: *Intelligent* = 1.00, *Confident* = 0.83, *Mature* = 0.83, *Extraverted* = 0.33, *Friendly* = 0.00,

Opinionated = 0.66, *Honest* = 0.00).

> "He seemed rather intelligent for his age, with a lot of knowledge on various matters. He seemed to be capable of using big words, however I wasn't certain if he actually knew what they meant in context." ({[Adult]Child}, panel 6, participant 25; person perception measure scores: *Intelligent* = 1.00, *Confident* = 0.33, *Mature* = 0.33, *Extraverted* = 0.00, *Friendly* = 0.00, *Opinionated* = 0.33, *Honest* = -0.33).

{[Child]Child} vs. {[Child]Adult}. We again calculated pooled means for each person perception measure, this time comparing scores from the {[Child]Child} condition with those from the {[Child]Adult} condition. Scores from {[Child]Child} were significantly greater than those from {[Child]Adult} with regard to *Intelligent*, $t(34) = 7.37$, $p < 0.001$, *Confident*, $t(34) = 5.22$, $p < 0.001$, *Mature*, $t(34) = 3.60$, $p < 0.01$, *Extraverted*, $t(34) = 3.17$, $p < 0.01$, *Friendly*, $t(34) = 3.08$, $p < 0.01$, and *Opinionated*, $t(34) = 4.63$, $p < 0.001$. Only with respect to *Honest* did scores not significantly differ, $t(34) = 1.82$, $p = 0.08$. Pooled means and standard deviations for each person perception measure are displayed in Table 6.

<Table 6 here>

The following are excerpts from participants' post-interaction written evaluations of {[Child]Child}. The interviewee in this condition received generally quite positive evaluations, while many participants explicitly referenced the interviewee's youth and age:

> "Very willing to venture a guess about questions asked. Honest about his uncertainty on some topics. Shows maturity. Well informed on local current issues and knows a wide range of information about basic science, which he says is his favourite topic. He mentioned one author he enjoyed but doesn't seem interested in reading literature. Smart, at the same level I would expect of his age." ({[Child]Child}, Panel 10, participant 43; person perception measure scores: *Intelligent* = 1.00, *Confident* = 0.50, *Mature* = 1.00, *Extraverted* = 0.33, *Friendly* = 0.17, *Opinionated* = 0.67, *Honest*

= 0.83).

> "I thought he was a friendly lad, and as expected he didn't know lots about literature, science, etc… Open to ideas, able to consider new points of view. Seemed intelligent." ({[Child]Child}, Panel 11, participant 48; person perception measure scores: *Intelligent* = 1.00, *Confident* = 0.17, *Mature* = 0.33, *Extraverted* = 0.33, *Friendly* = 0.67, *Opinionated* = 0.17, *Honest* = 0.33).

> "Cute. Funny. Knowledgeable for a kid, has a good interest for science as well as current events." ({[Child]Child}, Panel 12, participant 51; person perception measure scores: *Intelligent* = 1.00, *Confident* = 0.50, *Mature* = -0.17, *Extraverted* = 0.83, *Friendly* = 0.83, *Opinionated* = 0.17, *Honest* = 0.00).

The following are excerpts from participants' post-interaction written evaluations of {[Child]Adult}. We can see that despite the fact that the same child confederate generated responses to interviewee's questions in both conditions, participants evaluated {[Child]Child} much more favorably than {[Child]Adult} (with whom participants were largely unimpressed):

> "I feel Stanley was quite an aloof in the matters of science, literature and current/hist. political events. He lacked the ability to expand on any points he mentioned. Although, he did seem to be quite passionate about graphic novels. Overall, it feels as if Stanley was in a world of his own. His actions were quite hesitant." ({[Child]Adult}, Panel 13, participant 58; person perception measure scores: *Intelligent* = -0.67, *Confident* = -0.50, *Mature* = -0.33, *Extraverted* = -0.83, *Friendly* = -0.67, *Opinionated* = -0.67, *Honest* = 0.00).

> "He did not have very much to say regarding the topics given. The way he expressed his opinions was a bit unorganized. I wasn't sure if he was informed

about the topics and unable to express himself or if he didn't understand the topics. He gave off a rather adult impression at first but as the conversation went on seemed a bit uninterested in most of the topics." ({[Child]Adult}, Panel 16, participant 71; person perception measure scores: *Intelligent* = -0.83, *Confident* = -0.67, *Mature* = -0.67, *Extraverted* = -0.50, *Friendly* = -0.17, *Opinionated* = -0.67, *Honest* = 0.00).

"He has knowledge of a high school graduate. He does not have the capability of thinking critically." ({[Child]Adult}, Panel 13, participant 55; person perception measure scores: *Intelligent* = -0.67, *Confident* = -0.17, *Mature* = -0.67, *Extraverted* = 0.00, *Friendly* = 0.00, *Opinionated* = -0.50, *Honest* = 0.00).

General Discussion

Findings

In both studies, participants' written and debrief statements provided perhaps the strongest evidence in favor of the cyranic illusion, though analyses of participants' responses to agree/disagree questionnaire items also proved convincing. Even in cases involving significant age incongruity between source and shadower (Study 2), participants failed to notice when their interlocutor was not self-authoring the words he spoke, suggesting that the cyranic illusion is a robust phenomenon not limited to instances of high source-shadower congruence. It seems that when encountering an interlocutor face-to-face, people rarely question whether the "mind" and the "body" of a person are indeed unified – and for good reason, as social interaction would be undermined if we began to doubt whether each person we encountered was indeed the true author of the words they expressed. This observation regarding everyday social life stands in contrast to socialization that occurs in artificial environments (e.g., Second Life and other virtual community games) wherein users can construct outer personae which starkly contrast with their real-world identities (see Vasalou & Joinson, 2009; Bessiere, Seay, & Kiesler, 2007), and wherein unity between the user and

their avatar is more readily questioned (see Donath, 1998).

Our analysis of *Utterance Length* in Study 2 showed that {[Adult]Adult} generated far greater utterance lengths than {[Adult]Child}, {[Child]Adult} and {[Child]Child}, which with respect to *Utterance Length* were statistically equivalent. There are two immediate explanations for why such a discrepancy may have occurred. First, it is entirely possible that the adult confederate's behavior confirmed stereotyped assumptions about the linguistic limitations (e.g., reduced ability to expand upon complex concepts) expected of the child confederate relative to their own, thus resulting in shortened prose when sourcing. This would suggest that the child confederate may have been capable of shadowing much longer utterances but was simply not afforded the chance to do so. The fact that a corollary pattern did not emerge when the child, in turn, sourced words for the adult confederate may suggest that whereas adults perhaps have the ability to alter their verbal behavior so as to speak utterance lengths akin to those typically used by children, children may not as readily be able to generate utterances as lengthy as those produced by adults (particularly university professors). However, this discrepancy is most likely an artifact born of the unique relationship between the confederates used in our study, as the adult confederate found it much easier to source abbreviated passages than paragraph-length prose and suggested that at times it was difficult for the child to accurately shadow long and complex speech. This implies that the cyranoid method might be constrained by functional factors, namely that certain source-shadower pairings may require that a source openly alter certain aspects of their verbal behavior in order for the cyranoid to function in a manner that preserves the illusion of autonomy. It is a limitation of our study that we did not more closely account for how and why differences in speech shadowing ability may have altered utterance lengths, though we recognize that source-shadower functional impediments are certainly worth investigating in their own right in future research.

In considering the final model for our *Question Difficulty* interlocution measure, the results of Study 2 provide mixed evidence for the notion that people's verbal behavior will confirm age-based stereotypes during social interaction. Our results indicate that encountering adult-generated responses (*[Adult]* = 1) overrode participants' inclination to ask "child-level" questions when faced with a child-bodied interviewee in that participants' questions in {[Adult]Child} were significantly more difficult than those in {[Child]Child}. On the other hand, the fact the difficulty of questions in {[Child]Adult} and {[Adult]Adult} were statistically comparable suggests that here participants' verbal behavior *did* confirm stereotyped assumptions about what types of questions one should ask another person on the basis of their physical age and independent of their actual capacity answer such questions. Considering the literature on situational ambiguity and heuristic processing (e.g., Bohner, Chaiken, & Hunyadi, 1994; Chaiken & Maheswaran, 1994) might help partially resolve this discrepancy. Participants in {[Adult]Child} may have adjusted the difficulty of their questions upward while those who encountered {[Child]Adult} did not seem to make a related adjustment downward due to relative differences in ambiguity between the two contexts. Participants in the {[Child]Adult} condition were presented with a situation in which their interviewee produced far less content than what might have been expected, as utterance lengths in the {[Adult]Adult} condition were significantly greater than those in {[Child]Adult}. The comparative lack of content produced by {[Child]Adult}, therefore, may have generated ambiguity by-way-of a violated expectation, leading participants to anchor on age-based heuristic cues and thus continue to pose questions comparable in difficulty to the {[Adult]Adult} condition. On the other hand, utterance lengths between {[Adult]Child} and {[Child]Child} were statistically similar, therefore the amount of content produced by {[Adult]Child} may not have comprised a violation of expectations, and as such the difficulty level of participants' questions in the {[Adult]Child} more directly tracked the adult-

generated words spoken by their interviewee.

An alternative interpretation of the discrepancies in question difficulty across Study 2's conditions involves considering that participants in the {[Child]Adult} condition may have refrained from lessening the difficulty of their questions on account of the fact that doing so might have been perceived as a form of *talking down* to their interviewee. Indeed, narrative researchers have pointed out that it is often quite difficult to speak appropriately with those who display a level of intelligence significantly diminished from what is considered normal (Biklen & Moseley, 1988; Booth & Booth, 1996). It is perhaps more socially acceptable to flatter a child stranger's intelligence by asking them adult-level questions than it is to imply a middle-aged stranger's lack of intelligence by asking them child-level questions, as doing so would contradict the status usually ascribed to members of their age-group (see Barker, Giles, & Harwood, 2004; Harwood, Giles, Clement, Pierson, & Fox, 1994). Moreover, talking down to others is in general a form of condescension, which tends to negatively correlate with pro-social forms of behavior (Nave, Sherman, Funder, Hampson, & Goldberg, 2010).

Our results also suggest that the sophistication of one's verbal communication will not necessarily confirm stereotypes on the basis of the body-type one embodies, as there was no evidence from Study 2 suggesting that the body through which confederates were interviewed directly influenced the sophistication of their responses. Indeed, evidence from our final model for *Response Sophistication* implies that perceptions of sophistication were much more a function of the amount of content interviewees produced (*Response Length*) than the age-group of the body they communicated though. However, it should be noted that for the purposes of our study this observation is evidence of experimental control, namely that the confederates we used gave consistently sophisticated responses across experimental conditions (when controlling for both *Response Length* and *Question Difficulty*),

contradicting Laurens' and Moscovici's (2005) assertion – at least with respect to this particular interlocution measure – that experimental confederates tend to behaviorally confirm expectations held by participants. This is perhaps a result of the training procedures we employed, as confederates had time to rehearse the procedures and settle into "being themselves" while sourcing. Had we instead assigned participants without knowledge of the research objectives to function as sources across experimental conditions, we may have observed source behavior confirm stereotypes held by both themselves and interactants. This is indeed an avenue that warrants future investigation considering the literature on self-stereotyping, social cues, and behavioral confirmation (e.g., Chen et al., 1997; Wheeler & Petty, 2001), particularly that which regards behavioral alignment with avatar-identity in virtual environments (e.g., Fox, Bailenson, & Tricase, 2013; Peña, Hancock, & Merola, 2009; Yee et al., 2009).

The cyranoid technique proved a novel route to exploring the relationship between person perception and outer vs. inner identity. Despite the same child confederate generating responses in both conditions, significant divergence occurred between {[Child]Child} and {[Child]Adult} on nearly every trait dimension captured by our coding frame, with {[Child]Adult}, on average, being more negatively perceived on all dimensions. Comparing {[Adult]Adult} with {[Child]Child}, we can see that on their own our confederates were evaluated quite similarly and favorably by participants. However, when we constructed hybrid personae, or "mash-ups" of these two characters in cyranoid conditions, perceptions dramatically altered on account of which confederate constituted mind and which constituted body. Interestingly, we see a contrast between the relatively *high* difficulty of questions posed to {[Child]Adult} in during panel interviews – a public forum – and the quite *low* opinions expressed of {[Child]Adult} in post-interaction written evaluations – a private setting. This pattern is evidence of the frequent tension between private and public expression

of attitudes discussed by Moscovici (1976). These results suggest that the cyranoid method holds promise for investigations into how social perceptions are mediated separately by inner disposition and outer appearance, and how the alignment of public and private expressions of perception shift on account of the mixture of identities one encounters. Though the relationship between person perception and outer vs. inner identity has been studied in virtual environments in recent years (see Neff, Wang, Abbott, & Walker, 2010; Nowak & Rauh, 2005), cyranoids present an opportunity to approach these questions using unscripted human interaction in face-to-face settings.

Future research areas

From here it is worth considering possible applications of the cyranoid method in future research. The flexible tripartite structure of cyranic interactions allows us to generate distinct research questions depending on which component is of interest to us: the interactant, the source, or the shadower.

Focus: Interactants. The cyranoid method can be used to address classic questions of person perception, principally those that center on how people separately process verbal and nonverbal cues when forming impressions of and subsequently interacting with other people. In particular, the method can potentially extend literature on discrimination and stereotyping. Experimental research has shown that discrimination can operate at the level of implicit attitudes (McConnell & Leibold, 2001; Nosek & Banaji, 2001) manifesting in behaviors that confirm stereotypes. Via the cyranoid technique, researchers can further explore how these implicit stereotypes reveal themselves in face-to-face, unscripted interactions by separately controlling and manipulating the inner and outer identities of cyranoid stimuli by skin color, age, gender, and so on while observing the behaviors of interactants.

The cyranoid method can also facilitate breaching experiments designed to investigate how people perceive those with whom they have close relationships. Mitchel et al.'s (2011)

artistic demonstration involving spouses encountering partners who have assumed alternative physical identities by-way-of a cyranoid provides an interesting thought experiment: we may think that what we connect with when we encounter an intimate partner, relative, or close friend is some essential, historically-consistent, and ethereal personal quality that exists beyond their physical nature. But in reality, waking up to find your partner had completely changed bodies while their memory and behavioral norms were otherwise intact would, in addition to being quite unsettling, serve to accentuate just how much physical presentation underscores our social relationships. Such scenarios encompass what Garfinkel (1964) referred to as "breached" social environments, within which the breakdown of familiar norms and the ensuing social psychological phenomena that unfold emphasize how dependent social life is upon mundane expectations.

Focus: Sources. Other potential research questions arise when we turn our attention to the position of the source in cyranic interactions. For instance, it would be particularly worthwhile to study whether a source's biases toward certain person-categories (e.g., race, gender, age, etc.) attenuate or magnify following their sourcing for a shadower whose external identity contrasts markedly from their own. Indeed, the effect of embodying racial- and age-differentiated avatars through the use of immersive virtual environment technology has demonstrated changes in implicit stereotyping and perspective-taking following embodiment (see Groom, Bailenson, & Nass, 2009; Yee et al., 2006). We suspect that a source's emotional and empathic responses following cyranoid embodiment might actually be much stronger than those demonstrated in virtual studies given the qualitative realism of a cyranic interaction: cyranoid embodiment involves interacting in-the-flesh with other humans through the body of another human, whereas by comparison immersive virtual environment embodiment of digital avatars is a more mediated and distal experience.

Focus: Shadowers. Finally, the experience of the shadower in cyranic interactions

provides another avenue of possibilities. For example, Robb Mitchell and colleagues have explored using shadowers as teaching surrogates in classroom environments (Mitchell, 2010; Raudaskoski & Mitchell, 2013). In these scenarios, remote teachers sourced for student shadowers in classrooms while delivering a lesson, with the role of the shadower rotating amongst the different students. Each student therefore had the opportunity to both present to the class in the form of a cyranoid as well as learn via the variety of teacher-student hybrids possible within the peer group. The authors suggest that the practice of shadowing for teachers in peer activities such as these may help scaffold students' learning and presentation skills. Along these lines, one could easily imagine the cyranic technique applied to helping those who suffer from social phobias, such as fear of public speaking, learn to overcome their anxieties by allowing sufferers to be guided by experts during social encounters that would otherwise provoke unease. Lastly, the method could be enveloped into current clinical training practices wherein experts can remotely guide the behavior of trainees (see Gordon, 1975).

Conclusion

Though Milgram did not live to see his cyranoid method come to fruition, the current research provides ample basis for the continued exploration of this intriguing methodological paradigm. There are many core domains within social psychology that can be approached with the technique and stand to benefit from the mundane realism that cyranoids bring to the laboratory (not to mention how enjoyable they are for participants to experience). Indeed, the cyranoid method may yet prove to be a long overdue addition to the social psychologist's toolkit.

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Tables and Figures

Table 1

Multilevel Model Fixed Factor Effect Size Estimates for Utterance Length – Study 2[a]

Predictors	*b* (SE)	95% CI
Constant	13.36 (2.16)**	8.14, 18.58
Categorical Fixed Factors[b]:		
{Adult}	2.54 (14.52)	-31.16, 36.25
[Adult]	4.56 (3.22)	-2.91, 12.02
Interaction: {Adult} x [Adult]	63.76 (20.67)*	16.01, 111.51

Note. Dependent measure is *Utterance Length*, defined as number of words per confederate interviewee utterance. Model includes random intercepts and random slope coefficients as the relationship between *{Adult}* and *Utterance Length* showed significant variance in intercepts across interview-panels, var(u_{0j}) = 8.37, $\chi^2(1) = 304.54$, $p < 0.001$, while slopes also varied significantly across interview-panels, var(u_{1j}) = 800.74, $\chi^2(1) = 23.70$, $p < 0.001$.

[a] {[Adult]Adult}: *n* = 139, 4 panels; {[Child]Adult}: *n* = 262, 4 panels; {[Child]Child}: *n*= 402, 4 panels; {[Adult]Child}: *n* = 290, 4 panels.

[b] Factor levels for {[Child]Child}: {Adult} = 0, [Adult] = 0; {[Child]Adult}: {Adult} = 1, [Adult] = 0; {[Adult]Child}: {Adult} = 0, [Adult] = 1; {[Adult]Adult}: {Adult} = 1, [Adult] = 1.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2

Multilevel Model Fixed Factor Effect Size Estimates for Question Difficulty – Study 2[a]

	Partial Model		Final Model[b]	
Predictors	*b* (SE)	95% CI	*b* (SE)	95% CI
Constant	2.01 (0.15)***	1.69, 2.34	1.88 (0.18)***	1.50, 2.25
Categorical Fixed Factors[c]:				
{Adult}	0.64 (0.21)*	0.17, 1.11	0.63 (0.21)*	0.18, 1.08
[Adult]	0.63 (0.22)*	0.16, 1.10	0.55 (0.22)*	0.08, 1.02
Interaction: {Adult} x [Adult]	-0.34 (0.33)	-1.04, 0.36	-0.41 (0.33)	-1.10, 0.27
Control Variable:				
Previous Response Sophistication[d]			0.08 (0.07)	-0.06, 0.22

Note. Dependent measure is *Question Difficulty*, computed by averaging coder difficulty ratings for each question posed by interview-panel members (ranges from 1 to 5: 1 = not at all difficult; 5 = very difficult). Final Model includes random intercepts as the relationship between *{Adult}* and *Question Difficulty* showed significant variance in intercepts across interview-panels, var(u_{0j}) = 0.06, $\chi^2(1) = 11.41$, $p < 0.001$.

[a] {[Adult]Adult}: *n* = 39, 4 panels; {[Child]Adult}: *n* = 91, 4 panels; {[Child]Child}: *n* = 158, 4 panels; {[Adult]Child}: *n* = 78, 4 panels.

[b] Final Model (-2 log-likelihood = 958.67) showed slight improvement in fit vs. Partial Model (-2 log-likelihood = 959.99).

[c] Factor levels for {[Child]Child}: {Adult} = 0, [Adult] = 0; {[Child]Adult}: {Adult} = 1, [Adult] = 0; {[Adult]Child}: {Adult} = 0, [Adult] = 1; {[Adult]Adult}: {Adult} = 1, [Adult] = 1.

[d] Defined as *Response Sophistication* score for confederate interviewee's response to preceding question.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3

Multilevel Model Fixed Factor Effect Size Estimates for Response Sophistication – Study 2[a]

	Partial Model A		Partial Model B[b]		Final Model[c]	
Predictors	*b* (SE)	95% CI	*b* (SE)	95% CI	*b* (SE)	95% CI
Constant	1.75 (0.15)***	1.41, 2.09	1.40 (0.15)***	1.08, 1.73	1.30 (0.07)***	1.15, 1.45
Categorical Fixed Factors[d]:						
{Adult}	0.14 (0.22)	-0.34, 0.62	0.03 (0.20)	-0.40, 0.45	0.02 (0.08)	-0.15, 0.19
[Adult]	1.01 (0.22)**	0.52, 1.50	0.91 (0.20)**	0.48, 1.34	0.82 (0.08)***	0.65, 1.00
Interaction: {Adult} x [Adult]	0.85 (0.32)*	0.16, 1.55	0.91 (0.29)**	0.29, 1.53	-0.08 (0.14)	-0.37, 0.20
Control Variables:						
Question Difficulty[e]			0.17 (0.04)***	0.10, 0.25	0.05 (0.03)	-0.01, 0.10
Response Length[f]					0.01 (6.42×10^{-4})***	1.02×10^{-2}, 1.27×10^{-2}

Note. Dependent measure is *Response Sophistication*, computed by averaging coder sophistication ratings for each statement made by confederate interviewee in response to interview-panel members' questions (ranges from 1 to 5: 1 = not at all sophisticated; 5 = very sophisticated). Final Model includes random intercepts as the relationship between *{Adult}* and *Response Sophistication* showed significant variance in intercepts across interview-panels, $var(u_{0j}) = 3.51 \times 10^{-3}$, $\chi^2(1) = 21.36$, $p < 0.001$.

[a] {[Adult]Adult}: $n = 43$, 4 panels; {[Child]Adult}: $n = 95$, 4 panels; {[Child]Child}: $n = 162$, 4 panels; {[Adult]Child}: $n = 82$, 4 panels.

[b] Partial Model B showed significantly improved fit vs. Partial Model A: $\chi^2(1) = 20.91$, $p < 0.001$.

[c] Final Model showed significantly improved fit vs. Partial Model B: $\chi^2(1) = 221.69$, $p < 0.001$.

[d] Factor levels for {[Child]Child}: {Adult} = 0, [Adult] = 0; {[Child]Adult}: {Adult} = 1, [Adult] = 0; {[Adult]Child}: {Adult} = 0, [Adult] = 1; {[Adult]Adult}: {Adult} = 1, [Adult] = 1.

[e] Derived from averaging coder scores of the difficulty of each question thread (1 = not at all difficult; 5 = very difficult).

[f] Word count of confederate interviewee's full response to question thread.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4

Comparison of Interlocution Measures – Study 2

	Utterance Length[a]		Question Difficulty[b]		Response Sophistication[c]	
Condition	n	*M* (SD)[d]	n	*M* (SD)[d]	n	*M* (SD)[d]
{[Adult]Adult}	139	72.09 (85.41)	39	2.91 (1.07)	43	3.68 (1.09)
{[Adult]Child}	290	17.31 (18.26)	78	2.63 (0.92)	82	2.74 (0.79)
{[Child]Adult}	262	15.26 (15.48)	91	2.64 (0.98)	95	1.84 (0.62)
{[Child]Child}	402	13.03 (14.56)	158	2.04 (0.83)	162	1.70 (0.58)

Note. Table displays pooled means for interlocution measures drawn from each experimental condition. For multilevel statistical comparisons of fixed factor effect size estimates and significance testing, see Tables 1, 2, and 3.

[a] *Utterance Length* defined as number of words per confederate interviewee utterance.

[b] *Question Difficulty* computed by averaging coder difficulty ratings for each question posed by interview-panel members; ranges from 1 to 5 (1 = not at all difficult; 5 = very difficult).

[c] *Response Sophistication* computed by averaging coder response sophistication ratings for each full statement made by confederate interviewee in response to interview-panel members' questions; ranges from 1 to 5 (1 = not at all sophisticated; 5 = very sophisticated).

[d] Means and associated standard deviations derived by pooling each observation by experimental condition (ignores interview-panel nesting).

Table 5

Person perception score comparison – Study 2: {[Adult]Adult} vs. {[Adult]Child}

	{[Adult]Adult}	{[Adult]Child}	
Person Perception Dimension	*M* (SD)[a, b]	*M* (SD)[a, b]	Δ
Intelligent	0.77 (0.30)	0.94 (0.27)	0.17
Confident	0.58 (0.24)	0.52 (0.38)	-0.06
Mature	0.35 (0.26)	0.59 (0.37)	0.24*
Extraverted	0.30 (0.28)	0.31 (0.30)	0.01
Friendly	0.25 (0.37)	0.27 (0.33)	0.02
Opinionated	0.43 (0.37)	0.21 (0.47)	-0.22
Honest	0.13 (0.32)	0.20 (0.34)	0.07

Note. Table compares pooled mean person perception scores attributed to confederate interviewee in participants' post-interaction written evaluations between {[Adult]Adult} and {[Adult]Child}. Differences in means evaluated using independent samples t-tests.

[a] Means and associated standard deviations derived by pooling each person perception score by experimental condition (ignores interview-panel nesting).

[b] The possible range for mean scores is between -1 and +1, with positive scores reflecting more frequent positive evaluation of confederate interviewee in participants' post-interaction written evaluations (e.g., describing the interviewee as "intelligent"), and negative scores reflecting more frequent negative evaluation of confederate (e.g., describing the interviewee as "unintelligent").

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 6

Person perception score comparison – Study 2: {[Child]Child} vs. {[Child]Adult}

	{[Child]Child}	{[Child]Adult}	
Person Perception Dimension	*M* (SD)[a, b]	*M* (SD)[a, b]	Δ
Intelligent	0.68 (0.39)	-0.37 (0.46)	-1.05***
Confident	0.31 (0.39)	-0.41 (0.43)	-0.72***
Mature	0.21 (0.48)	-0.26 (0.28)	-0.47**
Extraverted	0.19 (0.40)	-0.22 (0.39)	-0.41**
Friendly	0.30 (0.33)	-0.05 (0.34)	-0.35**
Opinionated	0.26 (0.43)	-0.38 (0.40)	-0.64***
Honest	0.30 (0.34)	0.08 (0.37)	-0.22

Note. Table compares pooled mean person perception scores attributed to confederate interviewee in participants' post-interaction written evaluations between {[Child]Child} and {[Child]Adult}. Differences in means evaluated using independent samples t-tests.

[a] Means and associated standard deviations derived by pooling each person perception score by experimental condition (ignores interview-panel nesting).

[b] The possible range for mean scores is between -1 and +1, with positive scores reflecting more frequent positive evaluation of confederate interviewee in participants' post-interaction written evaluations (e.g., describing the interviewee as "intelligent"), and negative scores reflecting more frequent negative evaluation of confederate (e.g., describing the interviewee as "unintelligent").

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure 1

Illustration of Laboratory Arrangement – Study 1