

HOW SOCIAL OTHERS FORM FIRST IMPRESSIONS OF ADULTS WITH
AUTISM SPECTRUM DISORDERS

by

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Dedicated to my parents, Dwain Faso and Catherine Kuehn, and my beautiful wife, Jessica Faso,
for their unending love and support throughout my life.

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Previous research examining social impairments in individuals with Autism Spectrum Disorder (ASD) has almost exclusively focused on identifying and remediating the cognitive and neurological differences contributing to social deficits. However, social interaction by definition includes more than one person, and little consideration has been given to how the perspectives and behaviors of others affect the social experiences of individuals with ASD. First impressions are rapidly formed and exert robust and long-term effects on social interactions, but have only been sparsely investigated in ASD, and not at all in adults with the disorder. Here, first impressions were made by typically developing (TD) adult observers (N=214) while viewing “thin slices” of real-world social presentations of ASD (N=20) and TD (N=20) adult models matched on age, gender, and IQ. Observers rated their first impressions of character traits of the models and their intentions to subsequently interact with them from isolated information channels of social presentation (e.g., visual cues, audio cues, and speech content). Using both univariate and multivariate analyses, we found that ASD models were consistently judged less

favorably than TD models, with awkwardness and attractiveness making the largest contribution, but no group differences were found for intelligence and trustworthiness. Negative impressions of those with ASD were largely associated with reduced intentions for social interactions. However, impressions of those with ASD did not differ from controls when evaluating their conversation content in the absence of audio-visual cues, suggesting that style not substance drives less favorable impression formation. These findings indicate that social interaction impairments in ASD may not only be an individual impairment, but a relational one in which the viewpoints of others affect the quantity and quality of social experiences for those with ASD. This perspective has strong implications for the conceptualization and treatment of ASD, and may reflect a previously under-appreciated barrier to social interaction for those on the autism spectrum.

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CHAPTER 1

INTRODUCTION

The formation of first impressions of adults with autism spectrum disorder (ASD) has only been sparsely investigated and the factors underlying this process are not well understood. Because impressions are rapidly formed and assert a long-term influence, they may serve as a previously underexplored contributor to the social interactive deficits that characterize ASD. This study obtained the first impressions of typically developing (TD) adults observing real-world social presentations of adults with ASD, as well as TD comparison participants, and examined the specific information channels (i.e., visual cues, audio cues, and speech content) that drive impression formation of adults with ASD within naturalistic social conditions and whether these impressions are associated with subsequent intentions to socially engage. By isolating the specific factors underlying both positive and negative social evaluations of adults with ASD, this study was designed to generate information that can be used to inform both ASD adults and their social partners about the causes and consequences of first impressions of adults with ASD. Ultimately, such information may be used to help mitigate some of the social difficulties adults with ASD routinely experience within novel social contexts, including higher education and employment settings.

CHAPTER 2

FIRST IMPRESSION FORMATION

In a seminal paper on first impressions, Asch (1946) details the processes underlying rapid impression formation. “We look at a person and immediately a certain impression of his character forms...such impressions form with remarkable rapidity and with great ease... and it is quite hard to forget our view of a person once it has formed.” Not only did Asch outline the basis for impression formation, but he guided future research by posing questions researchers have been seeking to answer ever since: “In what manner are these impressions established?”, and, “How do several characteristics function together to produce an impression of one person?” (Asch, 1946, p. 258).

How we respond to previously unfamiliar individuals during social interactions is governed in large part by first impressions, which are quick, almost instantaneous judgments of personality and character traits based upon “thin slices” of information (Ambady, Bernieri, & Richeson, 2000; Ambady & Rosenthal, 1992). Within a social environment, people communicate information through both verbal and nonverbal *channels* (O’Sullivan, Ekman, Friesen, & Scherer, 1985) and individuals quickly integrate these multisensory cues to form impressions of potential social partners (Baron & Bourdreau, 1987; Zaki, 2013).

First impressions within real-world environments are associated with immediate behavioral responses and long-term attitudes toward new acquaintances (Human et al., 2013; Lutz-Zois, Bradley, Mihalik, & Moorman-Eavers, 2006; Selfout, Denissen, Branje, & Meeus, 2009; Sunnafrank & Ramirez, 2004). Although positive first impressions of a target individual can evoke approach behaviors (e.g., Bromgard & Stephan, 2006), a negative first impression can

create a stigma of a novel social partner (Harris & Garris, 2008), prompting behaviors to reject or avoid that person (Klein & Snyder, 2003; Sunnafrank, 1986) and a motivation to distance oneself from the situation (Blascovich, Mendes, Hunter, & Lickel, 2000). Initial impressions often result in a self-fulfilling prophecy where positive or negative first impressions promote engaging and reciprocal or stilted and quickly extinguished relationships, respectively (for review see Harris & Garris, 2008). For example, college students randomly assigned to briefly converse with a stranger on the first day of class were more likely to sit near the person during subsequent classes if they formed a positive first impression of their partner (Sunnafrank & Ramirez, 2004). Positive first impressions also predicted the development and maintenance of a friendship amongst newly acquainted college students at the end of the semester (Human et al., 2013; Sunnafrank & Ramirez, 2004). These approaches provide an ecologically valid perspective of potential consequences of first impressions, but research has also long been interested in disentangling how different and separable information channels contribute to overall impression formation (Carney, Colvin, & Hall, 2007; Ekman et al., 1980).

2.1 Information channels contributing to impression formation

Assessing the influence of any single channel (e.g., appearance, voice, gesture, or speech content) on overall impression formation first requires separating each information channel into *presentation modalities* (e.g., audio containing only voice; silent video displaying dynamic gestures). Observers then rate each presentation modality individually on some personality attribute or relevant character trait, and finally, comparisons are made between observer ratings on the different presentation modalities. The comparisons between observer ratings provide

metrics of how verbal, nonverbal, or some combination of information channels can be used when forming first impressions.

Identifying the most informative channel (e.g., gesture, voice, face, or speech content) contributing to first impression formation is a long sought after aim of researchers (Asch, 1946; Ekman et al., 1980) but determining which channel is most influential depends on the context of task performed by target participants and the attribute being judged by observers (Carney et al., 2007; O'Sullivan et al., 1985). The extent to which various verbal and nonverbal channels contribute to impression formation varies greatly across specific contexts, defined as the situation in which an information channel is perceived and an impression is formed (e.g., during a job interview; meeting a new teacher).

For example, a primary source of nonverbal information from which first impressions of a stranger are derived is physical appearance (Albright et al., 1988), and a large proportion of impression formation literature based on physical attributes has focused on the appearance of the face (Olivola & Todorov, 2010; Zebrowitz, Bronstad, & Lee, 2007; for review see, Todorov et al., 2015). Personality traits like competence, likeability, and trustworthiness can be reliably, but not always validly (Olivola & Todorov, 2010) perceived by observers from a face, even when only briefly viewed (Rule & Ambady, 2008; Willis & Todorov, 2006).

Certain physical attributes aid in quick judgments when viewing a face. A bolder brow or wider jaw are perceived as more dominant and less friendly (Petrican, Todorov, & Grady, 2014; Willis & Todorov, 2006), and the rapidity of this process is thought to be driven by an evolutionary purpose to evaluate and detect interpersonal danger from strangers (Todorov et al., 2008; Zebrowitz et al., 1996). Facial appearance can also reliably influence decision-making and

social behaviors (Olivia & Todorov, 2010; Todorov et al., 2015). For example, specific features of a face can predict above chance levels the court verdicts given to defendants (Mazella & Feingold, 1994; Zebrowitz & McDonald, 1991) and candidate selection when voting for politicians (Ballew & Todorov, 2007; Koppensteiner & Stephan, 2014), independent of any additional information being provided. Indeed, in many ways faces are a primary source of nonverbal social information and are often prioritized during impression formation even when other information is available. When determining the sexual orientation of targets from social media profiles, observers utilized photographs to make decisions even in the presence of textual cues (i.e., content of the profile). Textual cues were only utilized for decision making when less than sufficient visual cues were present (Van Der Heide et al., 2012) indicating that in some contexts (e.g., online environments), nonverbal visual cues can be more influential for impression formation relative to other information channels.

These examples are just a small subset of the vast literature describing how personality judgments are reliably ascribed to faces presented in isolation (for review see, Todorov et al., 2015). First impressions, however, are not typically formed from faces alone, but occur within dynamic social interactions that contain a wealth of social information beyond what is contained within static facial cues. Indeed, other nonverbal visual cues, even seemingly trivial ones like the color and type of clothing being worn (Gillath et al., 2012, Maier et al., 2013), can influence impression formation. For example, observers find job applicants that wear a red shirt or tie as less intelligent and capable compared to applicants wearing other colored clothing (Maier et al., 2013), and based on just the shoe type of a target, observers could reliably predict the age and gender of participants, as well as some personality traits like agreeableness (Gillath et al., 2012).

Nonverbal information, however, is not the only channel by which first impressions are formed. The influence of verbal channels (i.e., voice, speech content) has also been investigated within various contexts, often comparing the relative influence of verbal vs. nonverbal information. Several studies have examined whether verbal qualities alone, like hearing a person speak or reading what they say, can influence impression formation independent of other information channels. Within the specific context of mock interviews, listening to a job candidate speak was more influential for impressions of intellect than just reading a transcript of their speech or additional visual cues (Schroeder & Epley, 2015), an effect the authors attribute to the unique qualities of voice that convey intelligence within a working environment where dress and other visual cues may be more homogenized. Similarly, when observers were asked to rate the empathy of targets, hearing a target speak was more informative for making accurate ratings than nonverbal visual cues (i.e., face and body in the absence of audio cues), but the transcript of speech content was actually most informative for the accuracy of observers' judgments overall (Hall & Schmid-Mast, 2007). Even though nonverbal cues (i.e., physical appearance) are highly salient and easily accessible when forming first impressions (for review see Harris & Garriss, 2008), these studies illustrate that in some contexts and when making certain judgments, visual channels are less informative compared to audio/speech channels.

Comparing whether visual channels (e.g., face, clothing), audio channels (e.g., voice) or the content of conversation are the most informative when forming first impressions is highly dependent on the context in which that information is conveyed, like during an interview or talking with a stranger (for review see, Carney et al., 2007), as well as the characteristic that is being evaluated. Such information may be particularly valuable when applied to understanding

the formation and consequences of *negative* first impressions, which can influence the quality and likelihood of subsequent social interactions (Harris & Garris, 2008). Linking certain information channels to specific trait judgments may provide guidance for how the formation of negative impressions might be circumvented, particularly within populations in which negative impressions are abundant and social interaction presents significant challenges.

2.2 Potential consequences of first impressions

First impressions are formed incredibly quickly (Ambady & Rosenthal, 1992; Bar, Neta, & Linz, 2006; Rule & Ambady, 2008), and once formed, they can be difficult to change and can have lasting effects on attitudes and behavior (Ambady & Skowronski, 2008; Selfhout, Denissen, Branje, & Meeus, 2009; Sunnafrank & Ramirez, 2004; Sunnafrank, 1988). For example, not only can impressions of a professor formed by students on the first day of class shape their view of the professor for the remainder of the semester (Laws et al., 2010), but even exposure to just a 10 second video of the professor's teaching largely predicts end of the semester evaluations (Ambady, 2010). Similarly, first impressions of strangers can predict the pursuit and intensity of future friendships between individuals (Human et al., 2013; Selfout et al., 2009; Sunnafrank & Ramirez, 2004).

Although some impressions of traits and behaviors are reliably formed when specific features within an information channel are present, like dominance perceived from faces with a heavy brow (Todorov et al., 2015; Willis & Todorov, 2006), many impressions are subjective and can vary based upon the perceiver (Miller & Turnbull, 1986; Willard et al., 2012). A positive or negative response to a novel social partner is based primarily on subjective perceptions of the partner, regardless of how accurate those inferences might be (Neuberg, 1989; Snyder & Stukas,

1999). For instance, perceived personality similarity, rather than actual similarity, between acquaintances can predict the formation of a long-term friendship and the degree of friendship intensity between strangers (Selfhout et al., 2009; Sunnafrank & Ramirez, 2004), as well as relationship satisfaction between newly-formed dating couples (Lutz-Zois et al., 2006). These studies outline how subjective perceptions can affect subsequent behaviors and responses to social partners regardless of the validity of the impressions (Harris & Garris, 2008; Snyder & Stukas, 1999).

Subjective first impressions have immediate effects on subsequent attitudes and behaviors during social interactions, which can impact reciprocal exchanges (Halberstadt, Denham, & Dunsmoore, 2001), especially when the impression is negative (Harris & Garris, 2008; Neuberg, 1989; Snyder & Stukas, 1999). For example, perception of a stranger as friendly is often followed by expressions of warmth and friendship, a process that fosters positive interaction and increases the possibility of relationship development (Horowitz et al., 2006). Conversely, perception of a stranger as unwelcoming and unfriendly increases the likelihood of responding more coldly (Sadler & Woody, 2003). In this way, a negative first impression may reduce the chances of social interaction and affect the quality of any subsequent interaction (for review see, Harris & Garris, 2008). As discussed by Grossman (2014), this reduction in the quantity and quality of social interactions would be most problematic for individuals who are consistently perceived pejoratively or inaccurately.

CHAPTER 3

AUTISM SPECTRUM DISORDER AND IMPRESSION FORMATION

3.1 *Social impairment in adults with ASD*

Social impairment is a core feature of autism spectrum disorder (ASD; APA 2013). Although some symptoms of ASD (e.g., motor stereotypies) tend to decrease into adulthood (Billstedt, Gillberg, & Gillberg, 2007), difficulties with reciprocal social interaction persist as a primary deficit in daily life for adults with ASD (for review see, Tobin, Drager, & Richardson, 2014). These difficulties are linked with many poor functional outcomes, including few friendships and high rates of loneliness (Bauminger & Kasari, 2000; Lasgaard et al., 2010; Levy & Perry, 2011), difficulties with romantic relationships (Levy & Perry 2011; Renty & Roeyers, 2007), few employment opportunities (Engstrom, Ekstrom, & Emilsson, 2003; Holwerda et al., 2012, 2013), and an overall decreased quality of life (Billstedt, Gillberg, & Gillberg, 2011; Howlin, 2000; Lin, 2014; Renty & Roeyers, 2006).

Researchers have extensively investigated how deficits in social cognitive abilities in ASD contribute to impaired social functioning (for review see, Sasson et al., 2011). This line of research has helped illuminate how otherwise cognitively-able adults with ASD frequently experience poor life outcomes (Howlin, Moss, Savage, & Rutter, 2013; Sasson et al., 2011). However, social cognitive deficits may not be the only factor affecting poorer social interactions for individuals with ASD. Social interaction quality is predicated not only upon effective social perception, but also social *expression* (Halberstadt et al., 2001; Riggio, 1986). Unlike studies of social cognition in ASD, comparatively little research has explored whether abnormal social presentations by individuals with ASD contribute to their reduced social functioning (for review

see, Begeer et al., 2008). Many aspects of social presentation are different in ASD, including vocal prosody (McCann & Peppé, 2003; Peppé et al., 2007; 2011), use of gestures (Attwood, Frith, & Hermelin, 1988; De Marchena & Eigsti, 2010), and facial expressivity (Capps et al., 1993; Faso, Sasson, & Pinkham, 2015; Grossman et al., 2013; Yirmiya et al., 1989). These differences in social expressivity might affect social interaction quality, with social partners either misinterpreting social cues expressed by individuals with ASD (Grossman et al., 2013; Yirmiya et al., 1989) or judging them more negatively (Faso et al., 2015; Grossman, 2014). In this way, some have argued that social interaction impairments in ASD should be considered a relational rather than an individual impairment (McGeer, 2004; Milton, 2013), and that remediation efforts should focus on the social experiences of individuals with ASD more holistically rather than just on their individual deficits.

3.2 First impressions of ASD individuals

Several studies have examined how others perceive individuals with ASD and whether these perceptions affect their future behaviors and responses toward them (e.g., Butler & Gillis 2011; Campbell et al., 2004; 2007; Harnum, Duffy & Ferguson, 2007; Iobst et al., 2009; Matthews, Ly, & Goldberg, 2015; Nevill & White, 2011; Siltan & Fogel, 2012; Swaim & Morgan, 2001). Several studies had TD children observe a child-actor portraying stereotypically “autistic” behaviors (e.g., hand flapping, rocking) and then attribute positively (e.g., smart) or negatively (e.g., sloppy) valenced words to the target child using the Adjective Checklist (Siperstein, 1980; Siperstein & Bak, 1977). Such studies found children provided less positive appraisals of the child expressing ASD behaviors and reported fewer intentions to socially interact with the ASD child (Campbell et al., 2004; Swaim & Morgan, 2001). Similar patterns

are found for adult observers who reported less positive views and were less accepting of children displaying ASD behaviors (Iobst et al., 2009). One study employed a similar video-rating task while using a child with ASD rather than an actor and found analogous results. However, only one child with ASD was used, and no typically-developing comparison children were included (Chambres, Auxiette, Vansingle & Gil, 2008).

Similarly, when reading a vignette describing a child expressing stereotypically autistic behaviors, both children and adults report less positive views of the ASD child, with child raters also reporting a greater inclination to avoid the child with ASD (Harnum et al., 2007). In related studies portraying adults with ASD through vignettes, TD adults reported both desires to socially distance themselves from adults expressing more autistic behaviors (Butler & Gillis, 2011) and less positive views with fewer intentions to interact with the an ASD adult (Matthew et al., 2015). When TD adults were asked about past experiences interacting with ASD peers, solely perceiving an interaction as positive increased the likelihood of interacting with an ASD individual in the future (Gardiner & Iarocci, 2014). Overall, the negative perceptions of individuals with ASD may relate to the social exclusion they experience in young adulthood (Belch, 2004). In turn, these social challenges can greatly impact their ability to successfully transition to the demands of independent living in early adulthood (Shattuck et al., 2012).

3.2.1 Issues with previous research on impressions of ASD individuals

Although these studies consistently demonstrate negative evaluations of ASD behaviors, only a few have explored specific factors contributing to these evaluations. The work that has been done in this area has focused upon variables related to the perceiver that modulate evaluation responses, rather than those related to the individual with ASD. Intention to engage

with ASD individuals has been shown to vary as a function of perceiver gender (Campbell, 2007; Gardiner & Iarocci, 2014; Iobst et al., 2009; Matthews et al., 2015;), their knowledge of or experience with ASD (Butler & Gillis, 2011; Gardiner & Iarocci, 2014; Nevill & White, 2011), the presence or absence of a diagnosis label (Butler & Gillis, 2011; Chambres et al., 2008; Matthews et al., 2015), and the incorporation of descriptive or explanatory information about autism (Campbell, 2007; Iobst et al., 2009; Silton & Fogel, 2012; Swaim & Morgan, 2001).

However, the direction of effect of these variables is inconsistent across studies. Several report that attitudes toward ASD individuals do not differ across the gender of the perceiver (Nevill & White, 2011; Stagg et al., 2014), but others find conflicting results where either females (Campbell, 2007; Gardiner & Iarocci, 2014; Iobst et al., 2009) or males (Matthews et al., 2015; Swaim & Morgan, 2001) hold more positive or negative views of ASD. In one study, providing an ASD diagnostic label was found to improve attitudes toward adults with ASD (Matthews et al., 2015), but another study found this manipulation to have no effect (Butler & Gillis, 2011). Providing descriptive or explanatory information about an autism diagnosis has also been found to improve attitudes toward individuals with ASD (Campbell et al., 2004) but other studies found that more information did not always confer the same positive benefits for perceptions of ASD (Iobst et al., 2009; Silton & Fogel, 2012).

3.2.2 Importance of ecological validity on impression formation

One factor that may underlie the inconsistency across findings within the impression formation literature, both within the ASD and non-ASD fields, is the lack of ecologically valid stimuli evaluated by raters. Of primary concern for this project is that the evaluations of ASD behavior in previous studies have largely not involved assessing actual individuals with ASD.

Several used written vignettes describing a person behaving in ways characteristic of ASD (e.g., Butler & Gillis, 2011; Harnum et al., 2007; Matthews et al., 2015; Nevill & White, 2011) or presented actors portraying diagnostically relevant ASD behaviors (e.g., Campbell et al., 2004; Iobst et al., 2009; Swaim & Morgan, 2001). Although such methods have provided insight into how autistic characteristics are judged by others, a more valid and comprehensive assessment of how individuals with ASD are perceived would examine impression formation based upon real-world behaviors under conditions in which first impressions are truly formed.

Only a handful of previous studies have employed authentic “thin-slice” presentations of ASD behavior. Faso et al. (2015) reported that static facial expressions of emotions evoked from adults with ASD under naturalistic conditions were rated by typically developing (TD) adult observers as appearing less natural and more intense compared to expressions from matched controls. Using short video clips of real-world behavior, Stagg et al. (2014) found that child peers rated children with ASD more negatively across a metric of friendliness when forming first impressions. Similarly, Grossman (2014) presented brief dynamic clips (<5s) of children with and without ASD producing auditory, visual, and audio-visual expressions to naïve typically-developing adult observers who rated whether the child producing the expression was socially awkward using a quick dichotomous decision making process utilized by many studies assessing first impressions of character traits (Todorov et al., 2015). Across both audio and visual modalities, children with ASD were rated as more socially awkward than the TD children.

CHAPTER 4

EXTENDING PAST RESEARCH ON FIRST IMPRESSIONS OF INDIVIDUALS WITH ASD

Grossman (2014) represents an important first step in understanding how individuals with ASD are perceived through first impressions. In particular, her finding that ratings of social awkwardness extend across audio and visual modalities suggests that multiple aspects of social presentation drive negative evaluations of individuals with ASD. A more comprehensive understanding of first impression formation of those with ASD, however, would require a number of significant extensions and modifications.

4.1 Increasing the number and type of variables measured

Instead of solely rating social awkwardness (Grossman, 2014) or any other single characteristic as is frequently done (Carney et al., 2007; Willis & Todorov, 2006), evaluating a more thorough array of traits associated with first impressions would provide more detailed information about how individuals with ASD are initially perceived, and whether judgments of these traits vary by presentation modality assessed. The use of multiple assessment variables will help determine how impression formation is dependent on the attribute being assessed (Carney et al., 2007; Ekman et al., 1980; O'Sullivan et al., 1985), and an increase in assessment variables is suggested for any methodology utilizing questionnaires (Krosnick & Presser, 2010). In line with these aims, the proposed study will assess the behavioral intentions of participants in addition to their impressions of character traits, which can elucidate whether character trait judgments are related to potential social responses, an important consideration for establishing how the evaluation process influences decisions about social approach versus withdrawal. This

connection between trait judgments and behavioral intent could highlight real-world implications of negative first impressions of individuals with ASD by showing that quick initial impressions may reduce opportunities for social experiences, thereby supporting the notion that the social challenges that characterize ASD are at least partially the product of their social partners (McGeer, 2004).

4.2 Assessing first impressions of adults with ASD in real-world contexts

Grossman (2014) and the majority of past research on first impressions of individuals with ASD (e.g., Campbell, et al., 2004, 2007; Iobst et al., 2009; Harnum et al., 2007; Stagg et al., 2014; Swaim & Morgan, 2001) have studied children with ASD. Although a handful of studies have focused on adults (Butler & Gillis, 2011; Matthews et al., 2015; Nevill & White, 2011), all of these included vignettes or actors, and none included impressions formed from observing actual adults with an ASD diagnosis. With an ever-growing population of adults with ASD who almost universally experience challenges navigating the social demands of independent living and employment (Friedman, Warfield, & Parish, 2013), examining how their actual social presentations and behaviors are perceived by social others may provide insights that could aid training and support efforts.

Additionally, although Grossman (2014) had observers evaluate more ecologically valid presentations of ASD behavior compared to other studies (e.g., Campbell et al., 2004; Matthews et al., 2015; Nevill & White, 2011; Swaim & Morgan, 2001), she presented clips of individuals with ASD performing a story-telling task rather than during spontaneous social presentation. Presenting real-world clips would not only capture social behavior rather than a more scripted social performance during the retelling of a story, but also would allow for first impression

evaluation of the variable *content* of speech rather than just the social mannerisms of the individual. Impression formation research has identified the content of speech to be highly valuable when making particular judgments regarding someone's behavior (Hall & Schmid-Mast, 2007; O'Sullivan et al., 1985). Thus, extending analyses of this additional aspect of social presentation may be particularly informative for understanding first impressions of adults with ASD given that they often fixate on certain idiosyncratic topics and interests that are frequently, and sometimes inappropriately, interjected into social conversations (Nadig et al., 2010; Sasson et al., 2012). A finding of negative first impressions of adults with ASD based upon the conversation content in the absence of visual and audio cues would suggest that aspects of social pragmatics can alone drive impression formation of individuals with ASD, and thus may constitute an additional target for social skills training.

4.3 Expanding the variability of ratings

Finally, Grossman (2014) only required dichotomous "yes/no" responses. Even though such responses are frequently used in studies of first impressions due to the rapid nature at which a decision can be made (e.g., Willis & Todorov, 2006), they are prone to biases (Krieg, 1999) and can be less reliable than more fine-grained scales (Maydeu-Olivares et al., 2009). Expanding to a more sensitive scale would create more variability across and within responses for each presentation modality evaluated. Allowing for a greater range of responses would also enable the use of more comprehensive analytic techniques that can identify similarities and differences in ratings across traits and information channels between ASD and TD groups. Collectively, such an approach offers more detailed information about the specific traits and behaviors in ASD that underlie first impression formation.

4.4 *Specific Aims*

This project compares the first impressions made by 214 TD observers rating twenty ASD adults and twenty TD comparison adults engaging in a challenging social presentation task. Compared to past research investigating impressions of individuals with ASD through vignette descriptions or actor portrayals (e.g., Butler & Gillis, 2011; Campbell et al., 2004, Swaim & Morgan, 2001), this project sought to collect evaluations of actual social behaviors by adults with clinical diagnoses of ASD. Like Grossman (2014), this study assesses observers' first impressions of multiple presentation modalities isolated from each other, including audio-visual, video-only, audio-only, and a static photograph. However, this project expands upon her study by focusing on adults with ASD, increasing the number of traits assessed, extending the variability of ratings, measuring behavioral intentions in addition to trait impressions, and assessing the content of speech, an important source of social information that may contribute to impression formation in ASD (Nadig et al., 2010; Sasson et al., 2012).

Here, the first 10s of dialogue produced by participants within the social presentation task is extracted to produce stimuli depicting five different *presentation modalities* to be rated later by TD observers naïve to their diagnostic status: (a) audio content only, (b) video content only, (c) a written transcript of speech content, (d) static frame, and (e) the full 10s clip with both audio and video. Because previous research indicates that differences in speech patterns (Peppé et al., 2007; 2011), facial expressions (Faso, Sasson, & Pinkham, 2015; Grossman et al., 2013) and gestures (De Marchena & Eigsti, 2010) by ASD individuals are perceived as more awkward and less natural compared to comparison participants, we expected impressions of ASD adults to be most negative within conditions containing such information, and more similar to controls in

conditions without such information (i.e., conversational content). Taken together, this project aims to identify specific aspects of social presentation driving first impressions of individuals with ASD and, if as expected, they are more negatively evaluated compared to TD controls, determine whether these first impressions are linked with decreased intentions to interact with adults with ASD. Collectively, this information may illuminate factors that contribute to reduced quality of social interaction in adults with ASD, potentially leading to avenues that can improve social functioning in this population.

Specific Aim 1. To identify the presentation modalities most associated with negative first impressions for ASD vs. TD groups. ***Hypothesis 1.*** ASD model participants are expected to be rated less favorably than TD model participants on all character traits and intention to engage items. ***Hypothesis 2.*** However, impressions are expected to vary by group across modalities, with ASD adults rated most negatively relative to TD adults in modalities with the most perceptible social information. Thus, the largest discrepancy in ratings between the groups is expected to occur in the audio-visual condition, with smaller but still significant differences in the video-only, audio-only, and static-image conditions, and little to no difference in the conversational content conditions. Support for this hypothesis would indicate that negative impressions of adults with ASD are driven by aspects of their social presentation rather than their speech content.

Specific Aim 2. To test the relationship between impressions of character traits and observers' intent to behaviorally engage with ASD or TD individuals. ***Hypothesis 1.*** Overall character trait assessments will positively correlate with intent to behaviorally engage for both ASD and TD groups, indicating that negative trait impressions of ASD individuals is associated

with reduced intentions on the part of raters to socially engage with them. ***Hypothesis 2.*** This relationship will be stronger for the ASD group compared to the TD group, which indicates that the negative impressions formed of ASD individuals is more closely related to how their social partners would respond during interactions. ***Hypothesis 3.*** However, this relationship between traits and intent is expected to differ by presentation modality, with the strongest correlations occurring for the audio-visual presentation modality as it contains the most information from which more reliable impressions are formed.

Specific Aim 3. Exploratory analyses will be pursued to examine: **1)** how the gender, sub-clinical autism-traits, and personality characteristics of observers relates to their impression formation; **2)** whether gender, age, IQ or presence of autistic traits of model participants are related to impressions formed by observers; and **3)** the constellation of trait and modality combinations that best characterize and differentiate the groups using Correspondence Analysis (CA).

CHAPTER 5

METHODS

5.1 Model Participants and stimuli creation

In total, 40 *model* participants (20 ASD; 20 TD) were individuals that provided consent for videos of themselves to be shown to others from whom the stimuli were created that were used in this study. Diagnoses of ASD had already been confirmed by a certified clinician using the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000), and intellectual ability (i.e., IQ) of all model participants was assessed using the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) or the Wide Range Achievement Test (WRAT-R, Jastak & Wilkinson, 1984). The ASD model and TD model groups were matched on gender (17 males and 3 females in each group), age (ASD mean = 24.5, TD mean = 25.0; $p = .786$), and intellectual ability (i.e., IQ; ASD mean = 106.4, TD mean = 110.5; $p = .293$). Each model participated in the “High Risk Social Challenge” task (HiSoc; Gibson et al., 2010), a videotaped task in which participants engage in a mock audition for a hypothetical reality show where they attempt to persuade judges that they should be chosen for the show. This task provides 45 to 60 seconds of social presentation from each model, and these videos were edited and trimmed into approximately 10 second clips of social presentation after introductions of the task (e.g., “Hey MTV, this is my audition tape...”) to contain audio, visual, or both audio and visual information. Separating the audio and video components for independent evaluation provides an opportunity to investigate which and to what degree these modalities contribute to first impression formation.

Decisions regarding the necessary length of clip used in this study, or “thickness” of the slice presented, is based on several factors. Although previous research using a similar paradigm

found reliable effects at 1s and 3s (Grossman, 2014), other studies of first impressions found accuracy and reliability of judgments improve when increasing slice length to 5s to 10s (Ambady, Hallahan, & Coner, 1999; Ambady & Rosenthal 1993). Additionally, minimal gains (if any) in reliability or accuracy of first impressions are found when providing substantially more information by increasing the slice length to one to five minutes or longer (Ambady & Rosenthal, 1992; Bernieri & Gillis, 2001; Carney, Colvin, & Hall, 2007). However, as discussed by Carney et al. (2007), the methodological differences across studies that compare slice length leave “little consensus” in the field regarding optimal slice length. The appropriate thickness is likely context specific and “length may matter only under some circumstances, for some constructs... there may be a linear effect up to a point and no evident gains beyond that.” (Carney et al., 2007, pg. 1058). Therefore, this study used approximately 10s clips, as they provide enough evidence of social behavior for making reliable first impressions, while also maximizing the number of presentations that rating participants can reasonably evaluate.

As physical attractiveness and general appearance can influence impression formation (Hassin & Trope, 2000; Todorov et al., 2008; Zebrowitz, 1996), a static frame from each participants’ clip was also extracted to assess the association between general appearance and social evaluations, as well as the extent to which other modalities contribute to impression formation above and beyond appearance alone. The image contains both the body and face of model participants to reflect the visual information typically available when first impressions are formed. In this way, the study can help determine whether static images of individuals with ASD are sufficient for reliable impression formation. The static frame was selected by a research assistant blind to the group (ASD vs. TD) of the participant. The assistant was instructed to

identify the first instance in the video where the participant is sitting in an upright position, eyes opened, and not speaking or gesturing.

Further, given that the topic of conversation can modulate social behaviors expressed by individuals with ASD (Nadig et al., 2010) and may contain content that can be perceived as inappropriate for an initial conversation, an addition condition was created in which rating participants provided impressions based solely upon a transcript of speech content included in each clip. In this way, this study can determine whether conversation content, independent of vocal and visual information, influences impression formation differently between groups.

5.2 Novel measure construction

The *First Impressions Assessment Scale for Observers* was designed for this project (see Table 1) based upon previous studies assessing the formation of first impressions (Findler et al., 2007; Grossman, 2014; Harnum et al., 2007; Nevill & White, 2011; Todorov et al., 2008; Willis & Todorov, 2006). The overall measure was designed to assess the characteristics reliably perceived when forming first impressions *and* the intended behaviors one may engage in with an individual after impression formation. The combination of answering both questions will expand on previous studies by 1) showing how multiple traits may be evaluated differently for each group and presentation modality; 2) highlighting which particular modalities are most related to impression formation for each group; 3) outlining how trait impressions relate to behavioral intent that possibly leads to suboptimal responses from others during social interactions.

Trait assessment items: Personality or character traits of *attractiveness*, *competence*, *trustworthiness/honesty*, *aggressiveness/dominance*, and *likeability* are five characteristics that can be reliably perceived when forming first impressions (Petrican, Todorov, & Grady, 2014;

Todorov, Pakrashi, & Oosterhof, 2009; Todorov et al., 2008; Willis & Todorov, 2006). For this project, aspects of '*competence*' will be assessed by a comparable item measuring intelligence, which has been partially attributable to competence in previous research (Eagly et al., 1991; Fiske, Cuddy, & Glick, 2007). The measure of 'social awkwardness' used by Grossman (2014) will also be included as an intended replication of her previous findings, while also assessing its similarity with other character traits. Collectively, six items in this project will assess the quick character trait judgments associated with first impression formation and will allow for group and individual differences on such judgments to be measured as a product of each presentation modality.

Behavioral intent items: The behavioral intent items allow an examination of how character impressions relate to potential behavioral responses from social partners. Matthews and colleagues (2015) investigated college students' perceptions of peers with ASD using the Multidimensional Attitudes Scale toward Persons with Disabilities (MAS; Findler et al., 2007), which assesses the likelihood that participants would engage in a particular behavior in response to an individual with ASD. Multiple items from the MAS overlap with items from the Openness Scale, which was originally designed to assess impressions of children with ASD (Harnum et al., 2007) and was subsequently adapted for use with adults (Neville & White, 2011). Four behavioral intent items utilized in this project were adapted from these scales by adjusting or removing pronouns and specific names. Each item contains statements regarding intentions to interact with a person, two of which indicate approach behaviors and two for distancing behaviors (Findler et al., 2007; Harnum et al., 2007; Nevill & White, 2011). All items are rated

using a four-point scale indicating level of agreement with each statement (i.e., Strongly Agree – Agree – Disagree – Strongly Disagree).

5.3 Questionnaires

In addition to qualities of stimuli participants that may affect judgments of observers independent of social behaviors (e.g., gender, age, IQ), characteristics of the observers could influence how they rate the stimuli from ASD and TD participants. Therefore, information about observers' personality and their character traits was collected using a generic measure of personality and a measure of subclinical autism traits. We also collected basic demographic information from observers including age, gender and ethnicity.

5.3.1 Broad Autism Phenotype Questionnaire (BAPQ)

The Broad Autism Phenotype Questionnaire (BAPQ; Hurley et al., 2007) was originally developed to efficiently classify broad autism phenotype traits in family members of individuals with ASD (Hurley et al., 2007; Sasson et al., 2013). However, the BAPQ has also been validated for identifying such traits in the general population (Wainer, Ingersoll, & Hopwood, 2011). The questionnaire consists of 36-items separated into three subscales (12 items each) that correspond to the triad of diagnostic features of ASD: *social aloofness*, defined as having limited interest in, and experiencing reduced enjoyment from, social interaction; *pragmatic language abnormalities*, conceptualized as difficulties in the social use of language, such as communicating effectively and maintaining reciprocal conversation; and *rigid personality*, defined as a strong preference for routine and a difficulty adjusting to change. Participants endorse items on a scale ranging from 1 (*very rarely*) to 6 (*very often*).

5.3.2 *Ten Item Personality Inventory (TIPI)*

The Ten Item Personality Inventory (TIPI; Gosling et al., 2003) is a self-report questionnaire that was designed to replace more lengthy personality surveys measuring the Big Five. Each item consists of one or two personality traits and participants are asked to indicate how much they believe that trait applies to them using a 7-point Likert scale ranging from 1 (*Disagree strongly*) to 7 (*Agree Strongly*).

5.4 *Rating participants and rating procedure*

Rating participants (i.e., ‘observers’) were recruited from the UTD SONA system. In total, 215 participants enrolled and began participation in the study. However, one participant was excluded after physical disabilities limited his/her ability to complete the computer-based portion of the study. The final sample consisted of 214 participants (164 female) that were representative of the current student body distribution of racial/ethnic diversity with 45.8% Caucasian (n=98), 34.1% Asian (n=73), 24.3% Hispanic (n=52), 9.8% African American (n=21), 1.9% Native American (n=4), 0.5% Pacific Islander (n=1), and 7.9% (n=17) of participants reported as Other or having mixed race heritage. Observers were similar in age (M=21.4 yrs., SD=5.7 yrs.) to models, and thus likely to represent potential real-world social partners. Power analysis using GPower 3.1 with an alpha level of .05, a power level of .8, and an effect of .3 determined a sample of 160 participants would be sufficient. The estimated effect size is comparable to studies employing similar methods that maximize power by utilizing within subjects designs (e.g., Faso et al., 2015; Healey et al., 2010). However, because these previous studies have included more rating participants and fewer presentation modalities, we aimed to

oversample and collected data from over 200 rating participants. This sample size allows for the detection of a conservative estimate of an expected effect size of .23.

After participating in the informed consent process approved by the UT-Dallas institutional review board, observers moved to a computer to complete a brief demographic questionnaire before beginning the rating procedure. All questionnaires and the rating of stimuli occurred on a desktop monitor using Qualtrics survey software. During the rating procedure, observers viewed/listened and rated only one presentation modality (e.g., conversation transcript, static frame) for each of the 40 stimulus participants to avoid any carry over effects from experiencing more than one stimulus from any individual. Given that there are five conditions to be rated and over 200 rating participants, each stimulus was viewed and rated by over 40 observer participants. For each stimulus viewed, participants read 10 statements derived from the first impression literature (see “4.2.4 Measure Construction”) and used a Likert-type scale to indicate how much they agree with each statement (0 = “*Strongly Disagree*”, 1 = “*Disagree*”, 2 = “*Agree*”, 3 = “*Strongly Agree*”). The bipolar, pseudo-dichotomous format forced observers to make a decision (agree vs. disagree), removed ambiguous/meaningless means centered on responses like, “*I don’t know*” or “*Neutral*”, and provided more variability in responses than previous studies (Grossman, 2014; Willis & Todorov, 2006). A 4-point scale maximized reliability compared to a 2-point scale while maintaining a reduced cognitive load for participants allowing for rapid first impressions to be made (Goggin & Stoker, 2014). Although there is no consensus regarding the optimal number of response options, this approach provided a balance between quick dichotomous decisions and a degree of variability necessary for

answering the proposed questions (Krosnick & Presser, 2010; Lozano, Garcia-Cuerto, & Muniz, 2008). After completion of the rating procedure, observers completed the BAPQ and TIPI.

CHAPTER 6

STATISTICAL ANALYSES

Prior to any analyses, items #1, #3, and #5, from the questionnaire in Table 1 were reverse scored so that higher scores on each item indicated more positive ratings and lower scores represented more negative ratings. Within any set of pairwise comparisons, Bonferroni corrections are utilized to correct for family-wise error. Greenhouse-Geiser corrections are implemented when Mauchly's test of sphericity is violated.

6.1 Specific Aim 1 Analyses

Specific Aim 1 examines how first impressions differ between the ASD and TD groups, and whether these patterns vary as a function of presentation modality. To test all hypotheses in Specific Aim 1, a 2 (Group) x 5 (Modality) x 10 (rating item) mixed model ANOVA was used, where group is between subjects and modality and rating items are within subjects. A main effect of group would support Hypothesis 1 that predicts less favorable first impressions of the ASD relative to the TD group. An interaction between group and modality would support Hypothesis 2 that predicts first impressions will vary between the groups across modalities. A significant interaction will be followed with paired-comparisons to identify which modalities differ both between and within groups, and examine whether, as predicted, the groups differ in modalities with social presentation information but not in the conversational content (i.e., Transcript) condition.

6.2 Specific Aim 2 Analyses

Specific Aim 2 assesses associations between observers' impressions of character traits and their intentions to socially engage with ASD and TD individuals. Although correlations

between all trait and intention items will be computed for both the ASD and TD groups, all hypotheses will be tested using aggregate variables. We computed the aggregate ‘behavioral intent’ rating by taking the mean of items #1-4 from Table 1, and the aggregate of the ‘character traits’ rating was calculated by taking the mean of items #5-10 from Table 1. Significant correlations between the behavioral intent aggregate and the character traits aggregate for both the ASD and TD groups would indicate support for Hypothesis 1. Hypothesis 2 predicts this correlation between behavioral intent and character traits will be stronger for the ASD group compared with the TD group, and Fisher’s r-to-z transformation will be used to compare group differences in the strength of this relationship. Hypothesis 3 states that the correlation assessed in Hypothesis 1 will be strongest in the AV modality and we will use Fisher’s r-to-z transformation to calculate any significant differences in the strength of this relationship across the five modalities.

6.3 Specific Aim 3 Analyses

Specific Aim 3 proposed a series of exploratory analyses. The purpose of each set of analyses is to explore results that have not been predicted, or to utilize a method that aims to reveal effects that cannot be found through previously described analyses.

6.3.1 Exploratory Analyses Set 1: Rating Participants

Exploratory analyses set 1 will assess whether the gender, BAP traits, and personality characteristics of the observers relates to impressions of the models. To assess the effects of observer gender and BAP status on ratings, we will perform a 2 (observer gender; male x female) X 2 (observer BAP status; positive vs. negative) by 2 (ASD vs. TD) by 5 (modality) by 10 (item rated) mixed model ANOVA, with the observers’ variables as between subjects factors and the

mean of the model participant variables as the within subjects factors. We will also use correlation analyses to assess whether personality traits (i.e., the Big Five) of the observers are associated with the mean impressions that they make for TD and ASD models.

6.3.2 Exploratory Analyses Set 2: Model Participants

Exploratory analyses set 2 will assess how characteristics of the models, beyond their diagnostic classification, may have influenced ratings. To assess the associations between ratings and model age and IQ, we will perform correlation analyses between model participant variables for both ASD and TD groups and their mean ratings given by observers. We will also use a t-test to explore whether mean ratings differ by gender for model participants in each group. Lastly, to assess associations between subclinical autism traits of TD models on their overall ratings, we will compute correlations between BAP scores and mean ratings.

6.3.3 Exploratory Analyses Set 3: Correspondence Analysis

Although ANOVA techniques can determine whether first impressions of specific traits differ between ASD and TD models both as a whole and as a function of presentation modalities, it cannot assess the constellation of trait and modality combinations that best characterize and differentiate the groups. The univariate methodologies performed in this project may not be sufficient to capture nuances in the data that show how variables may be related to—or differ from—one another across the different presentation modalities and the variables rated by observers. Moreover, the Likert-type scale utilized can create data that should be treated nominally rather than as a continuous scalar variable. Therefore, even though the main focus of this project is to assess how different modalities affect various first impressions of ASD and TD

adults, we are also interested in how the pattern of traits for each group is distributed within those modalities.

For these reasons, we will employ correspondence analysis (CA) as a more data driven approach to explore profiles of trait/modality combinations for the ASD and TD groups. CA is a factor analytic technique designed for categorical and contingency based data in which frequencies or counts represent the co-occurrence between two sets of variables (e.g., χ^2 analysis). CA is similar to principal components analysis (PCA) in the respect that CA produces orthogonal components that maximize the variance captured. CA produces factor scores for each row and each column, and these scores are then plotted in the factor space as a visual representation of the relationship between variables, and typically, just as in PCA, two components are plotted together. When the 1st and 2nd principal components are plotted as the X- and Y-axes respectively, the factor space created represents the largest proportion of variance that can be captured by two factors from the data.

We will use CA to visualize the data and explore whether additional information exists within particular modalities that addresses differentiation of models between or within groups. Such information could not be captured by ANOVA alone, imploring the use of CA for exploratory purposes. CA has been used for similar types of data in a broad range of psychological domains (e.g., Beaton, Filbey, & Abdi, 2013; Pinkham et al., 2012; Shepard, Spence, & Sasson, 2012), as well as other scientific disciplines (e.g., Pledger & Arnold, 2014; Ringrose, 1992). For a more detailed explanation of CA and historical perspective of the method, please see Greenacre (2007, 2010).

The structure for the data analyzed is as follows. Large contingency tables (i.e., 40 x 40 matrices) were constructed containing model participants on the rows and variables rated by observers on the columns. Each of the 40 rows is one of the 20 ASD or 20 TD model participants. The 10 rating variables (see Table 1) are expanded into each of the possible responses (1-4). Frequencies (i.e., counts) of each response for every model participant comprise the value in each cell (i.e., co-occurrence between models and ratings). To assess which traits are most related to first impressions when evaluating group differences, the columns of each table are comprised of the six character trait judgments.

These analyses are performed to explore the overall patterns within the data that may be missed by the formal inferential statistical analyses. In this exploratory analysis, we analyze the visual representation of these different modalities for our TD and ASD groups across the character trait ratings. To remove redundancy and focus on group separation that could not be revealed by ANOVA and correlation analyses, we will present the exploratory results that provide additional information about patterns within the data and follow-up appropriate results with some degree of inferential analysis through a process of bootstrapping the traits on particular factors. This resampling is performed because visual assessment of the factor space can sometimes provide insights into the structure of the data, but we can assess the actual contributions of each rating variable on components of our factor space as well. We utilize bootstrapping to resample the data with replacement for 1000 iterations, and therefore, we can determine which ratings significantly contribute to a particular component at $p = .001$. All of these analyses are conducted in R [version 3.0.2 (R Core Team, 2013)] with the ExPosition package (Beaton, Fatt, & Abdi, 2014) and additional custom code.

CHAPTER 7

RESULTS

7.1 *Specific Aim 1 results*

Hypothesis 1 stating that the ASD group will be rated more negatively than the TD group across all ratings was supported by a significant main effect of group. ASD individuals were perceived more negatively across all items compared to the TD individuals ($F(1,38) = 47.33, p < .001, \eta^2 = .56$). However, a significant item by group interaction ($F(1.92,72.83) = 17.57, p < .001, \eta^2 = .32$) indicated that the effect of group differed across individual items. Paired comparisons for the rating items between groups revealed that the ASD group was rated more negatively compared to TD adults on items assessing awkwardness ($t(38)=9.37, p < .001, 95\% \text{ CI } [.63, .98]$), attractiveness ($t(38)=7.98, p < .001, 95\% \text{ CI } [.42, .70]$), dominance ($t(38)=3.59, p = .001, 95\% \text{ CI } [.15, .53]$), and likability ($t(38)=4.67, p < .001, 95\% \text{ CI } [.17, .44]$), but not traits of trustworthiness ($t(38)=.14, p = .89, 95\% \text{ CI } [-.14, .16]$) or intelligence ($t(38)=.89, p = .38, 95\% \text{ CI } [-.08, .21]$). Observers also indicated they would be less likely to sit next to ($t(38)=4.41, p < .001, 95\% \text{ CI } [.12, .32]$), hangout with ($t(38)=5.50, p < .001, 95\% \text{ CI } [.24, .52]$), or talk to ($t(38)=5.05, p < .001, 95\% \text{ CI } [.19, .44]$) the ASD group compared to the TD individuals, but no statistical difference was found for how much they'd mind living near these individuals ($t(38)=2.03, p = .05, 95\% \text{ CI } [.00, .19]$). Figure 1 contains all comparisons of rating items across groups.

Hypothesis 2 predicted that group differences on first impressions would vary across presentation modalities. This hypothesis was supported by a significant interaction between group and modality ($F(2.23,84.67) = 9.14, p < .001, \eta^2 = .19$). Pairwise comparisons between

groups on each modality indicated that ASD participants were rated more negatively compared with TD participants in the Audio-Visual (AV) ($t(38)=6.80, p < .001, 95\% \text{ CI } [.29, .54]$), Audio ($t(38)=3.32, p = .002, 95\% \text{ CI } [.10, .40]$), Static ($t(38)=6.42, p < .001, 95\% \text{ CI } [.25, .48]$), and Video conditions ($t(38)=7.01, p < .001, 95\% \text{ CI } [.29, .52]$). However, consistent with predictions, no significant effect was found for Transcript ($t(38)=1.00, p = .323, 95\% \text{ CI } [-.06, .20]$). Figure 2 depicts these between group comparisons.

The effect of modality within each group was also examined. For the ASD group, the omnibus test was significant ($F(2.31,49.92) = 6.68, p = .002, \eta^2 = .26$) indicating an effect of modality. Pairwise comparisons showed the AV modality to have significantly more negative ratings compared to the Audio ($p = .036, 95\% \text{ CI } [.01, .27]$) and Transcript ($p < .001, 95\% \text{ CI } [.11, .35]$) conditions. The Static condition was also rated more negatively than the Transcript condition ($p = .018, 95\% \text{ CI } [.02, .36]$). No significant differences emerged for any other pairwise comparison. Ratings of the TD group also varied across presentation modalities ($F(1.97,37.47) = 4.48, p = .018, \eta^2 = .19$). Pairwise comparisons showed that TD models were rated more favorably in the Video condition compared with the Static condition ($p = .037, 95\% \text{ CI } [.004, .19]$). However, after corrections, none of the other comparisons between any of the modalities reached statistical significance.

The interaction between rating item and modality ($F(6.41,243.42) = 6.97, p < .001, \eta^2 = .16$) and the three-way interaction between group, modality, and rating items ($F(6.41,243.42) = 3.10, p = .005, \eta^2 = .08$), were also significant. The breakdown and description of the rating item and modality interactions can be found in supplemental materials.

7.2 Specific Aim 2 Results

Specific Aim 2 examines relationships between observer's character trait ratings of the models and their intentions to socially engage with the models. As predicted by hypothesis 1, a strong positive correlation ($r = .84, p < .001$) between mean-level character trait ratings and behavioral intent ratings was found. Hypothesis 2 predicting that this relationship would be greater for the ASD group than the TD group was partially supported. Correlation values were generally higher for the ASD group than the TD group (see Table 2), but none of the comparisons of correlation coefficients between the groups reached a level of significant difference (all $ps > .17$). Hypothesis 3 predicted the correlation between character trait ratings and behavioral intent ratings would be strongest in the AV modality. However, correlations were similarly strong in the AV ($r = .86, p < .001$), Audio ($r = .82, p < .001$), Static ($r = .88, p < .001$), and Video conditions ($r = .89, p < .001$). Using Fisher's r-to-z transformation, correlations were only weaker in the Transcript condition ($r = .63, p < .001$) compared to the other four modalities (all $ps < .05$). Further, we find that correlations between related modalities that overlap in informational channels (e.g., Audio & Transcript) are stronger than correlations between modalities depicting unique informational channels (e.g., Static image and Transcript). For example, ratings of traits in the Transcript condition only significantly correlate with ratings from the Audio condition ($r = .66, p < .01$), and traits rated in the Static condition only correlate with the AV and Video-only conditions, all which share visual information ($rs > .51, ps < .05$).

7.3 Specific Aim 3 Results

7.3.1 Exploratory Results Set 1: Rating Participants

The first set of exploratory analyses aimed to discover whether ratings differed depending upon the gender, autistic-traits, and personality characteristics of the observers. Ratings did not differ by observers' gender ($F(1,210) = .15, p = .84, \eta^2 = .000$) nor BAP status ($F(1,210) = 1.79, p = .47, \eta^2 = .002$), nor did these factors produce a significant interaction ($F(1,210) = .23, p = .63, \eta^2 = .001$). Table 3 contains metrics for all observer variables assessed.

Correlations between the Big Five personality characteristics of the observers assessed by the Ten Item Personality Inventory (TIPI; Gosling et al., 2003) and their mean ratings revealed only a few small but significant correlations: increased observer agreeableness significantly correlated with more positive ratings of both ASD and TD models, and greater observer emotional stability correlated with more positive ratings of TD participants (see Table 4). These correlations were significant only for female observers, and correlations did not vary by BAP status of the observers. Using Fischer's r-to-z transformation, correlations between personality traits of observers and their ratings were not significantly different for ASD and TD models (all $ps > .08$).

7.3.2 Exploratory Results Set 2: Model Participants

The second set of exploratory analyses examined whether characteristics of model participants related to impressions formed by observers. A t-test assessing differences between gender on overall ratings found males and females did not differ in mean ratings ($t(38)=7.46, p = .17$, Male: $M = 2.41, SD = .21$; Female: $M = 2.28, SD = .20$, 95% CI $[-.06, .31]$). Next, correlation analyses revealed that age did not correlate with the average rating given by

observers ($r = .01, p = .96$), but IQ was moderately related to mean ratings of model participants ($r = .36, p = .02$). Lastly, we examined whether subclinical autistic traits related to ratings for TD models, but neither the total BAP score ($r = .24, p = .30$) nor any of the three subscales (aloof, $r = .31, p = .18$; pragmatic language, $r = .04, p = .87$; rigidity, $r = .03, p = .89$) were significantly related to mean ratings. Additionally, no BAP score was significantly related to any individual trait rating (all $ps > .12$). However, the lack of significant results related to BAP scores, especially the moderate effect sizes attributed to the aloof subscale, may be influenced by the lack of power due to the small number of TD model participants comprising these sub-groups.

7.3.3 Exploratory Results Set 3: Correspondence Analysis

For the three modalities that contain visual information (AV, Video, Static), Correspondence Analysis (CA) for each revealed unidimensional separation of the ASD and TD groups across component 1, supporting the findings from the original ANOVA results. Figures 3, 4, and 5, depict the factor spaces for the models in the AV, Video, and Static modalities respectively, and clear group separation can be seen across the x-axis or component 1. Within each figure there are results of the bootstrap inference analyses showing the traits that had all four ratings significantly contributing to component 1. The ratings of awkwardness and attractiveness consistently contributed to group separation along component 1 in all three visual modalities. This exploratory analysis for the visual modalities did not reveal novel information concerning within-group differentiation.

Within the CA for the Audio modality, however, the factor space reveals a more multidimensional structure determining model participant separation. Figure 6 shows the ASD group disassociating across component 1, with a large cluster of individuals to the right of the

origin and another cluster overlapping entirely with TD models near and to the left of the origin. The TD group also disassociates within itself, but primarily along component 2. Figure 7 depicts the factor space for the trait ratings, and the cluster of ASD models to the right of the origin appear to be primarily defined by more negative impressions of awkwardness, attractiveness and likeability. However, the bootstrap ratio inference of component 1 (see Figure 8) shows that nearly all the ratings are significantly contributing to component 1, but awkwardness and attractiveness are the largest contributors to this component, and thus, the split within the ASD group. Component 2 is significantly and uniquely contributed to by aggression (see Figure 9) with more aggressive models appearing in the lower half of the factor space, which is also associated with lower ratings of likeability, intelligence, and trustworthiness. Almost all other ratings also contributed to component 2 except for attractiveness. Within the Audio condition that lacked any visual information, there is within-group separability for both groups. Even though each group has an overlapping cluster whose audio was rated as likeable, intelligent, trustworthy, and generally not awkward, the ASD group exhibits a cluster comprised of very awkward, very unattractive, and very passive speakers, and the TD group exhibits a cluster of very aggressive, untrustworthy, not likeable speakers.

This pattern persists to some degree within the Transcript modality in which the content of speech remains without the auditory information (see Figure 10). Even though group separability and clustering is less defined compared to the Audio modality, similar within-group disassociation is present. The large overlapping cluster of ASD and TD models in Figure 10 exists to the left and mostly below the origin, and based on Figure 11 that depicts the factor space of traits in the Transcript condition, we can expect that the transcripts from these models

appeared extremely trustworthy, intelligent, and likeable. The small cluster to the far right of the origin is comprised primarily of TD models who appear very aggressive, unlikeable, and untrustworthy. The small cluster far above the origin hovering around component 2 is comprised primarily of ASD models appearing extremely awkward. Bootstrap ratio tests for component 1 (see Figure 12) reveal that extreme aggression is the strongest predictor driving the dimension of component 1 on the right of the origin where we find the cluster of TD models. Bootstrap ratio tests for component 2 (see Figure 13) reveal awkwardness as the strongest contributor to component 2, with extreme awkwardness defining the cluster of ASD individuals above the origin. Additional analyses exploring variables potentially associated with the cluster distributions can be found in supplemental materials along with further discussion of the effects of model variables (e.g., IQ) that, even though they do not appear to in the results of this study, could potentially influence subtyping of diagnostic groups.

CHAPTER 8

DISCUSSION AND CONCLUSION

This project provides novel information about how adults with ASD are initially perceived by unfamiliar TD same-age peers during a social presentation task in real-world settings. Although the findings from this project broadly support prior research indicating that first impressions formed of ASD models are more negative than those formed of matched controls (e.g., Butler & Gillis, 2011; Grossman, 2014; Matthews et al., 2015), this project expands beyond prior findings in many important ways that are detailed in sections covering the following topics: 1) examination of the traits that do and do not differ between adults with ASD and TD controls during first impression formation made by social others; 2) how first impression formation of adults with and without ASD varies by presentation modality; 3) associations between negative first impressions and intentions for social engagement; 4) exploration of whether characteristics of the observers affect first impressions of those with and without ASD; 5) limitations and conclusions.

First Impressions of Character Traits of Adults with ASD

Whereas prior research has indicated that individuals with ASD are quickly and reliably judged as more awkward than TD controls (Grossman, 2014), the current project found that adults with ASD are also perceived as less likeable, less attractive, and more submissive. The extension to these three other negative trait evaluations suggests that poor first impressions of individuals with ASD are not limited to perceptions of awkwardness but rather encompass other evaluative judgments that may disadvantage adults with ASD in terms of social opportunities and quality social experiences.

Notably, however, negative impressions of adults with ASD did not extend to all evaluated traits. The two groups did not differ on ratings of perceived intelligence or on trustworthiness. The lack of group differences on these traits suggest that individuals with ASD are not uniformly viewed less favorably, but rather that social presentation differences in the ASD group may lead to more negative evaluations of traits associated with social appeal and approach behaviors (i.e., awkwardness, attractiveness, likability) than those associated with competence (intelligence) and character (trustworthiness). It may be the case that characteristics related to social appeal and approachability are more easily assessed during the brief window of time allotted for evaluation in this study, and more complex judgments like trustworthiness and intelligence require more time for assessment, or require other behavioral information not revealed within the current task demands. Alternatively, the lack of group differences could reflect accurate perceptions of these traits on the part of the observers. Although no information was collected about the actual trustworthiness of our model participants, prior research indicates that individuals with ASD are often overly trusting (Adolphs, Sears, & Piven, 2001) and less adept at deception (Frith, 1989). Thus, it is possible that aspects of the social presentation exhibited by ASD models conferred accurate indications of their trustworthiness. The current study did, however, collect an estimation of the intellectual capabilities of model participants, and this did not differ between the two groups. Therefore, the lack of group differences here may indicate that observers were able to accurately perceive the ASD models to be as intellectually capable as the TD models, a finding that parallels prior research reporting thin slices of behavior can be used to accurately perceive intelligence (Borkenau et al., 2004).

Presentation Modalities and First Impression Formation of Adults with ASD

This project represents the first empirical attempt to determine why individuals with ASD are viewed more negatively than controls. By systematically manipulating the presentation modalities available to observers when making their first impressions, this project was able to isolate the specific modalities of social presentation in ASD that contribute to more negative first impressions. For ASD models, impressions were most negative in the audio-visual (AV) condition in which all available aspects of social presentation were available. This finding suggests that the combination of many different social cues may produce a cumulative effect on negative impression formation. Further analysis suggested that in particular, visual information was a primary driver of negative first impressions of those with ASD. The two conditions containing solely visual cues (i.e., Static and Video conditions) also produced negative ratings, whereas the conditions lacking visual information (i.e., Transcript and Audio) were more positively rated compared to the AV condition in the ASD group. Indeed, no differences were found between first impressions made of ASD and TD models in the Transcript condition in which no audio or visual information was available. The lack of group differences in the Transcript condition suggests that the substantive content of communication does not appreciably differ in ASD relative to controls in its effect on first impression formation. Rather, it appears that the style rather than the substance of social presentation in ASD drives negative impression formation, with visual cues in particular contributing to poorer first impressions of the ASD group.

The TD models, on the other hand, showed the opposite pattern across presentation modalities: they were rated most negatively in the Transcript condition, and ratings improved

when visual information was included. This suggests that the more positive impressions of TD models were driven by a more favorable response to their stylistic presentations relative to those of ASD models, particularly in the visual domain. Supporting this interpretation, the Video condition, which includes stylistic content in the absence of substantive speech content, received the most positive ratings for TD models, even more so than the AV condition that includes more stylistic content but also provides access to speech content.

Thus, this study found that any visual cue, even those contained within static images, was enough information for naïve observers to consistently form more negative impressions of adults with ASD relative to TD controls. Although prior research indicates that many clinically relevant judgments can be made from thin slices of behavior drawn from many different information channels (for review see, Siepian, Bogart & Ambady, 2014), the findings here suggest that the visual domain is most relevant for the formation of first impressions of adults with ASD. Further, because negative first impressions may have social consequences for those with ASD, a need remains to better understand the specific components of visual presentation that contribute to negative impression formation in ASD. In other words, what aspects of visual presentation (e.g., body posture, grooming, and fashion) might be driving such negative evaluations of individuals with ASD?

Prior research may provide some clues. There is some evidence that the facial movement patterns of individuals with ASD are atypical and may represent a salient cue of awkwardness or difference to TD observers (Guha, Yang, Grossman, & Narayanan, 2016; Metallinou, Grossman, & Narayanan, 2013). Kinematic analyses of facial expressions in this population point to subtle dynamic differences related to the complexity of dynamic transitions (Metallinou et al., 2013) as

well as symmetry of movement patterns between face regions (Obafemi-Ajayi et al., 2015), which could represent at least some of the cues potential conversation partners use to form their first impressions of individuals with ASD. However, perceptions were not based solely on information from the face, and atypical social presentation expressed with the body frequently found in ASD, like abnormal gait (Weiss et al., 2013), posture (Molloy, Dietrich, & Bhattacharya, 2003; Travers et al., 2013) and gestures (Attwood, Frith, & Hermelin, 1988; de Marchena & Eigsti, 2010), could also negatively impact impressions.

Negative judgments of people with ASD in this study were not limited to video stimuli, but remained equally robust for static images, indicating that the rougher movement patterns of individuals with ASD (Guha et al., 2016; Obafemi-Ajayi et al., 2015) and general motor coordination deficits (Fournier et al., 2010) are not solely to blame for this phenomenon. Recent studies also suggest the presence of autism-specific dysmorphology, specifically related to distances between facial features (Obafemi-Ajayi et al., 2015) could lead to perceptions of atypicality even when looking only at static images. However, significant dysmorphic features most commonly characterize individuals with more significant autism symptoms and severity (Obafemi-Ajayi et al., 2015), which does not describe the individuals with preserved language and cognitive skills who appeared in the stimuli for this study and therefore cannot explain the rapid and robust negative evaluations. Other visual cues, like obesity in the face and body, are linked with poorer first impressions (Elmore et al., 2015; Re & Perrett, 2014). Weight and/or BMI of the models was not assessed in the current study, but prior research indicates that individuals with ASD are at much higher risk for obesity for several reasons: more sedentary life styles, effects of psychopharmacologic treatments, abnormal sleep patterns, and barriers to

adequate physical activity (Curtin, Jojic, & Bandini, 2014; Gillette et al., 2015). Based on evidence in the literature and the data presented here, negative first impressions of ASD are not exclusive to any one feature of expression, but rather represent an effect of subtle physical and dynamic cues of presentation that could also include additional features, such as clothing choices and grooming habits (Lausten, 2014). Future research should seek to explore the visual aspects of presentation that differ between ASD and TD individuals as this could prove useful for identifying domains more modifiable and therefore, more open to intervention, like grooming or clothing compared to features of facial attractiveness.

Findings from ANOVA results that indicate a central role of visual cues for forming negative impressions of adults with ASD were supported by subsequent correspondence analyses (CA). In the visual conditions, the ASD and TD models were reliably separable by observers across trait ratings. In particular, ratings of awkwardness and attractiveness were primary traits driving separation of ASD and TD models. Such patterns support the original findings from the ANOVA results but did not provide extensive additional information about model differentiation. However, the CA did reveal novel information for the Audio and Transcript conditions missed by the more traditional ANOVA analyses. Here, with visual information removed, a multidimensional structure within the model groups was revealed, where the ASD models disassociated themselves into subtype clusters that were separable primarily by the rating of awkwardness. The TD models were also found to differentiate once visual information was removed primarily across ratings of aggression. Although at the group level, ANOVA results showed the ASD models to be rated more negatively than the TD models in the Audio condition, CA results indicate that solely by listening to speech, there are groups of ASD adults that are

indistinguishable from their TD counterparts. Likewise, the ANOVA results showed no group level difference between ASD and TD models in the Transcript condition, yet CA results revealed that there are still speech content components of particular ASD models that promote perceptions of awkwardness.

Findings indicate sub-typing of ASD models depends in part on their vocal patterns. The perspective that individuals with ASD produce flat or monotonous speech dates back to early accounts of autism (Kanner, 1943). More recent research has found that the abnormal prosody in speech produced by individuals with ASD (McCann & Peppe, 2003; Peppe et al., 2011) is marked by misplaced stress and augmented pitch (Shriberg et al., 2001) and is much more variable in terms of fundamental frequency range compared to TD individuals (for review see Nordgren, 2016). Variable prosodic patterns in ASD speech is perceived as more odd by listeners (Filipe, Frota, Castro, & Vicente, 2014), yet this variability in expressivity of speech suggests that not all individuals with ASD will exhibit abnormal speech qualities. The subtype clustering seen in our CA results may reflect this variability, with varying vocal characteristics of ASD models perceived and evaluated differently by listeners. Future work could utilize a similar approach to explore how specific vocal characteristics, like pitch or stress, contributes to perceptions of voices from individuals with ASD. Additionally, identification of the specific vocal qualities that lead to negative impressions could be widely applied to assist with highly targeted and individualized intervention techniques, which have shown promising results for improving atypical speech prosody in individuals with ASD (Nordgren, 2016).

Associations between Negative First Impressions and Intentions to Socially Interact

This project is the first to establish links between negative first impressions of adults with ASD and reduced intentions by others to pursue subsequent social interactions. These results highlight how initial social evaluations of adults with ASD that are formed quickly from very brief glimpses of social presentation may contribute to a reduction in the quantity and quality of their social experiences. These findings have clinical relevance, not only because research with typically-developing populations reports unfavorable first impressions can lead to poor relational outcomes (e.g., Ambady & Skowronski, 2008; Selfhout, Denissen, Branje, & Meeus, 2009; Sunnafrank & Ramirez, 2004), but also because the quality and quantity of social experiences is associated with the development of social competence and skill. As discussed by Dawson and colleagues (2004), children with ASD may derive reduced reward from affective exchanges (Mundy & Neal, 2001) limiting their intrinsic motivation to participate in such exchanges or orient to social information (Dawson et al., 1998; 2004), that over time may affect the development of social skills.

Perceptions of adults with ASD and their relation to the reduced quality and quantity of their social experiences are particularly important given the unique challenges faced by adults with ASD, including obtaining and maintaining employment, establishing social support networks, and living independently from caregivers (Friedman, Warfield, & Parish, 2013). In fact, while services and educational opportunities for children with ASD has grown markedly over the last 30 years, individuals with ASD typically lose or age out of services in early adulthood, most commonly when they are no longer in the public school system (Eaves & Ho, 2008; Gerhardt & Holmes, 1997; Howlin et al., 2004). A tremendous need exists for services

tailored to adults with ASD and for understanding mechanisms underlying their poor social and functional outcomes. Results from this project may offer a foundation for understanding how social presentation behaviors expressed by adults with ASD may relate to the broader social challenges they experience. For example, unemployment or underemployment faced by adults with ASD often occurs despite the presence of valuable job-related skills and the necessary training or educational requirements (Engstrom, Ekstrom, & Emilsson, 2003; Holwerda et al., 2012, 2013). Not only is employment for adults with ASD especially complex as they must navigate the social and communicative intricacies of the workplace (Hendricks, 2010), but poor employment outcomes may also occur in part because of negative social appraisal by potential employers. Findings from this study may provide novel avenues toward more success in this domain of functioning even though information pertaining to specific social presentation, like voice, is not typically measured in research assessing employment success for adults with ASD (Schaller & Yang, 2005). One example could be based on results from the Audio modality, which suggests that some ASD individuals would receive similarly positive ratings to their TD counterparts. These individuals may perform better during phone interviews compared to in-person encounters, and our results also identify others that may benefit from more training for improved success during phone interviews. This is extremely impactful for the current trend in research pursuing strategies to provide training to adults with ASD focusing on specific job interview skills (Strickland, Coles, & Southern, 2013) and more broadly applicable vocational skills needed to obtain meaningful employment (for review see; Seaman & Cannella-Malone, 2016).

Reduced intentions to interact with ASD adults have implications not only for their professional lives, but their personal lives as well. Cognitively-able adults with ASD desire social connections to a similar degree as their peers (Bauminger & Kasari, 2000; Orsmond, Krauss, & Seltzer, 2004), yet may not have the social tools necessary to establish or maintain these relationships. Negative first impressions, regardless of how accurate those perceptions are, may stifle the willingness of novel social partners to provide appropriate approach behaviors that foster relationship development (Bromgard & Stephan, 2006; Snyder & Stukas, 1999). Further, given the large literature in social psychology indicating that biases and prejudices that promote social distancing are best alleviated through personal familiarity and interaction (Pettigrew & Tropp, 2000), negative first impressions may limit opportunities for adults with ASD to establish the intergroup contact necessary for mitigating negative biases. In this way, negative first impressions may act as another barrier that limits access to quality social interactions, further restricting the opportunities to form desired social connections and friendships, leading to the high rates of loneliness reported by adults with ASD (Bauminger & Kasari, 2000; Lasgaard et al., 2010; Levy & Perry, 2011).

Because negative impressions may relate to the social exclusion individuals with ASD frequently experience (Belch, 2004), interventions aiming to improve overall functioning may seek to mitigate these biases through meaningful personal interaction with others that in turn may increase the opportunities for relational development to occur. Further, the social experiences of ASD adults may also benefit by educating others to be more aware and accepting of their social presentation differences, rather than trying to change the many interwoven factors of self-presentation that mark the expressions of individuals with ASD as atypical. Given the social

cognitive difficulties in perspective taking associated with autism, some individuals with ASD may lack insight about how their social presentation is viewed by potential social partners. Others, however, may be more cognizant of these perceptions but are comfortable in their self-expression. For them, intervention strategies targeting awareness and acceptance among TD peers in their social environments may be a more sensitive and accommodating approach than encouraging impression management strategies.

Correlational analyses conducted in this study not only reveal relations between negative first impressions of adults with ASD and a reduced desire to interact with them, but also offer some insight about the specific traits that were most associated with decreased intentions to engage with adults with ASD. Perceptions of likeability and attractiveness were strongly correlated with “intent to engage” items, and although this occurred regardless of diagnosis of the model participants, these associations were strongest for the ASD group. In contrast, however, perceptions of awkwardness were only associated with reduced intentions to hang out with or talk to ASD models, not TD models. Thus, perceived awkwardness appears to be a unique barrier to subsequent social engagement for adults with ASD. Two other traits also related to approach behavior, attractiveness and likeability, consistently differentiate the groups in both the univariate and multivariate analyses. Collectively, these three trait judgments appear particularly relevant to reduced intentions to socially engage with adults with ASD.

Do Characteristics of the Observers Affect Impression Formation of Adults with and without ASD?

Lastly, this study examined whether characteristics of the observers influenced first impression formation. First impressions largely did not differ for TD or ASD models based upon

the big five personality traits, the presence of subclinical autistic traits, or the gender of the observers, suggesting that the group differences reported for the ASD models are relatively uniform regardless of observer characteristics. As a result, these findings suggest that improving social experiences for adults with ASD may not be achievable simply by constructing social environments comprised by the “right” kind of people who are likely to evaluate them more favorably. Rather, broadly applied educational programs would be more effective in lowering the stigma and exclusion experienced by individuals with ASD (Gillespie-Lynch et al., 2015; Staniland & Byrne, 2013). In fact, broad based integrative classroom experiences that focus on peer tutoring can increase the amount of time children with ASD spend socializing with partners, allowing more time to practice appropriate, reciprocal social interactions (Kamps, Barbetta, Leonard, & Delquadri, 1994). Neurotypical peers within integrated classroom settings also exhibit marked increases in knowledge about autism and express far more positive attitudes regarding individuals with ASD compared to children without those experiences (Mavropoulo & Sideridis, 2014), and therefore, an effort toward community integration could prompt larger attitude shifts as well (Scheeren & Geurts, 2015). With increasing numbers of adults diagnosed with an ASD, employing integrative strategies into the workplace, higher education systems, and the community may yield more promising results for the broader society beyond efforts focused on individual deficit reduction.

Limitations and Conclusions

Although this study provides new information concerning the formation of negative first impressions of adults with ASD, several limitations should be considered when interpreting the results reported here. First, we analyzed social presentation during a standardized task that may

not completely reflect the real-world behaviors experienced and expressed by adults with ASD. However, the “High Risk Social Challenge” task is validated to elicit spontaneous social presentation representative of how individuals may present themselves to strangers (Gibson et al., 2010), and its inclusion maintains a high level of experimental control while greatly improving the ecological validity of results when compared to the previous literature that utilized written vignettes or actors portraying ASD behavior (e.g., Butler & Gillis, 2011; Campbell et al., 2004, Swaim & Morgan, 2001). Future studies interested in examining whether first impressions differ when generated from actual face-to-face interaction should consider employing a more dyadic approach where participants engage in social interaction with a live conversation partner. Such a design would provide a high degree of ecological validity while also allowing for more nuanced analyses of actor-partner effects through modeling the dynamic nature of impression formation. Second, to further maximize ecological validity, we chose not to provide observers with diagnostic labels of the model participants, as such knowledge is typically not immediately available when meeting someone for the first time or when deciding to engage with someone socially. Thus, findings from the current study can inform how adults with ASD are perceived prior to social contact, but cannot determine whether knowledge of diagnostic status would affect the ratings reported here. Some prior research has indicated that impressions of ASD individuals improve when labels are present (Chambres et al., 2008; Matthews et al., 2015), though it is unclear whether such a pattern would have occurred in our study, and if it did, whether it would also extend to greater intentions to socially engage. Third, findings from the current study were derived exclusively from the first 10 seconds of social presentation from each model. Although research indicates that this timeframe is sufficient to capture many aspects of first impressions

(Ambady, Hallahan, & Coner, 1999; Ambady & Rosenthal 1993), impressions for some traits from some presentation modalities may require more information to be reliably perceived. For example, the speech content of individuals with ASD has been shown to vary in structure and substance from typically developing controls (e.g., Nadig et al., 2010), particularly in regards to inappropriately redirecting conversation to the topic of a special interest, yet this study failed to find significant group level differences between ratings of ASD and TD models based upon the transcript of their speech. Although this could indicate that the groups do not differ in their actual speech content in ways that influence first impressions, it may be the case that 10 seconds of speech is not sufficient for differences in content to be apparent for observers to reliably separate groups, and CA results partially corroborate this interpretation. Future studies could assess similar first impression ratings on longer segments of speech content to determine whether such an effect may arise. Lastly, our model sample consisted exclusively of individuals with average to above average IQ, and thus results may differ for the significant proportion of individuals with ASD who are less intellectually-able. Further, the sample was also predominantly white and male, which prevented examination of whether reported patterns extended to females and minorities with ASD. With a growing literature indicating that females with ASD may show greater compensatory social skill that camouflages their disabilities (Lai et al., 2011), and minorities with ASD are often diagnosed differently (Begeer et al., 2009), it may be premature to assume that the results from this study can be extrapolated to these populations.

Despite these limitations, this project provides comprehensive evidence that first impressions of adults with ASD are significantly less favorable than those of matched controls and are also associated with greater reluctance on the part of observers to pursue subsequent

social engagement. Presentation modalities containing visual information consistently provided enough information leading observers to reliably separate ASD and TD adults, yet, this separation was reduced once visual information was removed. Based on audio information in correspondence analyses, ratings disassociated ASD adults into potential subtype clusters that warrant future research to determine if these subtypes may be diagnostically and clinically meaningful.

Collectively, these findings reflect a previously overlooked contributor to reduced quantity and quality of social interaction for cognitively-able individuals with ASD (Shattuck et al., 2012) that goes beyond the more well-researched area of their own social cognitive impairments. Results reported here support emerging theories that consider social interaction deficits in ASD as not only an individual impairment, but also a relational one (McGeer, 2004; Milton, 2013) in which social factors outside the individual with ASD affect the quantity and quality of their social experiences and social development. Ultimately, consideration of both of these factors is necessary for a full understanding of social impairment in ASD, and intervention and education approaches that target both those with ASD as well as their TD peers may offer a more comprehensive approach for improving social and functional outcomes in ASD.

APPENDIX A

SUPPLEMENTAL ANALYSES

Additional Analyses following Specific Aim 2

In addition to testing the proposed hypotheses for *Specific Aim 2*, we also explored how individual character traits related to behavioral intent items, and whether certain trait relationships differed between ASD and TD models. Mean ratings for each item were calculated across modalities. Table 5 depicts the correlation matrix for all rated traits and behavioral intent items. For both groups, consistently strong correlations (all $r_s > .59$, $p_s < .01$) are seen between ratings of *trustworthiness*, *likability*, and *intelligence* of the models with all four behavioral intent items. One stark difference in correlations between the groups was the rating of model awkwardness. For the TD group, there were no significant correlations between awkwardness and behavioral intent items. However, we do find significant relationships between awkwardness ratings of ASD models and the raters' future intent to talk to ($r = .56$, $p < .01$) and to hang out with ($r = .58$, $p < .01$) ASD models. Using Fisher's r-to-z transformation, the correlation difference between awkwardness and intent to hangout for the ASD and TD group is statistically different ($z = 1.7$, $p = .04$), though the correlation difference for groups between awkwardness and intent to talk to does not reach significance ($z = 1.34$, $p = .09$). Ratings of aggressiveness also varied between groups. For the ASD group, only the rater's willingness to live near the models was associated with ratings of aggressiveness ($r = -.54$, $p < .05$). However, the TD group had consistently strong correlations between aggressiveness and all four behavioral intent items (all $r_s > -.67$, $p_s < .01$). The strength of correlations for these relationships was found to be

statistically different for ASD and TD groups using Fisher's r-to-z transformation (all z s > 1.92 , p s $< .03$).

Because intelligence represents the one rated trait in which we have objective information on the model participants, we explored whether perceived intelligence correlated with actual intelligence in order to gauge the validity of first impression judgments for this trait. Table 6 contains the correlations between IQ and ratings, split by group and by modality. We find that perceived intelligence is moderately correlated with actual intelligence for all model participants across each of the conditions, except for the Video condition. For ASD models, actual intelligence was only significantly correlated with ratings of intelligence in the Static condition ($r = .52, p = .02$). For TD models, actual intelligence was significantly correlated with ratings of intelligence in the Audio ($r = .52, p = .02$) and the Transcript conditions ($r = .48, p = .03$). Thus, despite no group level differences in IQ between the groups, visual information was associated with judgments that reflected actual intelligence for the ASD group but not the TD group, while content of speech (i.e., Transcript condition) was associated with judgments that reflected intelligence for the TD group but not the ASD group. These divergent correlational patterns support the notion that, in contrast to TD controls, first impressions of ASD models' intelligence may be more influenced by their style of presentation, primarily related to basic visual presentation, rather than the substantive content of their social presentation.

Expanded Description of Item x Modality interactions

The interaction between rating item and modality ($F(6.41, 243.42) = 6.97, p < .001, \eta^2 = .16$) is subsumed by the three-way interaction between group, modality, and rating items ($F(6.41, 243.42) = 3.10, p = .005, \eta^2 = .08$). Pairwise comparisons reveal that the pattern of the

group x modality interaction in which the ASD group is more negatively viewed in all but the Transcript condition holds up for each of the rating items where a difference was found in the group x item interaction except for ratings of awkwardness ($t(38)=2.87, p = .007, 95\% \text{ CI } [.10, .59]$) and attractiveness ($t(38)=3.09, p = .004, 95\% \text{ CI } [.07, .33]$) with ASD models rated more negatively compared to TD models.

CA Results: Expanded description of visual modalities

Figure 3 represents the CA of the Audio/Visual (AV) modality depicting the factor space of model participants, Figure 3 shows group separation along component 1 (i.e., the X-axis), which accounts for 43.3% of the variance contained in the data and bootstrap analysis for component 1 reveals that all eight possible ratings for awkwardness and attractiveness uniquely and significantly contribute to the variance that separates TD and ASD individuals. In particular, “strongly agree” ratings indicating an individual was awkward bore a majority of the variance defining the left half of component 1, the side predominantly inhabited by ASD model participants within the factor space.

Figure 4 contains the factor space of model participants for the Video modality. A clear separation can be seen between ASD and TD groups along component 1 accounting for 51.5% of the variance. These similar separations across modalities indicate that perceptions from observers were robust and unique to the models, where removal of the audio information from the AV modality may not fundamentally change how people make ratings. We later test the factor space structure similarity between modalities, addressing whether the AV ratings are more associated with the visual cues (body movement, gestures, posture), or vocal cues as produced in the Audio

modality. Ratings of attractiveness and awkwardness again almost uniformly define component 1 and the unidimensional group separation of TD and ASD models.

Examining how the removal of audio or visual information from the stimuli can affect patterns of ratings can help address whether more simplified aspects of each of these channels elicit similar ratings from observers. The most basic visual cue available is the Static image. Figure 5 depicts how models were distributed within the factor space with component 1 contributing 46.9%, and again we can see clear unidimensionality of group separation across the first component. In previous factor spaces of modalities with visual cues (i.e., AV, see Figure 3; Video, see Figure 4) there was also robust group separation across the first component, indicating that with the ratings being made within this study, any visual cue contains enough information to reliably distinguish ASD and TD model participants at the group level, supporting the original results from the ANOVAs. All ratings of awkwardness, attractiveness and likeability largely contribute to the variance within component 1.

Cross modality factor structures and individual model analyses

To assess the similarity or dissimilarity between the factor structures of each modality across the first and second component, we performed multiple correlation analyses between the respective factor scores of each modality. Table 7 contains coefficients for within component correlations for both factor 1 and 2. The factor scores for almost all bivariate relationships are strong, indicating that the factor space of component 1 and 2 across the modalities are very similar. The Transcript modality sees the weakest relationships with the other modalities, only reaching moderate correlations with the Audio modality, further supporting the importance of separating information cues to understand their individual contributions to first impressions.

To explore individual differences across TD model characteristics (e.g., autism traits) we compared the factor scores from the rows (i.e., model factor scores) for both component 1 and component 2 within each of the modalities across a series of correlation analyses. First, we assessed how the Broad Autism Phenotype (BAP) within TD models related to factor scores across both component 1 and component 2. BAP scores were measured continuously rather than categorically, a method utilized to explore how the continuous nature of these traits is reflected as personality characteristics (Faso et al., 2015). No significant correlations arose for factor scores from component 1 across any modality. For component 2, the Static modality factor scores were negatively related to Aloofness ($r = -.59, p = .006$) and total BAP ($r = -.45, p = .049$), and the Transcript modality factor scores were positively related to Aloofness ($r = .48, p = .032$). These correlations can be interpreted within the respective factor spaces. Within the Static modality factor space, TD models with higher Aloof scores (e.g., TD #38; $M = 3.67$) are found within the lower distribution of component 2 (see Figure 5) compared to individuals with lower Aloof scores (e.g., TD #31; $M = 1.17$), and these scores could relate to the associated traits along this dimension of separation, like higher aggressiveness or lower trustworthiness (see Figure 14). Within the Transcript modality factor space, TD models with higher Aloof scores (e.g., TD #28, #40, #21; $M_s > 3.33$) are found higher within the factor space across component 1 (see Figure 10) compared to individuals with lower Aloof scores (e.g., TD #22, #24, #31; $M_s < 2.00$), and these scores could relate to the primary trait associated with this component, awkwardness (see Figure 11). Higher aloof TD models present speech content that is rated as more awkward, a finding that is corroborated by assessing the correlation between awkwardness ratings and aloof scores in TD models ($r = .45, p = .049$).

Exploration of Intelligence in Audio and Transcript Modalities

In an effort to explain what could be contributing to the multidimensionality of group separation in both the Audio and Transcript modalities, we have explored how IQ is visually represented within each of the factor spaces. IQ was determined to be the only variable measured in both ASD and TD models relating to cognitive or affective abilities. Figure 15 shows IQ projected into the Audio modality factor space (Red = High IQ top 25%; Purple = High-middle IQ 50-75%; Blue = Low-middle IQ 25-50%; Green = Low IQ bottom 25%). We can see some color separation but it is not uniform across either component. Fewer high IQ models (i.e., Red points) are located far to the right or far below the origin, with the majority clustering where ratings were more positive. However, there are ‘Low IQ’ individuals within that cluster as well. Figure 16 shows IQ projected into the Transcript modality factor space, and again, we do not see any definitive delineation of individuals across components that would indicate that intelligence is completely explaining factors associated with group separation for this condition. We do see the majority of high IQ models near the origin and more low (i.e., Green) or low-middle (i.e., Blue) models populating the ends of the components. This result mirrors the correlational findings that showed some moderate relationship between model IQ and their overall ratings from observers.

APPENDIX B
TABLES AND FIGURES

Table 1.

First Impressions Assessment Scale for Observers

Item

1. I would mind if I had to live near this person^a
2. I would hang out with this person in my free time
3. I would be uncomfortable sitting next to this person^a
4. I would start a conversation with this person^a
5. This person is socially awkward
6. This person is attractive
7. This person is trustworthy/honest
8. This person is aggressive/dominant
9. This person is likeable
10. This person is probably as smart as I am

Response options: Strongly Agree – Agree – Disagree – Strongly Disagree

Note: ^a indicates a minor modification adapted from the original version for use in this project

Table 2.*Correlations for ratings of traits and behavioral intent across modalities*

Variable	1	2	3	4	5	6	7	8	9	10
1. Trait Audio	--	.76**	.27	.45*	.29	.87**	.35	.15	.44	.15
2. Trait AV	.61**	--	.55*	.46*	.61**	.71**	.71**	.41	.43	.41
3. Trait Static	.01	.51*	--	.14	.77**	.18	.54*	.88**	.33	.62**
4. Trait Trans	.66**	.37	-.05	--	-.07	.49*	.35	.14	.64**	-.02
5. Trait Video	.27	.73**	.76**	-.05	--	.05	.45*	.66**	.07	.84**
6. BehInt Audio	.76**	.59**	-.11	.55*	.06	--	.55*	.14	.61**	-.05
7. BehInt AV	.60**	.77**	.14	.49*	.30	.84**	--	.55*	.60**	.43
8. BehInt Static	.08	.42	.72**	.13	.53*	.19	.45*	--	.36	.62
9. BehInt Trans	.57**	.37	-.24	.75**	-.26	.80**	.70**	.10	--	.22
10. BehInt Video	.47*	.62**	.57**	.04	.76**	.32	.49*	.69**	-.04	--

Note: Correlations below the diagonal in blue reflect associations within TD models.

Correlations above the diagonal in red reflect associations within ASD models. **Bolded** values reflect correlations between the same modality. * $p < .05$. ** $p < .01$.

Table 3.*Rating Participant Variables*

Variable	<u>Male (n=50)</u>	<u>Female (n=164)</u>
	Mean (SD)	Mean (SD)
Age	21.7 (4.8)	21.3 (5.9)
<i>Broad Autism Phenotype Questionnaire (BAPQ)</i>		
	Scale Mean (% meeting cutoff for positive status)	
BAP Total	2.98 (10.0%)	3.03 (40.2%)
Aloofness	3.08 (8.0%)	2.94 (29.9%)
Prag Lang	2.73 (26%)	2.82 (40.9%)
Rigidity	3.12 (16%)	3.32 (32.3%)
<i>Ten Item Personality Inventory (TIPI)</i>		
	Subscale Mean (Standard Deviation)	
Extraversion	7.38 (2.97)	7.96 (3.49)
Agreeable	10.44 (2.43)	10.31 (2.24)
Conscientiousness	10.78 (2.62)	11.16 (2.39)
Openness	10.26 (2.31)	10.30 (2.51)
Emotional Stability	11.08 (2.25)	6.70 (2.97)

Table 4.*Correlations between Big Five traits of Raters and mean ratings of ASD and TD models*

Variable	All Raters <i>N</i> = 214		BAP + Raters <i>n</i> = 71		BAP – Raters <i>n</i> = 143		Male Raters <i>n</i> = 50		Female Raters <i>n</i> = 164	
	ASD	TD	ASD	TD	ASD	TD	ASD	TD	ASD	TD
Extraversion	-.01	-.13	-.11	.05	.07	-.10	.03	-.15	-.02	-.13
Agreeable	-.15*	-.18**	-.15	-.14	-.14	-.16	.00	-.07	-.20**	-.23**
Conscientious	.09	.07	.17	.12	.08	.10	.11	.12	.07	.06
Emotional Stability	-.11	-.14*	-.16	-.07	-.08	-.07	.02	-.11	-.17*	-.16*
Openness	-.01	-.02	-.02	.02	.03	.05	.13	.21	-.07	-.10

Note: * $p < .05$. ** $p < .01$.

Table 5.*Correlations for ratings of traits and behavioral intent items*

Variable	1	2	3	4	5	6	7	8	9	10
1. Live Near	--	.78**	.94**	.83**	.16	.55*	.94**	-.54*	.86**	.70**
2. Hangout	.87**	--	.88**	.98**	.58**	.88**	.72**	-.09	.88**	.59**
3. Sit Next	.95**	.94**	--	.94**	.38	.72**	.88**	-.35	.90**	.71**
4. Talk To	.88**	.96**	.94**	--	.56**	.85**	.78**	-.15	.92**	.63**
5. Awkward	-.24	.08	-.11	.17	--	.59**	.19	.60**	.53*	.21
6. Attractive	.42	.72**	.53*	.63**	.32	--	.41	.12	.64**	.56**
7. Trust	.94**	.85**	.92**	.89**	-.08	.35	--	-.57**	.85**	.58**
8. Aggressive	-.88**	-.68**	-.84**	-.67**	.57**	-.20	-.79**	--	-.25	-.08
9. Likeable	.81**	.92**	.89**	.94**	.23	.61**	.88**	-.58**	--	.53*
10. Smart	.91**	.76**	.86**	.78**	-.22	.27	.90**	-.82**	.71**	--

Note: Correlations below the diagonal reflect associations within TD models. Correlations above the diagonal reflect associations within ASD models. * $p < .05$. ** $p < .01$.

Table 6.

Correlations of model IQ with ratings of intelligence

Variable	ALL	ASD	TD
AudioVisual	.33*	.38	.29
Video	.19	.38	.16
Audio	.35*	.19	.52*
Transcript	.40*	.39	.48*
Static	.36*	.52*	.05

Note: Correlations under ‘ALL’ are the combined model participants. * $p < .05$. ** $p < .01$.

Table 7.*Correlations within Component 1 & 2 Factor Scores across Modalities*

Variable	1	2	3	4	5
1. Audio	--	.89*	.92*	.91*	.35
2. AudioVisual	.91*	--	.96*	.85*	.04
3. Video	.93*	.98*	--	.84*	.12
4. Static	.93*	.88*	.93*	--	.29
5. Transcript	.43	.14	.27	.56	--

Note: Correlations below the diagonal reflect relationships between Component 1 Factor scores, above the diagonal reflects relationships within Component 2 Factor scores. Bonferroni corrections for multiple comparisons provided an alpha level of .0025 * $p < .0025$.

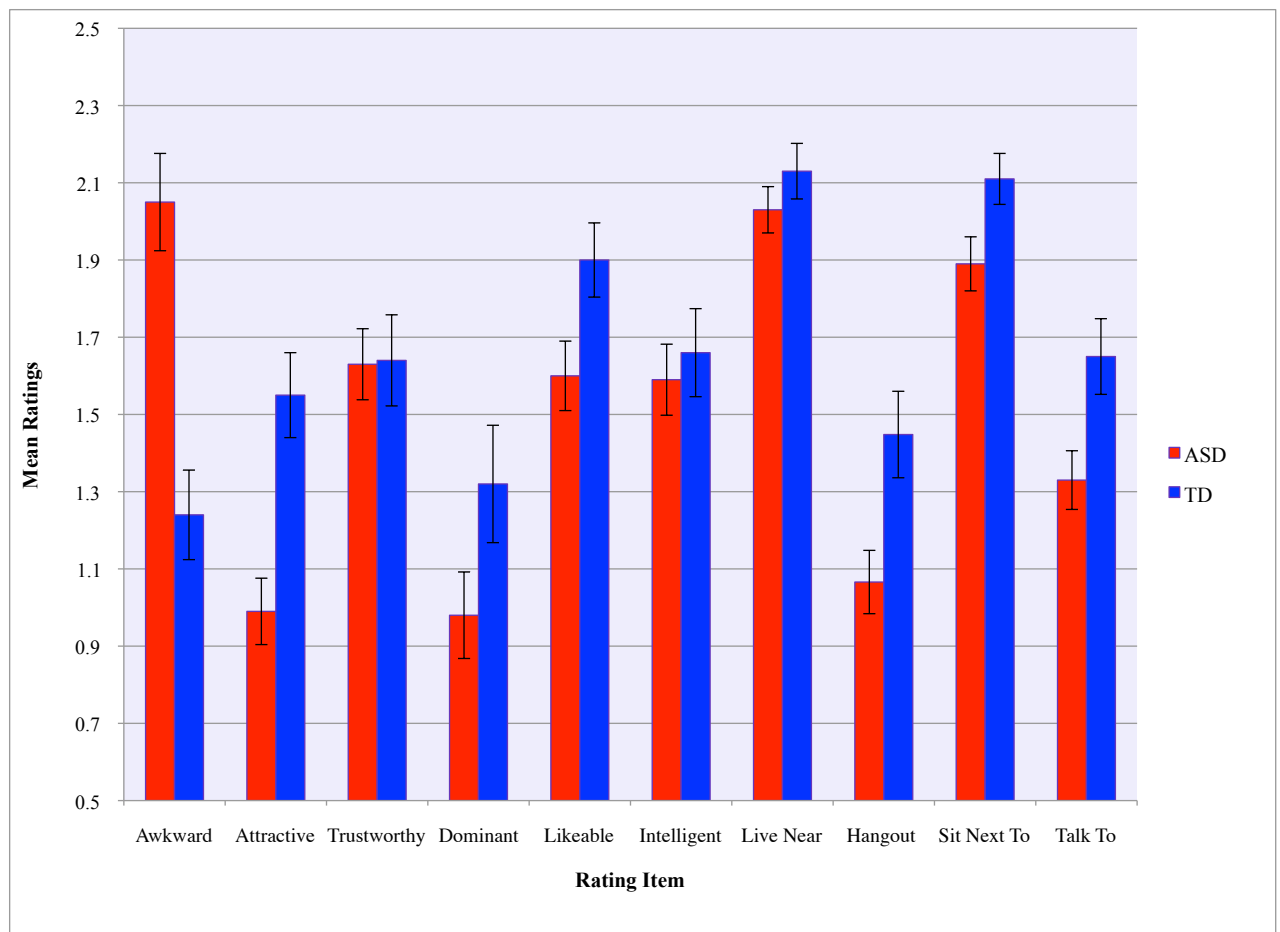


Figure 1. ASD and TD groups mean ratings across assessed items.

Note: Error bars represent 2 standard errors of the mean

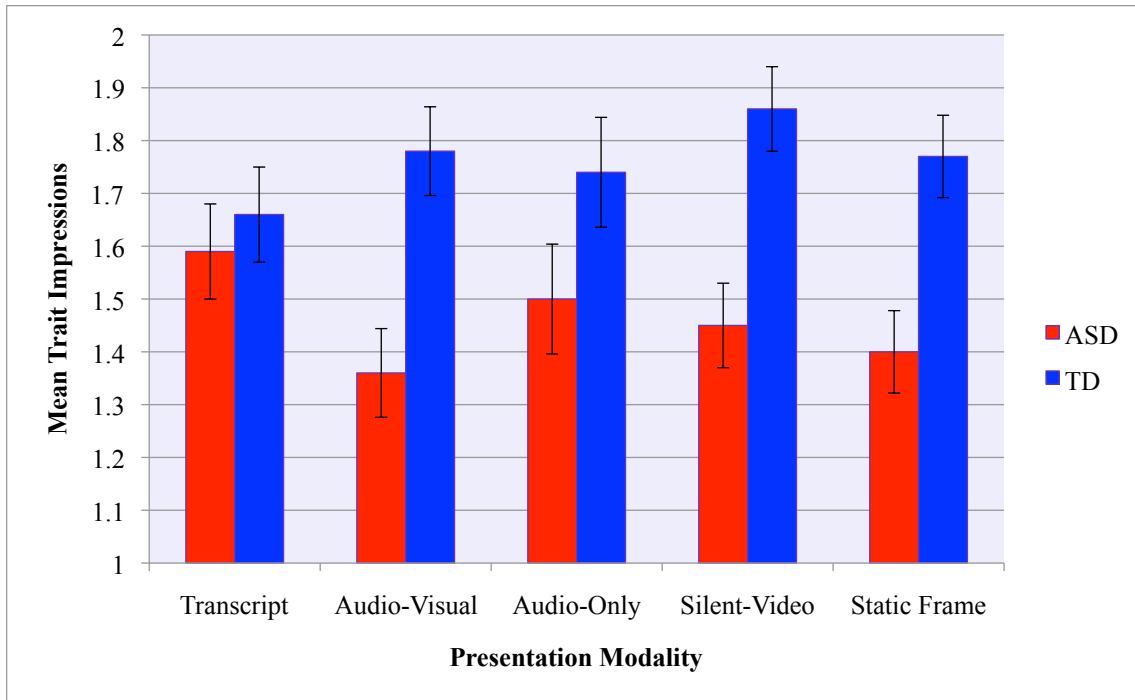


Figure 2. ASD and TD groups mean ratings across presentation modalities.

Note: Higher values equate to more favorable ratings. Error bars represent 2 standard errors of the mean

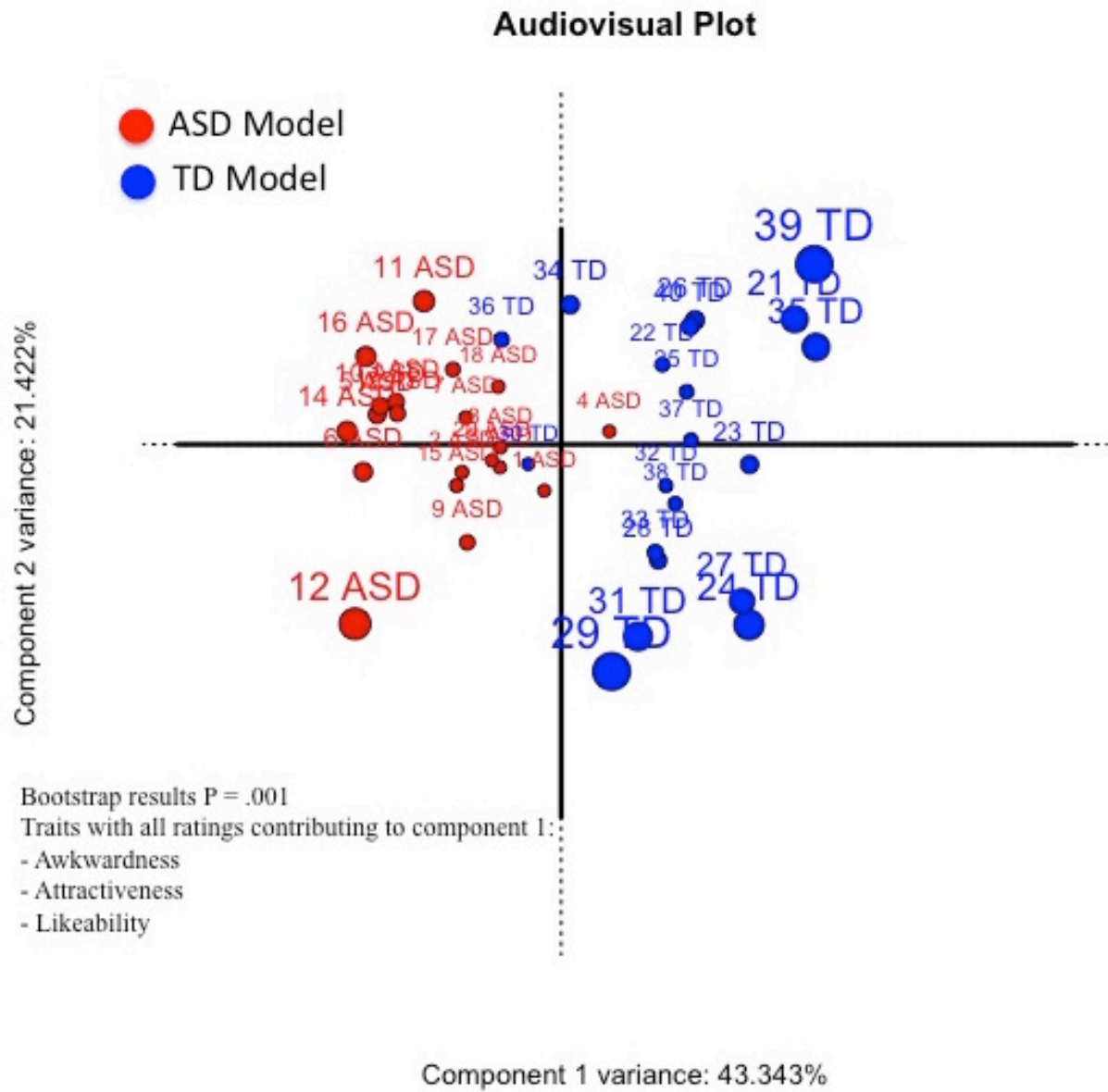


Figure 3. Correspondence Analysis plot of group factor scores for the AudioVisual modality

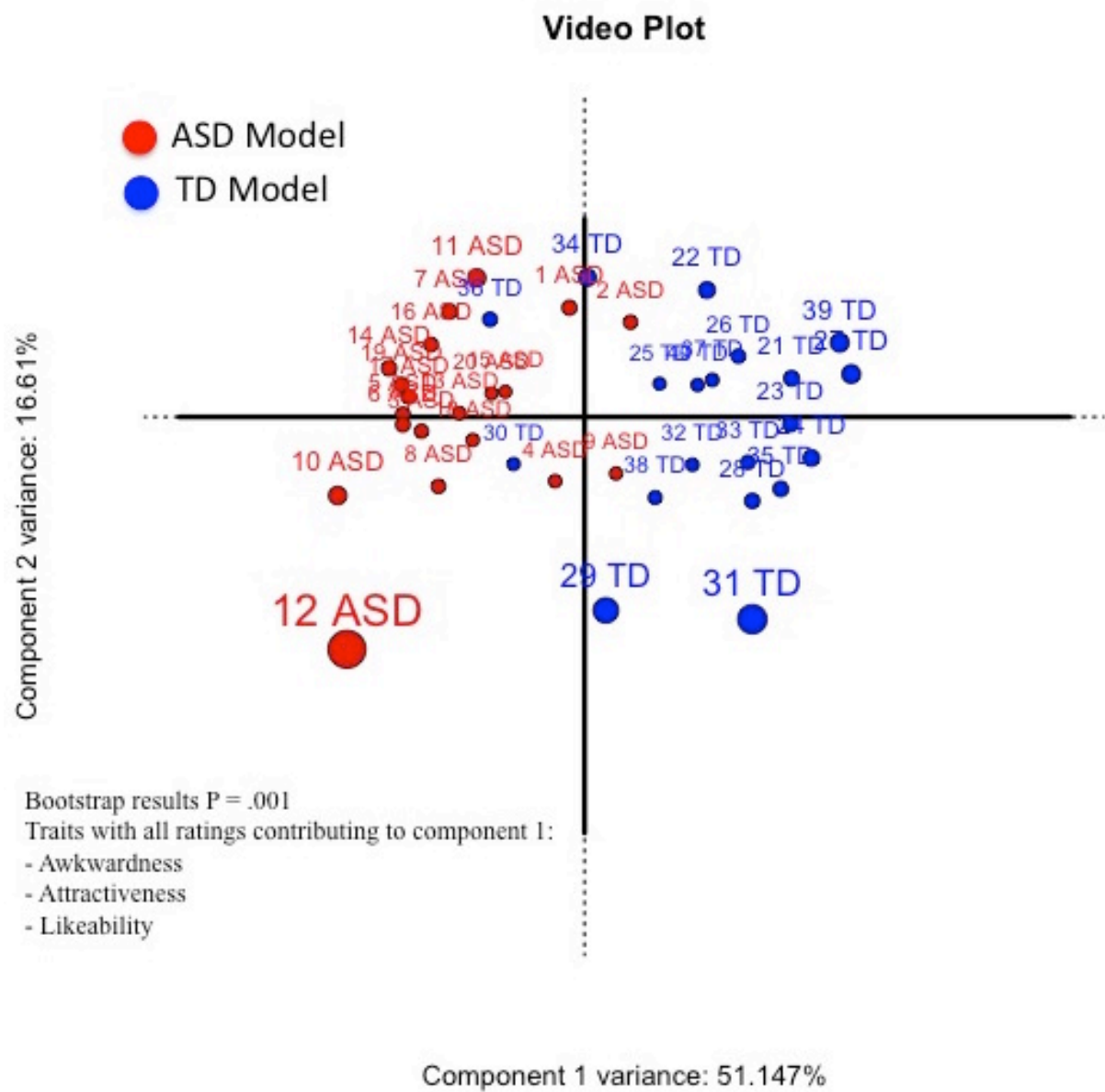


Figure 4. Correspondence Analysis plot of group factor scores for the Video modality

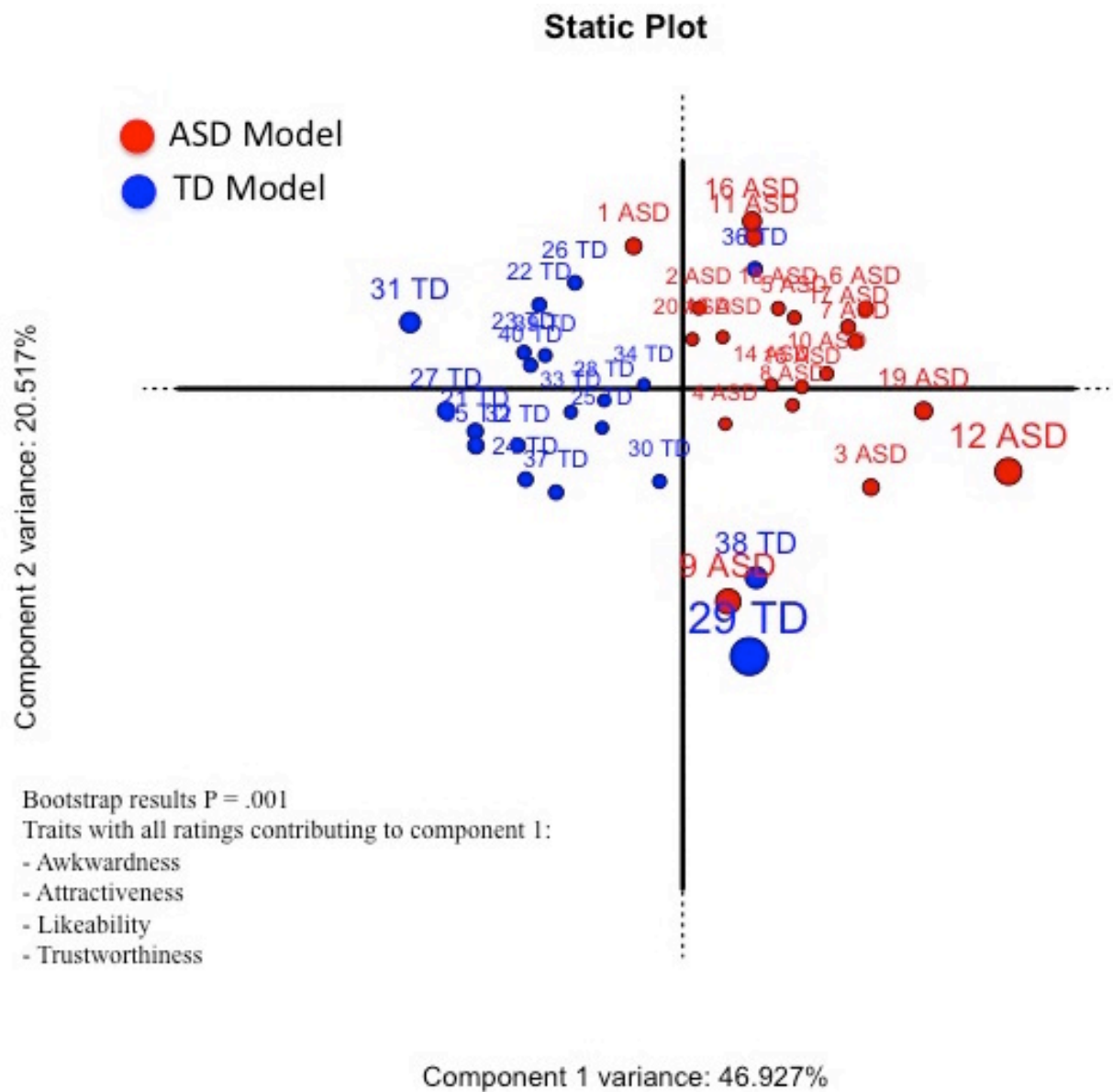


Figure 5. Correspondence Analysis plot of group factor scores for the Static modality

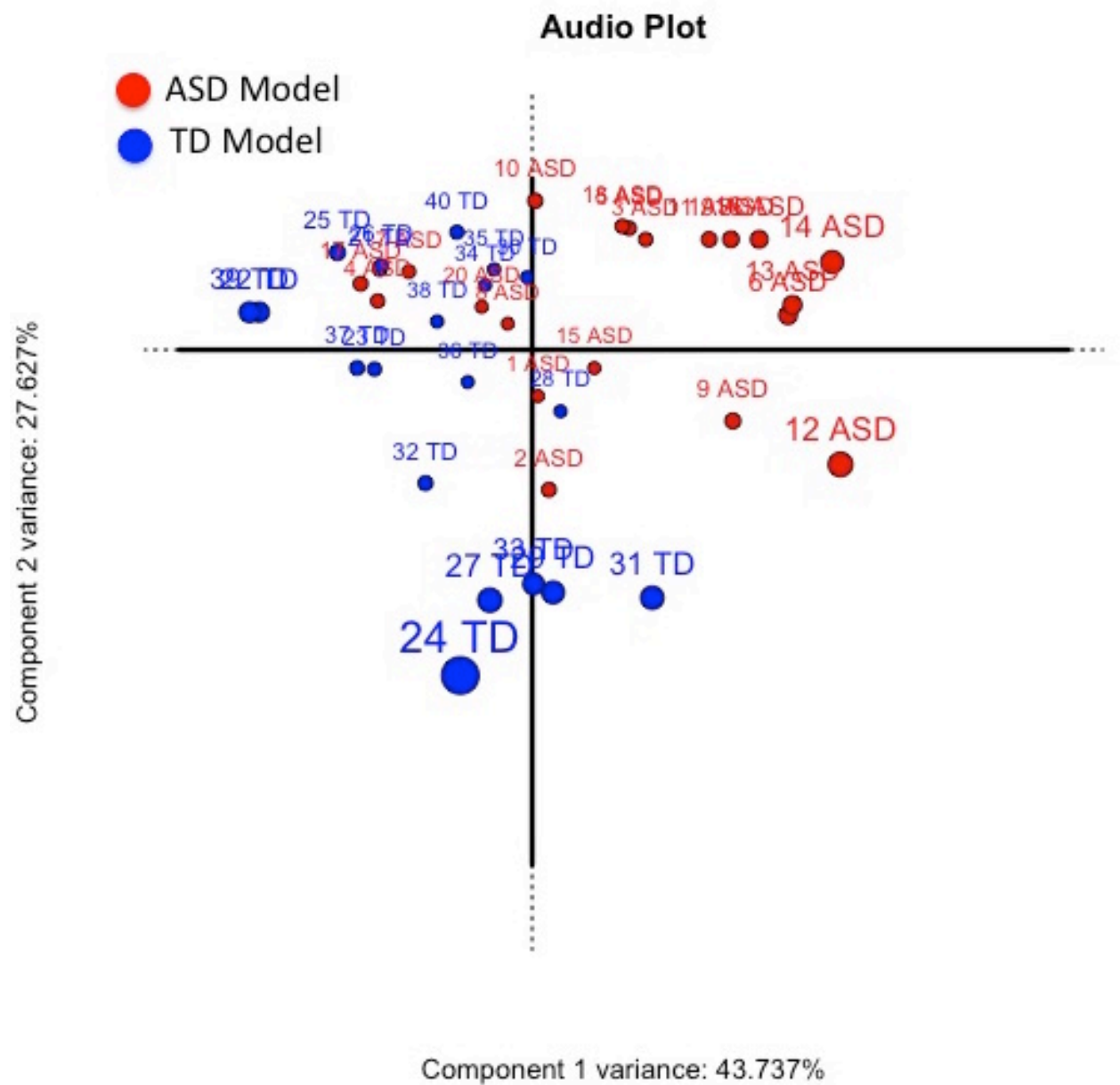


Figure 6. Correspondence Analysis plot of group factor scores for the Audio modality

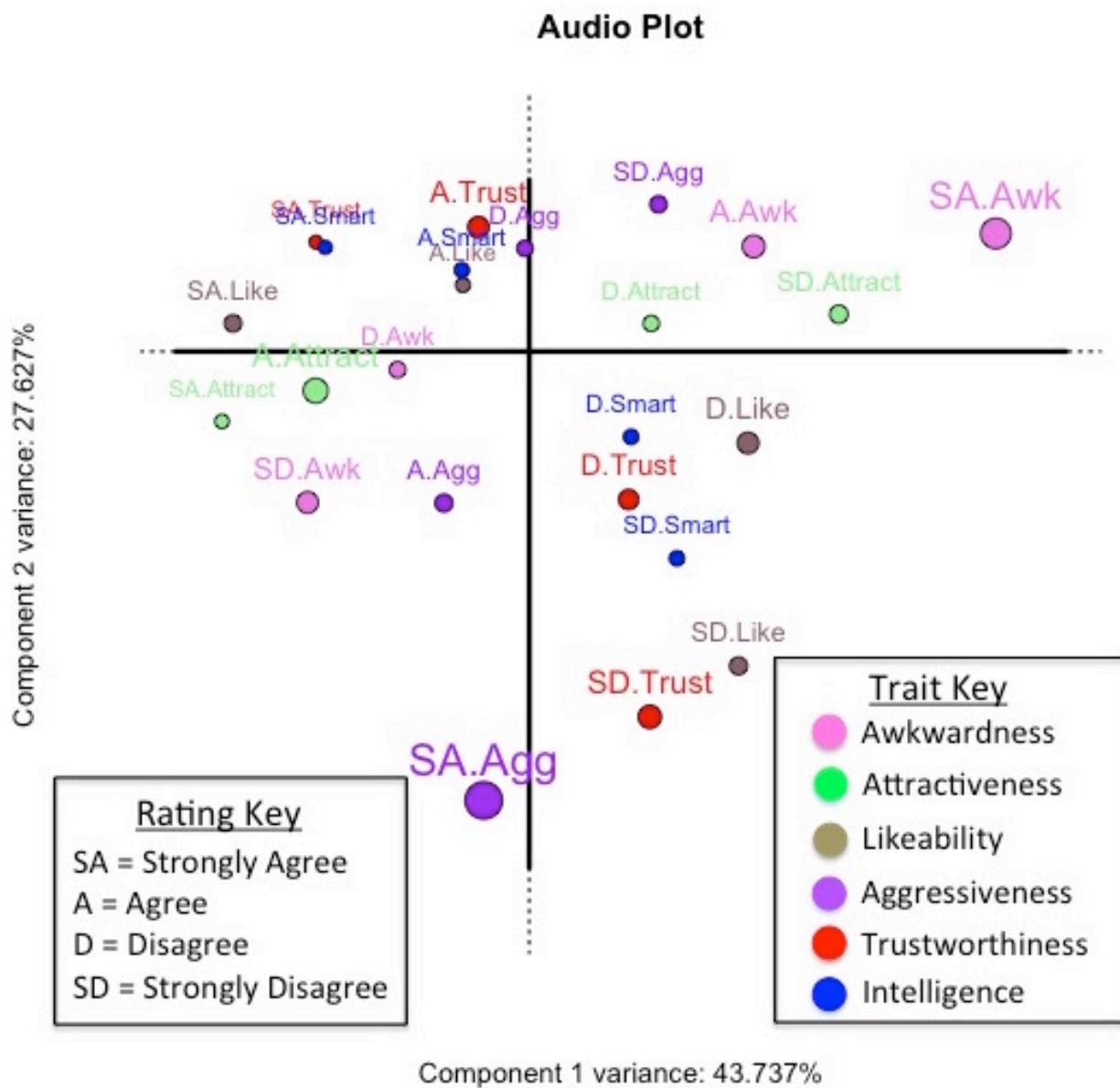


Figure 7. Correspondence Analysis plot factor scores of traits for the Audio modality

Bootstrap Ratios Component: 1

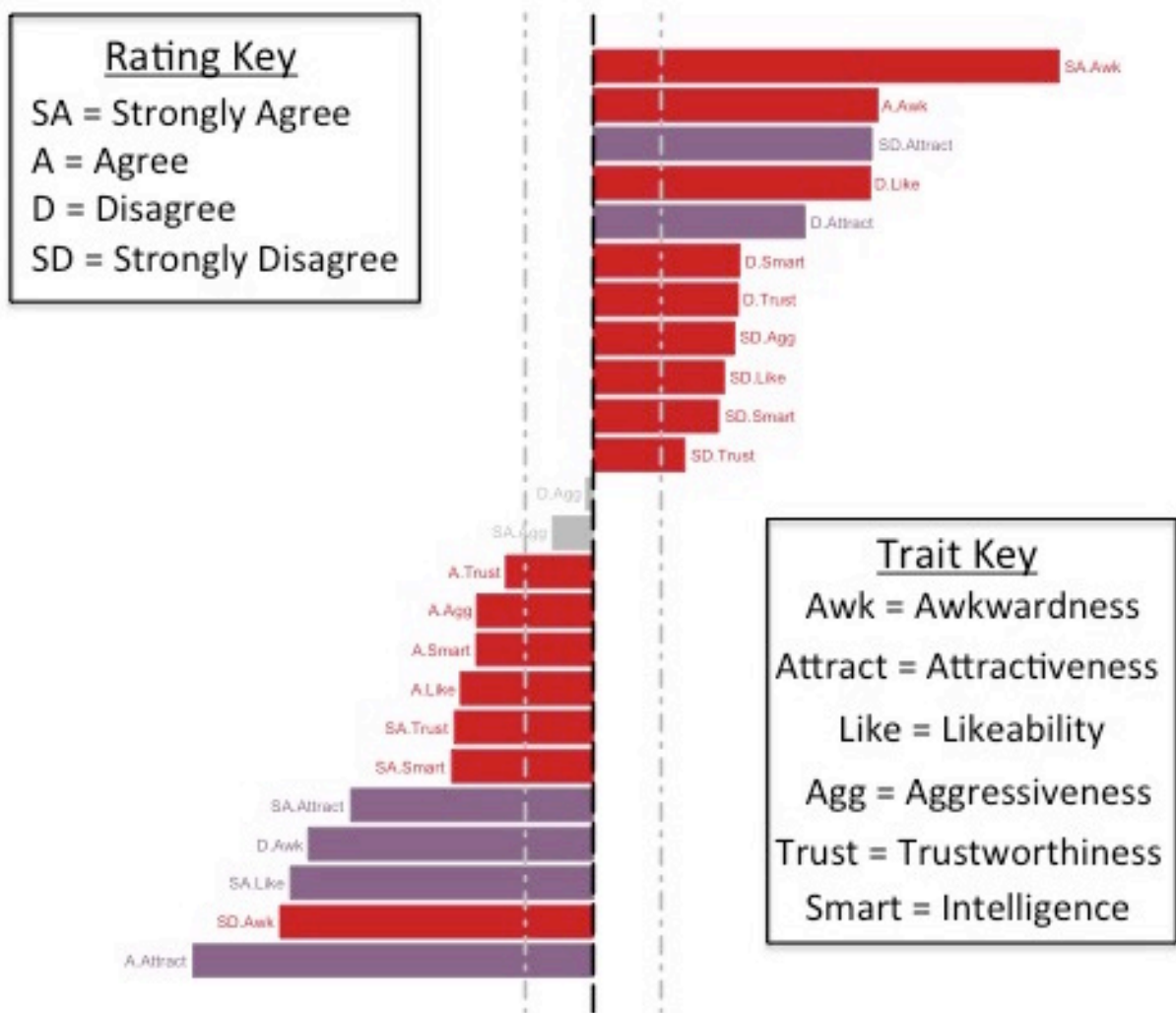


Figure 8. Bootstrapped Ratios of Audio Trait Ratings on Component 1

Note: Ratings that cross the significance threshold of $p=.001$ indicated by the dashed line are colored, nonsignificant ratings are in gray. Purple bars indicate ratings solely contribute to component 1, red indicates significant contributions to both components

Bootstrap Ratios Component: 2

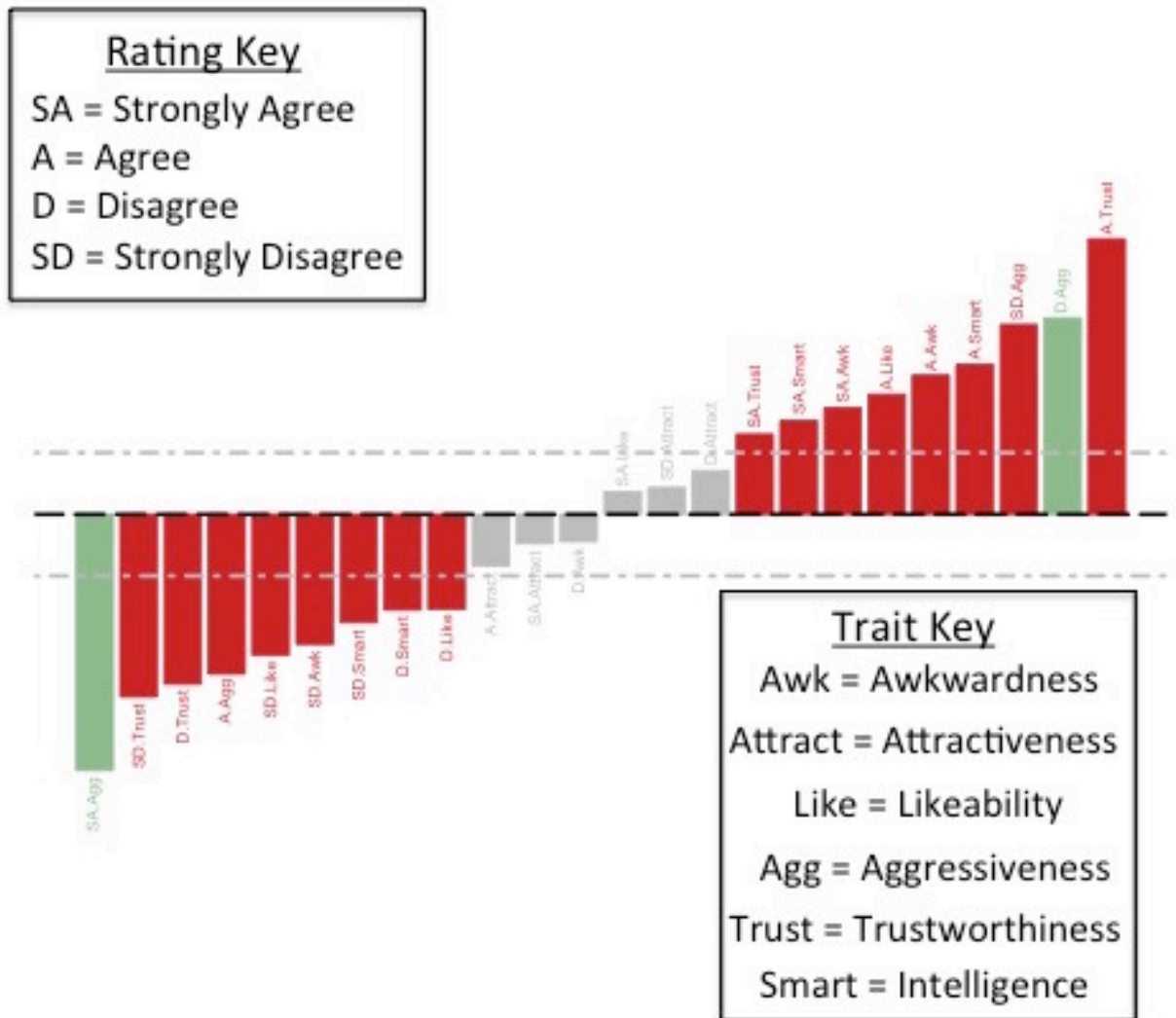


Figure 9. Bootstrapped Ratios of Audio Trait Ratings on Component 2

Note: Ratings that cross the significance threshold of $p=.001$ indicated by the dashed line are colored, nonsignificant ratings are in gray. Green bars indicate ratings solely contribute to component 2, red indicates significant contributions to both components

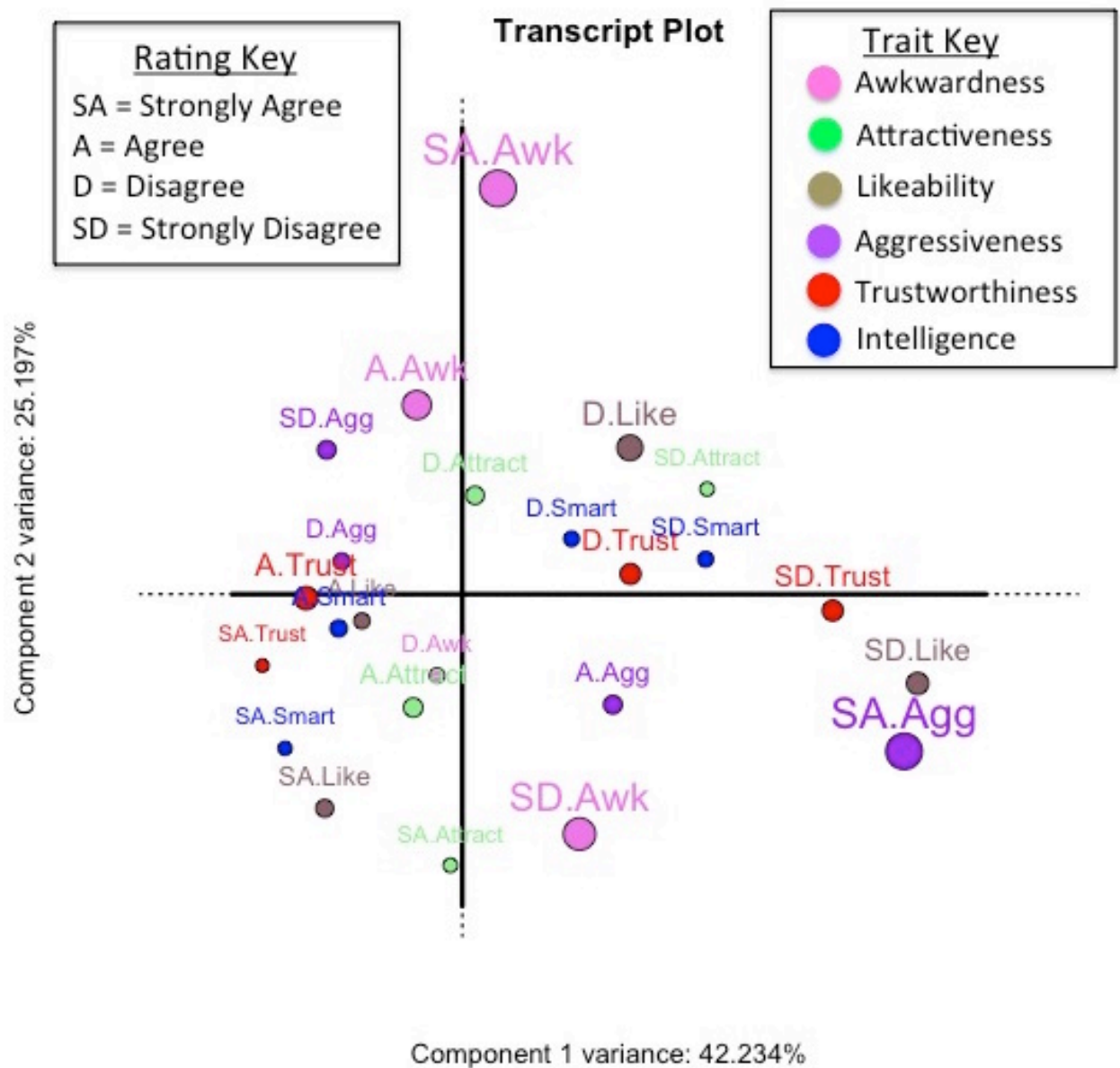


Figure 11. Correspondence Analysis plot of factor scores of traits for the Transcript modality

Bootstrap Ratios Component: 1

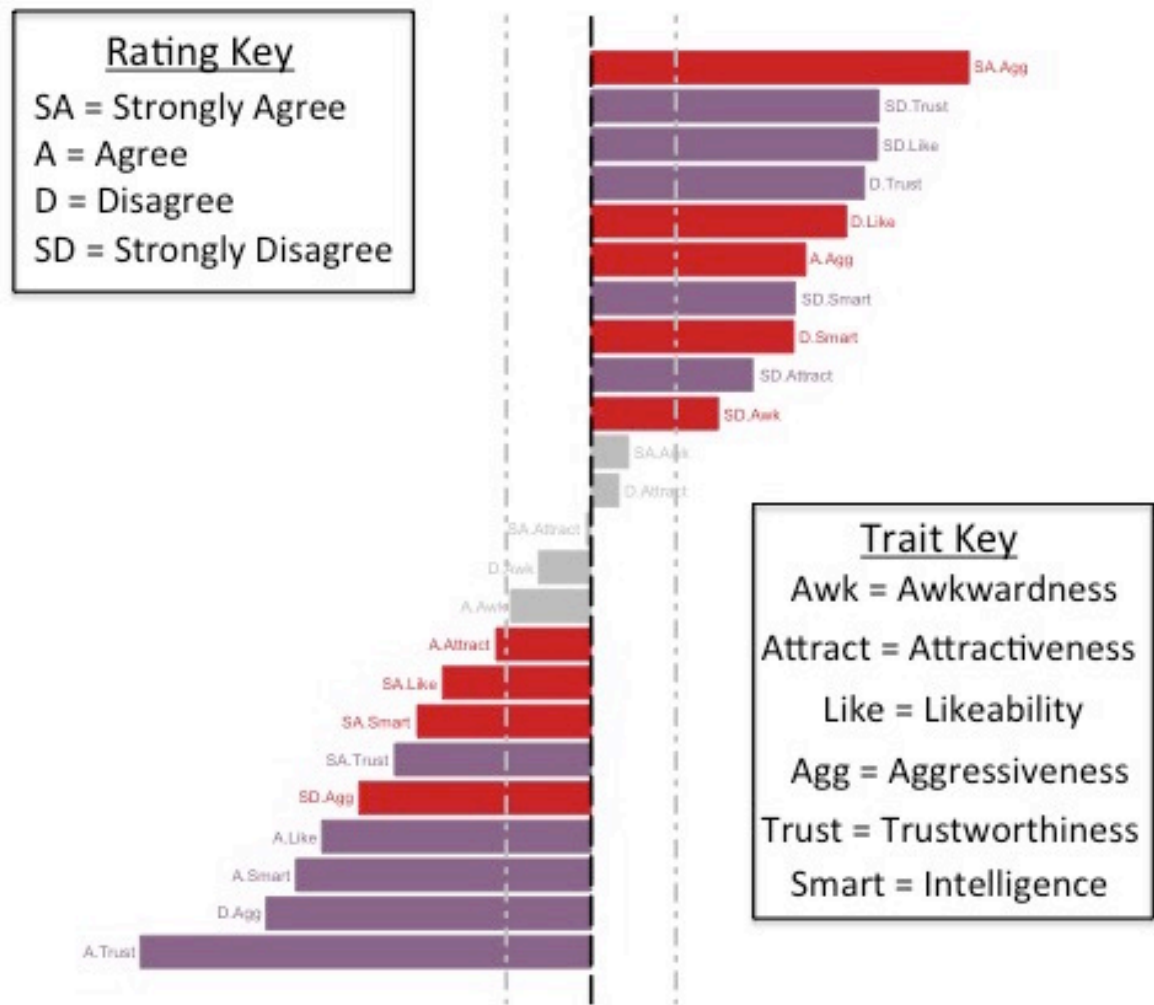


Figure 12. Bootstrapped Ratios of Transcript Trait Ratings on Component 1

Note: Ratings that cross the significance threshold of $p=.001$ indicated by the dashed line are colored, nonsignificant ratings are in gray. Purple bars indicate ratings solely contribute to component 1, red indicates significant contributions to both components

Bootstrap Ratios Component: 2

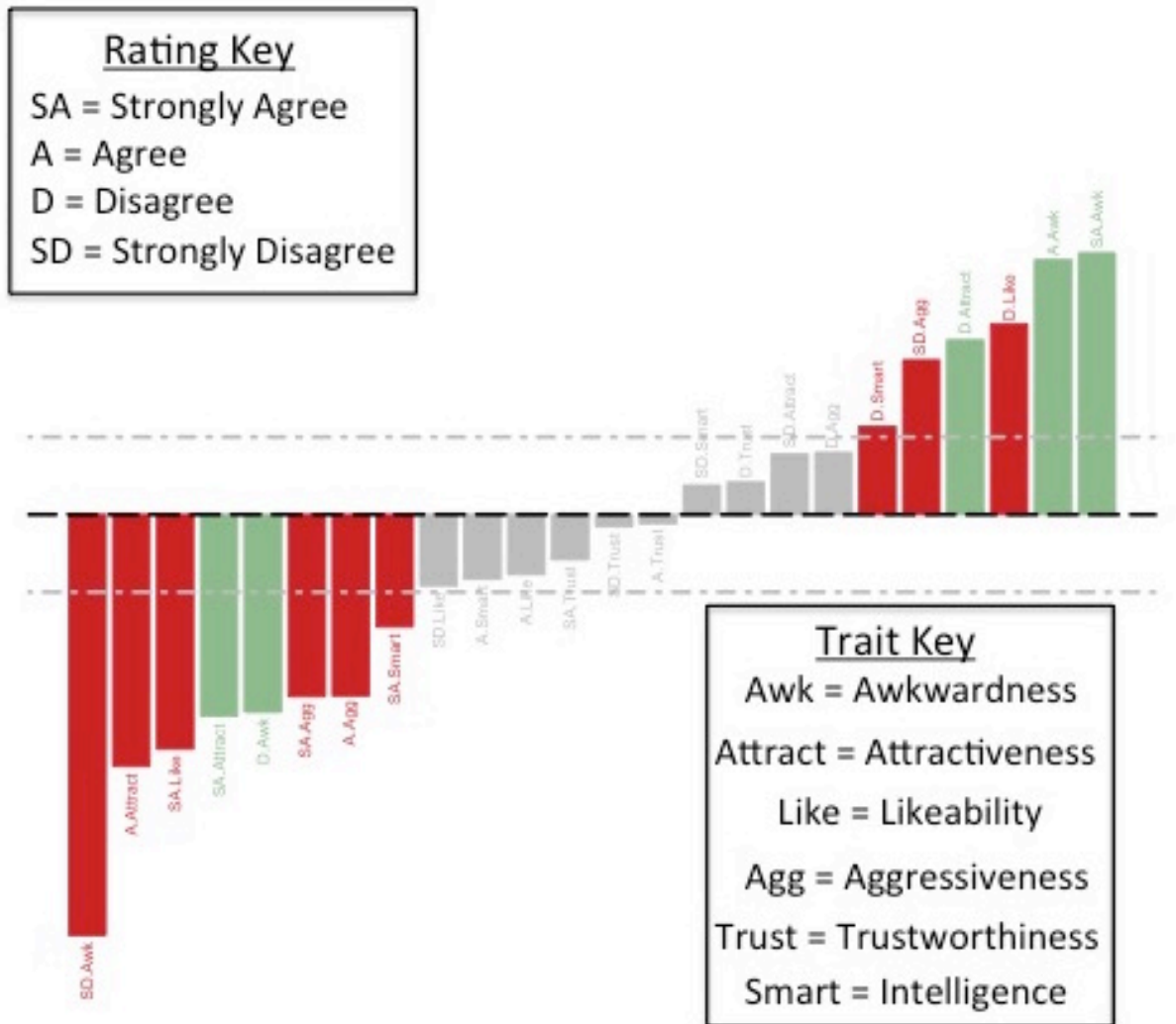


Figure 13. Bootstrapped Ratios of Transcript Trait Ratings on Component 2

Note: Ratings that cross the significance threshold of $p=.001$ indicated by the dashed line are colored, nonsignificant ratings are in gray. Green bars indicate ratings solely contribute to component 2, red indicates significant contributions to both components

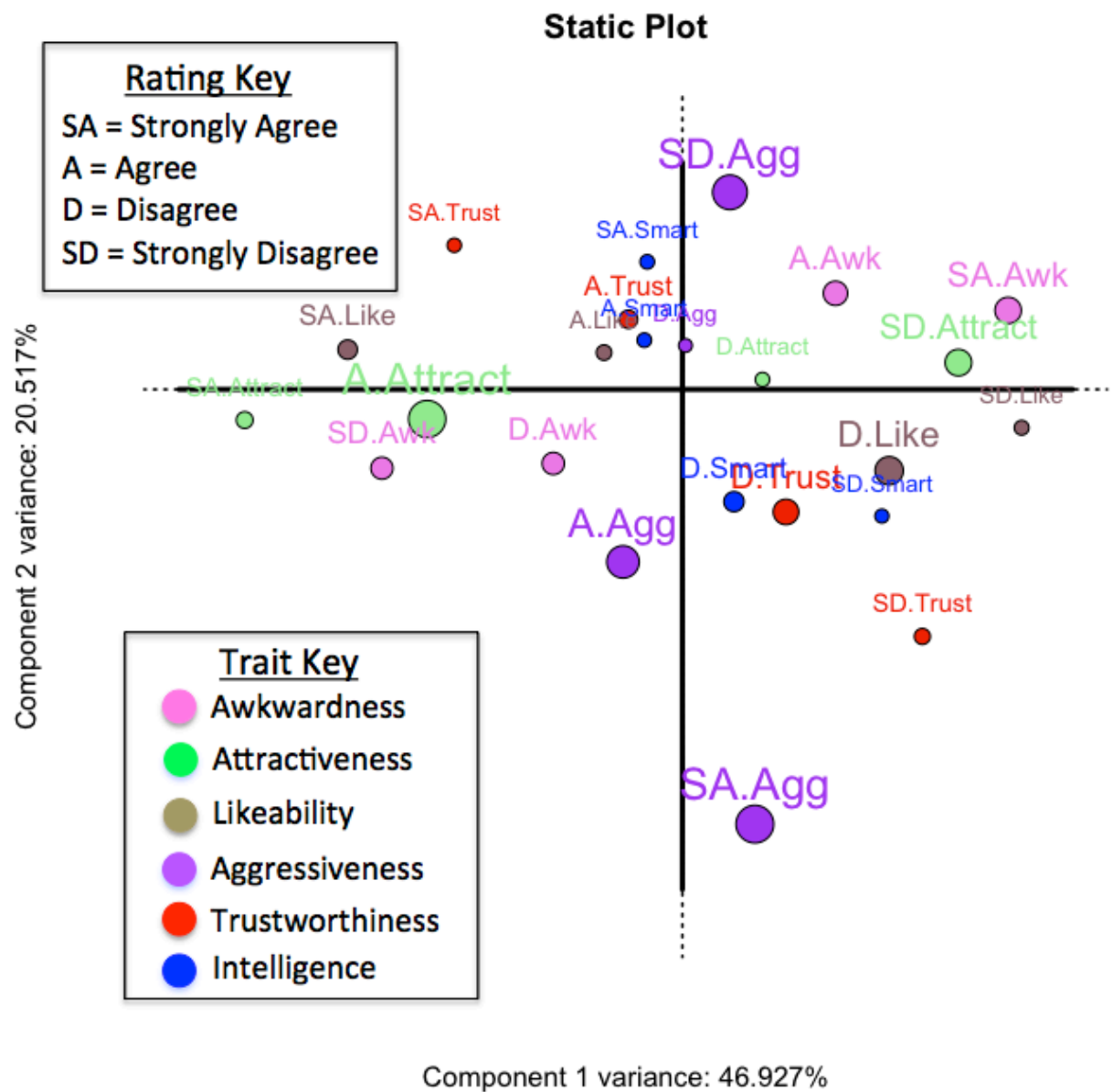


Figure 14. Correspondence Analysis plot of factor scores of traits for the Static modality

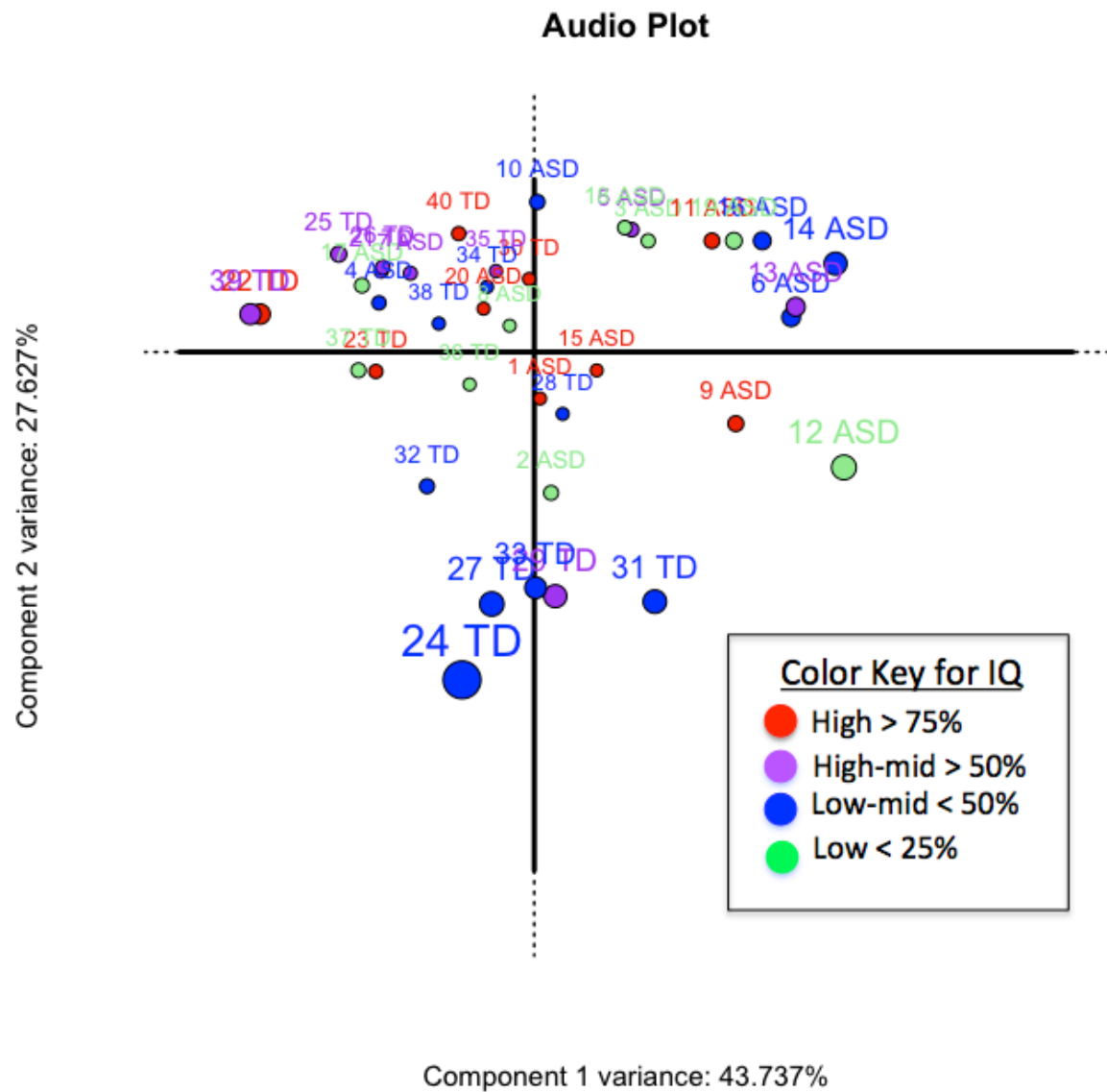


Figure 15. IQ projected in the Correspondence Analysis plot of model factor scores for the Audio modality

Note: Colors represent quartiles of distribution of IQ scores

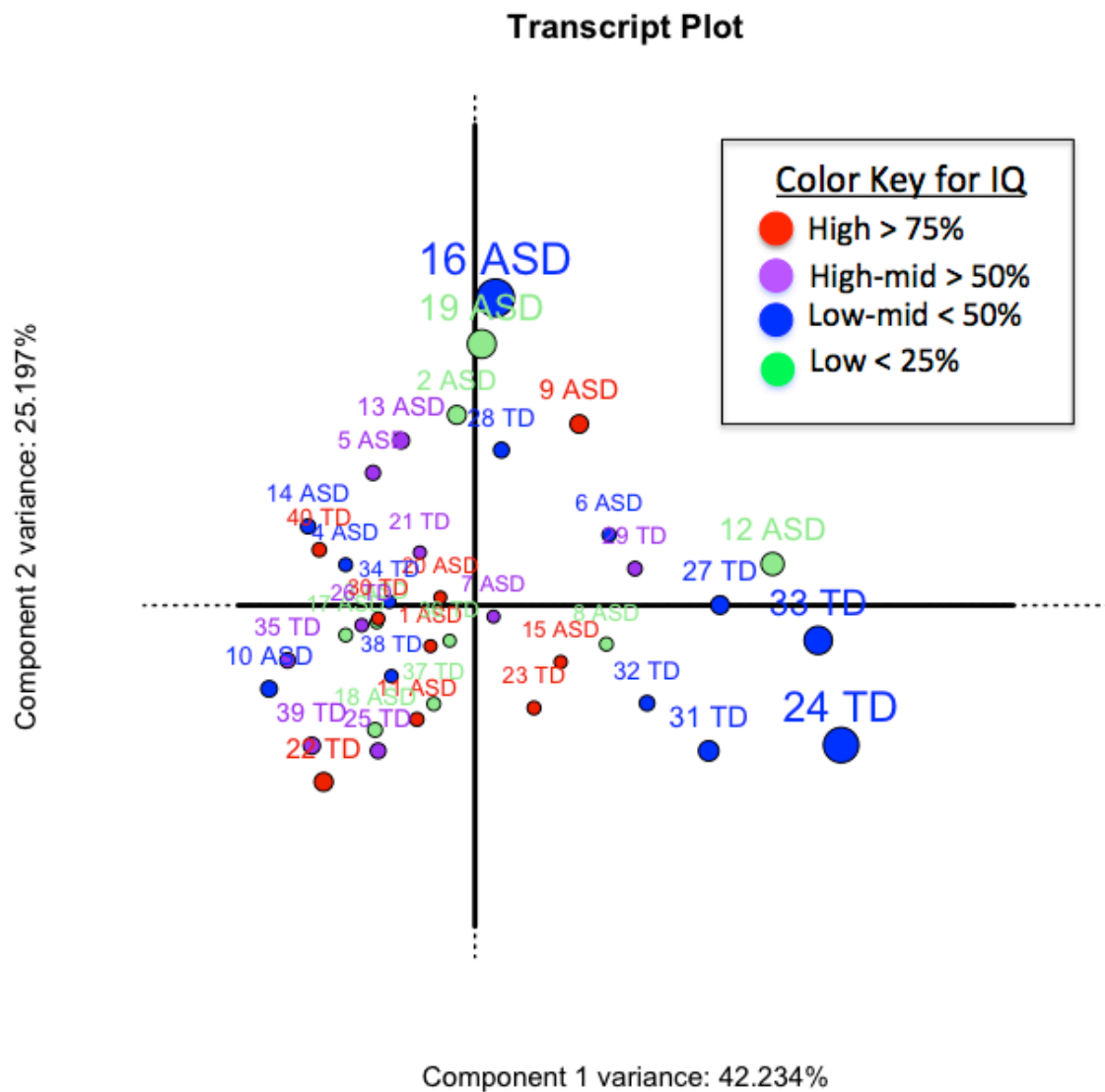


Figure 16. IQ projected in the Correspondence Analysis plot of model factor scores for the Transcript modality

Note: Colors represent quartiles of distribution of IQ scores

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BIOGRAPHICAL SKETCH

Daniel Faso is completing his doctorate in Psychological Sciences from The University of Texas at Dallas. Mr. Faso is involved with a number of professional and student organizations including Psi Chi, the International Society for Autism Research, and he is the current President of the Society for Applied Multivariate Research.

Throughout his research and professional career, Daniel has been involved with individuals diagnosed with an Autism Spectrum Disorder and their families. During his undergraduate training at The University of Texas at Austin, Daniel worked with children, adolescents, and adults across the spectrum to promote social skills development within various settings. After graduating from UT with honors in 2011, Daniel was accepted into the PhD program at UTD where he began working with Dr. Noah Sasson. At this time, he formed a relationship with a local nonprofit, which guided his research career to focus more specifically on the experiences of adults diagnosed with ASD. Daniel has conducted a myriad of impactful research projects with original work published within some of the leading autism-focused scientific outlets; including *Autism*, *Journal for Autism and Developmental Disorders*, *Autism Research*, and *Research in Autism Spectrum Disorders*.

Outside of academics, Daniel has strong personal ties with the local community. He was born and raised in Allen, TX, went to high school at Jesuit in Dallas, and is now living in Addison with his loving wife. He currently holds a position as the Director of Program Engagement at nonPareil Institute.

CURRICULUM VITAE

DANIEL FASO

Education

2011-present; Ph.D, Psychological Sciences, School of Behavioral and Brain Sciences, The University of Texas at Dallas. Mentor: Noah J. Sasson, Ph.D. (Expected Graduation: 2016)

2011 – 2014; M.S. Applied Cognition and Neuroscience, School of Behavioral and Brain Sciences, The University of Texas at Dallas.

2007 – 2011; B.A. (Departmental Honors) Psychology, The University of Texas at Austin.

Achievements in Original Investigation

Articles in Refereed Journals

- Faso, D. J.,** Corretti, C. A., Ackerman, R. A., & Sasson, N. J. (2015). The Broad Autism Phenotype Predicts Relationship Outcomes in Newly Formed College Roommates. *Autism*, 1-13.
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Refereed Conference Symposium, Workshops and Poster Presentations

Faso, D. J., et al. (2016). Evaluating people's first impressions of adults with Autism using correspondence analysis. Presented at the Southwestern Psychological Association Conference for the Society for Applied Multivariate Research, Dallas, Texas

Faso, D.J., Morrison, K.E., & Sasson, N.J. (2016) How Social Others Form First Impressions of Adults with Autism Spectrum Disorder. Poster presented at the International Meeting for Autism Research, Baltimore, Maryland.

Chambers, L., Morrison, K.E., **Faso, D. J.,** & Sasson, N.J. (2016). The Content and Function of Interests in the Broad Autism Phenotype. Poster presented at the International Meeting for Autism Research, Baltimore, Maryland.

Chambers, L., Morrison, K.E., **Faso, D. J.,** & Sasson, N.J. (2016). Interests for individuals with and without the Broah Autism Phenotype. Poster presented at the Southwestern Psychological Association Conference, Dallas, Texas

Faso, D. J., Sasson, N. J., Corretti, C. A., & Ackerman, R. (2015) The Broad Autism Phenotype Predicts Relationship Outcomes in Previously Unfamiliar College Roommates. Poster presented at the International Meeting For Autism Research, Salt Lake City, Utah.

Morrison, K. E., Shasteen, J. R., **Faso, D. J.,** Pinkham, A. E., & Sasson, N. J. (2015) Context Effects on Facial Affect Recognition in Autism and Schizophrenia. Poster presented at the International Meeting For Autism Research, Salt Lake City, Utah.

Hubbard, D. J., **Faso, D. J.,** Sasson, N. J., & Assmann, P. F. (2015) Affective Prosody Production in Autistic and Typically Developed Adult Males. Poster presented at the Acoustical Society of America, Pittsburgh, Pennsylvania.

Faso, D. J., Beaton, D. (2015). Complementary and Alternative Approaches to p-values: Intervals, Effect Sizes, and Practical Advice. Workshop hosted by the Society for Applied Multivariate Research at the Southwest Psychological Association, Wichita, Kansas.

Beaton, D., **Faso, D. J.,** Sasson, N., Abdi, H. (2015) An Introduction to Permutation & Bootstrap Resampling. Workshop hosted by the Society for Applied Multivariate Research at the Southwest Psychological Association, Wichita, Kansas.

Carson, K. J., Corretti, C. A., **Faso, D. J.,** Ackerman, R. (2015). Consequences of Ignoring Nonindependence in Dyadic Data: An Illustration with Roommate Dyads. Poster presented at the Southwestern Psychological Association, Wichita, Kansas.

Faso, D. J., Sasson, N. J., & Pinkham, A. E. (2014). Evaluating Posed and Evoked Facial Expressions of Emotion from Adults with Autism Spectrum Disorder. Poster presented at the International Meeting for Autism Research, Atlanta, Georgia.

Sasson, N. J., Pinkham, A. E., **Faso, D. J.**, Simpson, C. & Kelsven, S. (2014). Comparing Social Cognitive Profiles of Autism and Schizophrenia. Poster presented at the International Meeting for Autism Research, Atlanta, Georgia.

Faso, D., Beaton, D., Sasson, N., & Abdi, H. (2014). An Introduction to ANOVA in R. Workshop hosted at the Southwest Psychological Association, San Antonio, Texas.

Faso, D. J., Sasson, N. J., & Pinkham, A. E. (2013). Recognizing Posed and Evoked Facial Expressions from Adults with Autism Spectrum Disorder. Poster presented at the Texas Autism Research Conference, San Marcos, Texas.

Faso, D. J., Beaton, D., Abdi, H., Sasson, N., & Pinkham, A. (2013). Distinct Visual Attention Patterns in Clinical Populations Identified by Partial Least Squares. Poster presented at the Southwestern Psychological Association, Fort Worth, Texas.

Faso, D. J., Neal-Beevers, A. R., & Carlson, C. L. (2012) Vicarious Futurity, Hope, and Well-Being in Parents of Children with Autism. Poser presented at The International Meeting for Autism Research, Toronto, Canada.

Sasson, N. J., **Faso, D. J.**, Langleben, D. D., & Gur, R. C. (2012). Individuals with Autism Exhibit Reduced Sensitivity to Infant Cuteness. Poster presented at the International Meeting for Autism Research, Toronto, Canada.

Faso, D. J., Neal-Beevers, A. R., & Carlson, C. L., (2011). Relationship between Hope and Marital Functioning Among Parents of Children with Autism. Poster presented at The National Conference for Undergraduate Research, Ithaca, New York.

Research Presentations

The Broad Autism Phenotype and Roommate Relationships. (September, 2014).

Developmental, Cognitive and Social/Personality Brownbag Series, School of Behavioral and Brain Sciences, Dallas, Texas

An Introduction to ANOVA in R. (March, 2014). Developmental, Cognitive and Social/Personality Brownbag Series, School of Behavioral and Brain Sciences, Dallas, Texas

Recognizing Posed and Evoked Facial Expressions rom Adults with Autism Spectrum Disorder. (December, 2013). Social Cognition and Schizophrenia Lab, Southern Methodist University, Dallas, Texas

Recognizing Posed and Evoked Facial Expressions from Adults with Autism Spectrum Disorder. (October, 2013) Developmental, Cognitive and Social/Personality Brownbag Series, School of Behavioral and Brain Sciences, Dallas, Texas

Investigating Abnormalities in Social Cognition and Social Reward in Adults with Autism. (May, 2012). Friday Language and Speech Hearing (FLASH) Series, Callier Center for Communication Disorders, Dallas, Texas

PROFESSIONAL MEMBERSHIPS

President 2014-Present; Society for Applied Multivariate Research (SAMR)
Member 2012-Present; International Society for Autism Research
Member 2013-Present; Southwestern Psychological Association
Member 2008-Present; Psi-Chi Honors Society

SERVICE

Editorial Experience

Ad Hoc Peer Reviewer

Research in Autism Spectrum Disorders

Research in Intellectual and Developmental Disorders

TEACHING EXPERIENCE

Course Instructor – The University of Texas at Dallas

<u>Date</u>	<u>Course</u>	<u>Enrolled</u>	<u>Instr Eval</u>
2016, Fall	PSY 3392 Research Design and Analysis	70	N/A
2014, Summer	PSY 3392 Research Design and Analysis	22	4.78/5.00

Teaching Assistant – The University of Texas at Dallas

2014, Fall	PSY 3392 Research Design and Analysis
2014, Spring	PSY 3392 Research Design and Analysis
2013, Fall	PSY 3392 Research Design and Analysis
2013, Summer	PSY 2301 Introduction to Psychology
2013, Spring	PSY 3392 Research Design and Analysis
2012, Fall	PSY 3392 Research Design and Analysis
2012, Summer	PSY 2317 Statistics for Psychology
2012, Spring	PSY 3392 Research Design and Analysis
2011, Fall	PSY 2301 Introduction to Psychology