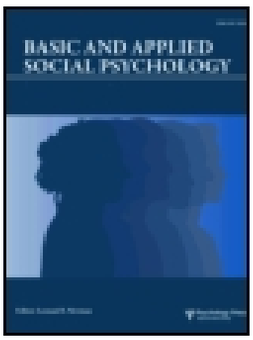

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ABSTRACT

This study examined neurotypical university students' ($n = 116$) perceptions of and behavior toward student confederates they believed to have autism spectrum disorder (ASD) or not. Confederates were labeled by membership in an ASD student organization, behavior stereotypical of ASD, both, or neither. Perceptions of the confederate, verbal and non-verbal behavior toward the confederate, and explicit and implicit attitudes toward individuals with autism were measured. Confederates depicting ASD behaviors were perceived more negatively than confederates who depicted neurotypical behaviors. Participants smiled less at confederates who depicted ASD behaviors than those who did not. Explicit attitudes toward autism were not associated with verbal or non-verbal behavior while implicit attitudes predicted some non-verbal behavior but only in specific combinations of labels and behavior.

According to the latest Center for Disease Control estimate, approximately 1 in 59 children in the United States is diagnosed with autism spectrum disorder (ASD) (Centers for Disease Control and Prevention, 2018). More young adults diagnosed with ASD are attending university than ever before, likely due to increased supports for children and adolescents with ASD in K-12 as well as programs funded by the U.S. Department of Education to facilitate the transition from high school to college for individuals with disabilities. For young adults with ASD, attending university is associated with increases in self-esteem, employment, and personal skills (Hart et al., 2010). While university enrollment offers important opportunities for the ASD population, it also presents a unique set of challenges, contributing to high dropout rates and academic failure (White et al., 2011). Indeed, only 30% of individuals with ASD attend some form of college—less than half the rate in the general population—and fewer yet successfully complete their degree (Newman et al., 2011; Roux et al., 2015; U.S. Census Bureau, 2019). Understanding the challenges that young adults with ASD face in the university environment is of critical importance (Adreon & Durocher, 2007; Gelbar et al., 2014; Neville & White, 2011).

Some of the challenges faced by university students with ASD are in the social domain. Because ASD is typified by communication delays, impaired social skills, and repetitive behaviors, young adults with ASD may have difficulty engaging in reciprocal social interactions, particularly those that involve non-verbal communication (American Psychiatric Association, 2013). Although most students with ASD report wanting to form friendships and romantic relationships in college, many struggle to maintain long-term relationships (Adreon & Durocher, 2007; Howlin et al., 2004; Jobe & White, 2007). Individuals with ASD have higher rates of social exclusion than their neurotypical peers (Jobe & White, 2007; Welkowitz & Baker, 2005; White et al., 2011), which is likely driven at least in part by the perception of neurotypical individuals that their peers with ASD are awkward, rude, or socially undesirable (Adreon & Durocher, 2007). At university, misconceptions by students' peers about autism can lead to stigmatization and exclusion of students with ASD (Gobbo & Shmulsky, 2014; Schindler et al., 2015; Wenzel & Brown, 2014). As such, examining judgments about and attitudes toward college students with ASD is critical to understand ways in which individuals with autism may be disadvantaged.

Research examining the perception of individuals with ASD suggests that neurotypical adults and adolescents perceive individuals with ASD more negatively (e.g., more awkward, less likeable) and are less willing to engage with them during a first impression (Grossman, 2015; Sasson et al., 2017; Sasson & Morrison, 2019). One factor that may affect these

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Supplemental data for this article can be accessed at publisher's website.

perceptions, however, is whether perceivers are aware that they are evaluating a person with autism. Indeed, research shows that perceptions of individuals with ASD are more positive if these individuals are labeled as being autistic (Matthews et al., 2015; Sasson & Morrison, 2019; but see Butler & Gillis, 2011). This more positive evaluation may be due to perceivers having a reason for their perceptions of atypical social behaviors (Matthews et al., 2015).

These previous studies used vignettes in which participants read about individuals with autism or videos in which participants watched a short segment of individuals with autism. While these studies revealed important information about perceptions of individuals with autism, it is important to examine more ecologically valid scenarios as well. That is, having dynamic face-to-face interactions with a peer displaying behaviors that may be considered awkward, rude, or socially undesirable (Adreon & Durocher, 2007) is a different experience than reading a vignette or watching a video interview about a person with autism. Thus, examining interactions that are more naturalistic may be more accurate at assessing perceptions and behavior during a real-world situation. The present study also included assessments of the behaviors that participants engaged in during an interaction with an individual they believed to have ASD and/or who depicted behaviors consistent with autism, in order to better understand the behaviors that may contribute to the social exclusion of individuals with autism (Jobe & White, 2007; Welkowitz & Baker, 2005; White et al., 2011). Previous research has not measured participants' behaviors in interactions with individuals displaying behaviors consistent with ASD. The current study examined neurotypical college students' face-to-face interactions with a confederate they believed to be autistic or neurotypical. As previous research has demonstrated that labeling an individual as autistic can improve perceptions, we subtly manipulated information given to the participants that suggested whether the confederate was autistic. In addition to examining perceptions of confederates with ASD, we also examined direct and unconscious discrimination which were measured using verbal (e.g., friendliness) and non-verbal (e.g., eye contact) measures of behavior, respectively (Darley & Fazio, 1980). These measures were taken from social psychological research on racial discrimination (Dovidio et al., 2002; McConnell & Leibold, 2001). A diagnosis of ASD was indicated in one or both of the following ways: by behavior stereotypical of ASD, and/or by an ASD label. By examining the relationship between label and interaction behavior under both circumstances, the study aimed to isolate the effects of labeling a peer confederate as having ASD, as opposed to a peer confederate acting in a manner consistent with an ASD diagnosis. We hypothesized that labeling the confederate as autistic would lead participants to act in a more positive manner toward the confederate compared with when the label did not indicate that the confederate was autistic, particularly in the condition when the behavior was consistent with ASD (Matthews et al., 2015; Sasson & Morrison, 2019).

Another goal of the current study was to examine predictors of the judgments of and behaviors toward these targets. Social psychological research examining discrimination on the basis of social categories such as race has demonstrated that there are two types of attitudes that predict judgments and behavior: explicit and implicit. Explicit attitudes reflect those of which an individual is aware, whereas implicit attitudes are not held consciously (Dovidio et al., 1997; Greenwald & Banaji, 1995). Explicit and implicit attitudes are thought to represent separate constructs (e.g., Dickter et al., 2020; Dovidio et al., 1997; Fazio et al., 1995; Thomas et al., 2007) and therefore affect different types of behavior, with explicit attitudes predicting behaviors that are to some degree within conscious control, including verbal behavior, and implicit attitudes predicting behaviors that are not consciously registered, such as nonverbal behaviors (Dovidio et al., 1997, 2002). As such, in the current study, it was expected that participants' explicit attitudes would predict their verbal behaviors and that their implicit attitudes would predict their non-verbal behaviors.

Method

Participants

The participants for this study were 152 undergraduate students from a medium-sized Southeastern university. All participants were required to be at least 18 years of age. Participants were recruited through the university's online research participation system and were compensated with course credit for their participation. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional Protection of Human Subjects Committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Figure 1. Screenshots of example trials in the Implicit Association Test used in the current study.

Materials

Activities list

To study whether the suggestion of an ASD diagnosis in an interaction partner affects an individual's behavior, two lists of organizations in which their interaction partner was purportedly involved were created, one reflecting the ASD Label condition and the other reflecting the neurotypical control condition. The control list included three organizations chosen in a pilot test for neutral "popularity" and "sociability" connotations by 37 students—Bike Alliance, Innovation and Design Thinking Club, and Colleges Against Cancer—while the ASD list included these three organizations, with the addition of an Autistic Student Association (ASA). In a second pilot test, 32 students were given either a list of four activities including the ASA or one not including the ASA, told that the list represented a student, and asked to rate the likelihood that the student had autism. Lists including the ASA ($M = 3.84$, $SD = .16$) were associated with a higher likelihood of the target being rated as autistic than those without it ($M = 2.78$, $SD = .24$), Cohen's $d = 0.20$.

Societal Attitudes Toward Autism Scale (SATA)

Developed by Flood et al. (2013), this inventory was designed to measure explicit attitudes toward individuals with ASD. The scale includes 16 items, such as "People with autism should not engage in romantic relationships." Participants were asked to respond to these items with *Strongly Disagree, Disagree, Agree,* or *Strongly Agree.* Reliability was acceptable ($\alpha = .79$). Item scores were summed, and a higher score indicated more positive explicit attitude.

Implicit Association Test (IAT)

To measure participants' implicit associations with individuals with ASD, this study employed an IAT created by Greenwald et al. (1998) and modified by Dickter et al. (2020). The autism IAT is a reaction time task where participants categorize stimulus words into superordinate categories in different blocks. For each trial, stimulus words appeared in the middle of a computer screen with response categories presented in the top right and top left portions of the screen, as detailed below and depicted in Figure 1. As specified by Greenwald et al. (1998), the first two blocks consisted of 20 trials each. In Block 1, participants categorized stimulus words associated with autism (i.e., different, challenged, special, dependent, impaired, disabled) and stimulus words associated with neurotypicality (i.e., normal, extroverted, functional, typical, independent, social) into the response categories "autistic" and "neurotypical," respectively. Each response category was mapped onto a response key on a keyboard and for each trial, participants pressed a key to indicate to which response category the stimulus word belonged. In Block 2, participants categorized positive (i.e., marvelous, superb, pleasure, joyful, beautiful, glorious) and negative (i.e., horrible, awful, tragic, agony, painful, terrible) stimulus words into the response categories "good" and "bad," respectively. For each trial, participants pressed one key on a keyboard for the response category "good" and one for "bad." In Blocks 3 and 4, participants grouped all stimulus words from the four groups (i.e., autistic, neurotypical, good, bad) into new paired response categories (i.e., "good/neurotypical," "bad/autistic," "bad/neurotypical," and "good/autistic"). Two of these new response categories were displayed at the top right and left portions of the screen for Blocks 3 and 4: half of the participants were randomly assigned to have "good/neurotypical" and "bad/autistic" as the two response options and half were randomly assigned to use "bad/neurotypical" and "good/autistic" as the response options. Block 3 had 20 trials and Block 4 had 40 trials. In Block 5, the response keys for "bad" and "good" switched sides on the screen, requiring participants to change their responses, and participants completed 40 trials with this new association, only categorizing negative and positive words into the "bad" and "good" categories, respectively; the "autistic" and "neurotypical" categories and words did not appear in Block 5. Two final blocks required participants to group all stimulus words into the paired response categories; the pairing was the opposite of those in Blocks 3 and 4. That is, for participants randomly assigned to have "good/neurotypical" and "bad/autistic" as the two response categories

in Blocks 3 and 4, they now had "bad/neurotypical" and "good/autistic" as the response categories in Blocks 6 and 7 (and vice versa for the other half of the participants). Block 6 had 20 trials and Block 7 had 40 trials. For each trial, the stimulus words appeared until participants responded by indicating to which paired response category the word belonged. If they responded incorrectly, a red "X" appeared on the screen until they made the correct response. After participants made a correct response, there was a 250 ms inter-trial interval. An IAT score closer to zero represented neutral associations with autism, while a higher positive score represented greater implicit bias against individuals with autism.

Social Perception

The Social Implication Scale (SIS), created by Montepare et al. (2014), was used to evaluate the confederate's social interaction potential. The measure contained nine items (e.g., "I would avoid this person"; "This person is a poor listener"), scored on a 7-point scale with endpoints of "strongly disagree" and "strongly agree" (Montepare et al., 2014). Reliability was acceptable ($\alpha = .79$). Item scores were averaged, and a higher score indicated more positive ratings of social interaction potential.

Autistic Trait Assessment

This measure was created to serve as a manipulation check for the behavior variable to ensure that participants were evaluating the confederates in the ASD behavior condition as having more autistic behaviors than in the control condition. This measure was designed from a pilot test from a mass testing survey conducted in Introduction to Psychology courses at the institution where the current study was conducted. In this survey, 1834 undergraduate students were asked, "What behaviors do you think are characteristic of an autistic college student?" Three research assistants coded participants' open-ended responses into 13 categories that captured the range of responses. Participants in the current study rated 13 statements derived from these 13 categories about their partner on a 7-point scale with endpoints of "strongly disagree" and "strongly agree" (e.g., "My partner exhibited poor communication"; "My partner exhibited low sociability"). Reliability in our study was acceptable ($\alpha = .74$). Item scores were averaged, and a higher score indicated more perceived autistic traits.

Procedure

Because prior research has found that completing an IAT or measures of explicit bias might influence behavior during an interaction, we separated the study into two sessions (Dovidio et al., 2002; McConnell & Leibold, 2001). Upon arriving to the lab for Session 1 and giving their informed consent, participants completed the SATA, administered using Qualtrics (www.qualtrics.com). Next, participants completed the Autism IAT using Inquisit software (www.millisecond.com). Once participants finished the IAT, they were debriefed on Session 1, and scheduled to return to the lab one to two weeks later for Session 2 of the study.

For Session 2, participants were assigned to one of four conditions: ASD Behavior/ASD Label, ASD Behavior/Neurotypical Label, Neurotypical Behavior/ASD Label, and Neurotypical Behavior/Neurotypical Label. Once again, they provided their informed consent. Participants were given a piece of paper and asked to write down a list of on-campus organizations or activities in which they were involved. The researcher said that they would give the participant's list to another college student participant, and that they would in turn be receiving a list of their fellow participant's on-campus activities. The other participant's list, however, was one of two lists created by the researcher. Half of the participants were randomly assigned to receive a list suggestive of an ASD diagnosis (i.e., contained Autistic Student Association), while the other half were assigned to receive the control list.

The next stage of the session was an interaction between the participant and a confederate. Two male student neurotypical actors, matched for race, were recruited through the university's theater department to serve as the confederates. Both actors had close family members with autism. Each confederate was used for approximately half of the participants. The following prompt, chosen by Dovidio and colleagues (1997) for its neutrality with respect to the topic of study and its relevance to university students, was used to facilitate an interaction between the participant and a confederate: "First-year college students often bring more than they need to college. Please identify three or four things that are most essential for first-year students to bring, as well as three or four things that first-year students are most likely to bring to college and do not need" (Dovidio et al., 1997, p. 527). Participants were given three minutes to discuss this prompt with the confederate.

Each confederate portrayed either ASD or neurotypical behavior, depending on the participant's assigned condition. To ensure that this behavior was

reflective of common behaviors in individuals with ASD, the confederate was shown video interviews of university students with ASD, and informed of common behaviors associated with this diagnosis. The training session also included sensitivity training so that the neurotypical confederates could portray a student with ASD in a respectful way. Some behaviors the confederate used to portray the ASD condition included a lack of eye contact with the participant and perseverating in talking about his bicycle. In the NT condition, the confederate was trained to let the participant lead the interaction, supplying natural and engaged responses, but not initiating conversation. In both conditions, the confederate gave the same responses to the discussion prompt, including talking about his bike, the importance of bringing bed sheets to college, and the lack of need to bring furniture.

Video cameras were pointed at the confederate and the participant during the interaction. The participant and confederate sat across from one another. The researcher handed the participant and confederate hard copies of the prompt, told them they would have three minutes to discuss it, notified them that their interaction would be videotaped, and then left. After three minutes, the researcher returned and brought the participant back to the room where they began the study, in order to complete a series of post-interaction assessments.

At this point, participants completed the SIS and the Autistic Trait Assessment. They also indicated whether they had a family member with ASD and provided some demographic information. They were also asked to indicate whether they knew the confederate. Following the completion of those measures, the participant was debriefed and then dismissed. As part of the debriefing procedure, students were asked if they knew the purpose of the study, and also asked whether they believed that the confederate was actually another student participant.

Behavioral coding

Following previous research that examined non-verbal and verbal behaviors during potentially racially prejudiced interactions (Dovidio et al., 2002; McConnell & Leibold, 2001), three trained undergraduate research assistants rated the participants' interaction behavior along non-verbal measures and verbal measures. When coding non-verbal behaviors, the judges watched a video of the interaction without sound. On a 9-point scale, they rated the participant's amount of eye contact (1 = *No Eye Contact,* 9 = *Eye Contact the Entire Interaction*) and on 5-point scales, they rated the participant's forward body lean (1 = *Leaning Away*, 5 = *Leaning Forward*). The judges also recorded the number of times the participant smiled.

When coding verbal behaviors, the judges listened to an audio recording of the interaction, and were not given access to the video. On 9-point, scales they rated the participant's friendliness (1 = *Very Unfriendly*, 9 = *Very Friendly*), abruptness (1 = *Very Abrupt,* 9 = *Not Abrupt*), and warmth (1 = *Very Cold*, 9 = *Very Warm*). The judges also recorded the number of speech errors/hesitations the participant made during the interaction (e.g., "um," "uh," "well,").

Results

Of the 152 participants, data from 116 (51 male, 64 female, 1 "other" participants, $M_{age} = 18.95$, $SD = 1.03$) were included in the analyses below. The rest of the participants were excluded for knowing the confederate outside of the study ($n = 11$), knowing the person they interacted with was an actor ($n = 10$), participant error ($n = 1$), or researcher error ($n = 10$). Four additional participants declined to allow their data to be used so they are not included in the analyses. Standards for interpreting η_p^2 effect sizes were based on Miles and Shevlin (2001) recommendation of small=.01, medium=.06, large=.14, as well as previous literature (Thompson, 2007) examining non-verbal and verbal interactions between individuals of the same versus different social groups (η_p^2 effect sizes between .03 and .14; e.g., Avery et al., 2009; Bergsieker et al., 2010).

Manipulation check for ASD traits in confederate

The Autistic Trait Assessment measure was normally distributed with a mean of 3.45 ($SD = 0.70$, range 1.92–4.92). Participants in the ASD Behavior condition ($M = 3.81$, $SD = 0.61$) gave their interaction partners higher Autistic Trait Assessment scores than participants in the NT Behavior condition ($M = 3.13$, $SE = 0.62$), $\eta_p^2 = .234$.

Descriptive statistics for explicit and implicit attitude measures

The SATA had a mean of 3.43 ($SD = 0.36$, range 2.19–4.00). The IAT scores were calculated based on Greenwald et al. (2003) revised method. The IAT had a mean score of 0.50 ($SD = 0.48$, range −1.12–1.42), which was larger than 0, Cohen's $d = 1.04$. This difference suggests an overall implicit bias against individuals with autism.

Table 1. Correlations among variables.

	1	2	3	4
1. Implicit Association Test	–			
2. Societal Attitudes Toward Autism	−.19	–		
3. Social Perception (SIS)	−.05	.25	–	
4. Autistic Trait Assessment	.12	−.27	−.43	–

Note. Numbers represent correlation coefficients.

Correlations among variables

Correlation analyses revealed that there was a small correlation between IAT and SATA, between the SATA and SIS, and between SATA and Autistic Trait Assessment (Table 1). The correlation between SIS and Autistic Trait Assessment yielded a medium effect size, suggesting that the greater number of autistic traits participants perceived the confederate to have, the more negative social perception they had of the confederate.

Social perception of the confederate

To examine the effects of behavior, club, implicit bias, and explicit bias on perception of the confederate, as measured by the SIS, an analysis of variance (ANOVA) was conducted to predict each behavior from the categorical variables Club and Behavior and from the continuous variables explicit bias (SATA) and implicit bias (IAT). The model was set up to examine main effects as well as interactions between the independent variables. The data were normally distributed in each of the between-subjects groups, as depicted in Supplementary Material (Shapiro–Wilks for each condition $>$ .95). Analyses revealed that the effect sizes for SATA, IAT, Club, and their interaction terms were trivial, $\eta_p^2 < .02$. There was, however, a medium effect of Behavior, such that being in the ASD Behavior condition (M = 4.66, SD = 0.10) led to more negative perceptions of the confederate than those in the NT Behavior condition (M = 5.28, SD = 0.09), $\eta_p^2 = .166$.

Behavior data

Data analysis strategy

Following the coding procedure described above, each verbal and nonverbal interaction behavior score was standardized and assessed for inter-rater reliability. The Warmth variable was excluded from analysis for having poor inter-rater reliability ($\alpha = .44$), but the other variables had acceptable reliability ($\alpha > .70$) (Liao et al., 2010; Pantzare, 2015). Moreover, the camera malfunctioned for six participants; thus, the below analyses exclude these participants. ANOVAs were conducted to predict each behavior from the categorical variables Behavior and Club and the continuous variables explicit bias (SATA) and implicit bias (IAT). The model was set up to examine main effects and interactions between the independent variables. In analyses that yielded at least a small effect size, estimated locations based on mean, standard deviation, and skewness were calculated. Means, standard deviations, skewness, kurtosis, and estimates for shape, scale, and location for each experimental condition are reported in Tables 2 and 3. Correlations between the bias variables and verbal and non-verbal behavior for all conditions are reported in Tables 4 and 5.

Non-verbal behavior

For Body Positioning ($\alpha = .76$), the IAT × Behavior × Club interaction yielded a medium effect size, $\eta_p^2 = .10$. In breaking down this interaction, there was a correlation between IAT and Body Positioning (Table 4). In the ASD Behavior/NT Club condition, participants with more implicit bias were more likely to lean toward the confederate. In the ASD Behavior/ASD Club condition, participants with more implicit bias were more likely to lean away from the confederate.

For Number of Smiles ($\alpha = .90$), the main effect of Behavior yielded a medium effect size, with participants smiling less in the ASD Behavior condition (M = −0.33, SD = 0.94, estimated location = −1.59) than in the NT Behavior condition (M = 0.33, SD = 0.88, estimated location = −0.68), $\eta_p^2 = .12$. The IAT × Club interaction yielded a small effect size, $\eta_p^2 = .04$. There was a positive correlation between IAT and Smiles in the NT Behavior/ASD Club condition (Table 4).

For Eye Contact ($\alpha = .77$), there were negligible effect sizes for all main effects and conditions ($\eta_p^2 < .01$) except for a small effect for the SATA × Behavior × Club interaction, $\eta_p^2 = .04$. Within this interaction there was a correlation between eye contact and explicit bias but only in the condition in which both club and behavior were neurotypical (Table 4).

Verbal behavior

For reverse-coded Abruptness ($\alpha = .74$), the effect of Club was small, with participants being more abrupt in the NT Club (M = −0.18, SD = 0.96) than in the ASD Club condition (M = 0.18, SD = 0.79), $\eta_p^2 = .04$, when comparing means. Location estimates showed the opposite pattern, with participants being more abrupt in the ASD Club (0.18) than in the NT Club condition (0.64), $\eta_p^2 = .06$. The effects for Friendliness ($\alpha = .72$) and Speech Errors ($\alpha = .70$) were negligible ($\eta_p^2 < .02$).

Table 2. Descriptive statistics of variables as a function of behavior and club.

Behavior	ASD behavior/ASD club	ASD behavior/NT club	NT behavior/ASD club	NT behavior/NT club
Eye contact				
M	−0.02	0.01	−0.05	0.02
SD	0.96	1.01	0.86	0.83
Skewness	−0.52	−0.43	−0.43	−0.47
Kurtosis	−0.49	−0.67	−0.47	−0.42
Shape Estimator	−2.25	−1.92	−1.92	−2.06
Scale Estimator	1.40	1.43	1.22	1.19
Location Estimator	1.00	1.02	0.81	0.88
Body Positioning				
M	0.10	0.10	−0.16	−0.03
SD	1.11	0.83	0.98	0.70
Skewness	−.14	0.48	0.16	0.05
Kurtosis	−0.72	0.41	0.47	1.04
Shape Estimator	−1.01	2.10	1.07	0.66
Scale Estimator	1.35	1.20	1.21	0.78
Location Estimator	0.86	−0.76	−0.87	−0.37
Number of Smiles				
M	−0.35	−0.31	0.38	0.27
SD	0.82	1.04	0.83	0.95
Skewness	0.46	1.27	0.52	0.81
Kurtosis	−0.07	2.76	−0.47	−0.20
Shape Estimator	2.02	n/a	2.25	4.32
Scale Estimator	1.17	1.82	1.21	1.51
Location Estimator	−1.19	−1.80	−0.50	−0.90
Friendliness				
M	0.13	−0.24	0.14	−0.03
SD	0.79	0.99	0.87	0.87
Skewness	0.22	0.36	−0.22	−0.06
Kurtosis	−1.20	−0.75	−0.71	−0.79
Shape Estimator	1.26	1.68	−1.26	−0.71
Scale Estimator	1.01	1.36	1.11	0.98
Location Estimator	−0.50	−1.17	0.84	0.42
Abruptness (Reverse-coded)				
M	0.11	−0.22	0.25	−0.15
SD	0.82	0.96	0.76	0.97
Skewness	0.16	0.09	−0.14	−0.68
Kurtosis	−0.60	−0.79	−1.03	−0.24
Shape Estimator	1.07	0.83	−1.01	−3.09
Scale Estimator	1.01	1.12	0.92	1.49
Location Estimator	−0.48	−0.79	0.77	0.98
Number of Speech Errors				
M	−0.07	0.18	0.00	−0.11
SD	0.94	0.92	0.86	0.83
Skewness	0.94	0.18	0.19	1.87
Kurtosis	0.43	−0.03	0.27	6.53
Shape Estimator	8.42	1.14	1.17	n/a
Scale Estimator	1.54	1.15	1.08	1.59
Location Estimator	−1.29	−0.51	−0.66	−1.47
Social Perception of Confederate				
M	4.86	4.46	5.30	5.27
SD	0.81	0.56	0.82	0.63
Skewness	−0.49	0.18	−0.35	0.16
Kurtosis	0.74	0.14	−0.54	0.26
Shape Estimator	−2.13	1.14	−1.65	1.07
Scale Estimator	1.17	0.70	1.12	0.78
Location Estimator	5.71	4.04	6.07	4.82

Note. Behavior and Club refer to the two between-subjects variables. ASD Behavior refers to the condition in which the confederate acted in a manner consistent with autistic physical tendencies. NT Behavior refers to the condition in which the participant enacted neurotypical behaviors. ASD Club refers to the condition in which participants viewed a list suggesting that the confederate has a diagnosis of autism. NT Club refers to the condition in which the list that participants received about the confederate did not suggest a diagnosis of autism. Cells that are labeled "n/a" are instances where the shape estimator could not be calculated because the skewness was greater than 1.

Discussion

The present study examined neurotypical college students' perceptions of and behaviors toward other college students they believed to be autistic compared to those they believed were not autistic. Confederates were labeled by either membership in an ASD student organization, behavior stereotypical of ASD, both, or neither. Results revealed that confederates who depicted behaviors consistent with autism were perceived more negatively than confederates who

Table 3. Descriptive statistics of variables for behavior and for club.

Behavior	ASD Behavior	NT Behavior	ASD Club	NT Club
Eye Contact				
M	0.00	−0.02	−0.03	0.02
SD	0.98	0.84	0.90	0.92
Skewness	0.05	−0.44	−0.46	0.13
Kurtosis	−0.62	−0.51	−0.53	−0.56
Shape Estimator	0.66	−1.95	−2.02	0.98
Scale Estimator	1.09	1.19	1.29	1.11
Location Estimator	−0.48	0.83	0.89	−0.60
Body Positioning				
M	0.03	−0.10	−0.04	0.04
SD	0.87	0.85	1.04	0.76
Skewness	0.07	0.05	0.04	0.37
Kurtosis	−0.26	0.75	−0.34	0.64
Shape Estimator	0.75	0.66	0.60	1.72
Scale Estimator	0.99	0.95	1.14	1.05
Location Estimator	−0.45	−0.52	−0.51	−0.68
Number of Smiles				
M	−0.33	0.33	0.04	−0.04
SD	0.94	0.88	0.90	1.03
Skewness	1.04	0.64	0.37	0.86
Kurtosis	2.11	−0.42	−0.23	0.82
Shape Estimator	n/a	2.84	1.72	5.19
Scale Estimator	1.57	1.34	1.24	1.66
Location Estimator	−1.59	−0.68	−0.82	−1.34
Friendliness				
M	−0.07	0.06	0.14	−0.14
SD	0.91	0.86	0.82	0.93
Skewness	0.04	−0.13	−0.21	0.15
Kurtosis	−0.97	−0.81	−0.90	−0.85
Shape Estimator	0.60	−0.98	−1.23	1.04
Scale Estimator	1.00	1.04	1.04	1.14
Location Estimator	−0.48	0.64	0.79	−0.80
Abruptness (Reverse-coded)				
M	−0.07	0.06	0.18	−0.18
SD	0.91	0.89	0.79	0.96
Skewness	0.02	−0.61	−0.00	−0.27
Kurtosis	−0.67	0.02	−0.87	−0.65
Shape Estimator	0.50	−2.67	0.00	−1.41
Scale Estimator	0.97	1.34	0.79	1.26
Location Estimator	0.40	1.06	0.18	0.64
Number of Speech Errors				
M	0.07	−0.05	−0.03	0.04
SD	0.93	0.84	0.89	0.88
Skewness	0.50	0.93	0.56	0.85
Kurtosis	−0.16	2.45	0.15	1.58
Shape Estimator	2.17	7.71	2.43	4.98
Scale Estimator	1.35	1.37	1.32	1.41
Location Estimator	−0.91	−1.14	−1.00	−1.07
Social Perception of Confederate				
M	4.66	5.34	5.14	4.89
SD	0.69	0.71	0.83	0.71
Skewness	0.02	−0.15	−0.39	0.32
Kurtosis	0.45	−0.34	0.07	−0.01
Shape Estimator	0.47	−1.04	−1.78	1.56
Scale Estimator	0.73	0.87	1.16	0.96
Location Estimator	4.41	5.84	5.94	4.25

Note. Behavior and Club refer to the two between-subjects variables. ASD Behavior refers to the condition in which the confederate acted in a manner consistent with autistic physical tendencies. NT Behavior refers to the condition in which the participant enacted neurotypical behaviors. ASD Club refers to the condition in which participants viewed a list suggesting that the confederate has a diagnosis of autism. NT Club refers to the condition in which the list that participants received about the confederate did not suggest a diagnosis of autism. Cells that are labeled "n/a" are instances where the shape estimator could not be calculated because the skewness is greater than 1.

Table 4. Correlations between behavior and bias as a function of behavior and club.

Behavior	Bias variable	ASD behavior/ASD club	ASD behavior/NT club	NT behavior/ASD club	NT behavior/NT club
Eye Contact	SATA	.25	−.23	.03	.35
Body Position	SATA	−.09	.02	.15	.12
Smiles	SATA	.06	.06	.03	.31
Abrupt	SATA	.13	−.28	.09	.13
Friendliness	SATA	.16	−.09	.06	.08
Speech Errors	SATA	.36	−.10	.19	.06
Eye Contact	IAT	.08	−.04	−.18	−.15
Body Position	IAT	.52	−.38	−.11	.09
Smiles	IAT	−.03	−.04	.36	−.03
Abrupt	IAT	.16	−.17	−.13	−.06
Friendliness	IAT	.13	−.07	.12	−.01
Speech Errors	IAT	.03	−.12	−.31	.17

Note. Behavior and Club refer to the two between-subjects variables. ASD Behavior refers to the condition in which the confederate acted in a manner consistent with autistic physical tendencies. NT Behavior refers to the condition in which the participant enacted neurotypical behaviors. ASD Club refers to the condition in which participants viewed a list suggesting that the confederate has a diagnosis of autism. NT Club refers to the condition in which the list that participants received about the confederate did not suggest a diagnosis of autism.

Table 5. Correlations between behavior and bias for behavior and for club.

Behavior	Bias variable	ASD behavior	NT behavior	ASD club	ND club
Eye Contact	SATA	−.05	.19	.14	−.02
Body Position	SATA	−.01	.13	.05	.06
Smiles	SATA	.06	.17	.07	.18
Abrupt	SATA	−.13	.09	.12	−.10
Friendliness	SATA	.00	.07	.11	−.01
Speech Errors	SATA	.09	.12	.28	−.05
Eye Contact	IAT	.02	−.16	−.07	−.09
Body Position	IAT	−.08	−.03	.06	−.16
Smiles	IAT	−.03	.03	.23	−.16
Abrupt	IAT	−.04	−.10	.01	−.11
Friendliness	IAT	.00	.07	.13	−.02
Speech Errors	IAT	−.03	−.12	−.16	−.00

Note. Behavior and Club refer to the two between-subjects variables. ASD Behavior refers to the condition in which the confederate acted in a manner consistent with autistic physical tendencies. NT Behavior refers to the condition in which the participant enacted neurotypical behaviors. ASD Club refers to the condition in which participants viewed a list suggesting that the confederate has a diagnosis of autism. NT Club refers to the condition in which the list that participants received about the confederate did not suggest a diagnosis of autism.

depicted neurotypical behaviors, regardless of label. Furthermore, the greater number of autistic traits that participants perceived the confederates to have, the more negatively they rated the confederate as a social interaction partner. Finally, although we predicted that non-verbal and verbal behavior toward the confederate would differ as a function of the manipulation and would be predicted by implicit and explicit attitudes respectively, there was mixed support for these hypotheses.

Previous research examining perceptions of individuals with ASD have used vignettes or videos to depict behavior associated with ASD and have generally found that individuals with ASD are perceived more negatively than those without ASD (Grossman, 2015; Sasson et al., 2017; Sasson & Morrison, 2019). The current study extends these previous findings to a more ecologically valid interaction in which participants are face-to-face with a peer. Participants in our study who viewed a confederate acting in a manner consistent with autism reported more negative perceptions of the confederate, compared to participants interacting with the confederate engaging in neurotypical behavior. In addition, the more autistic traits that participants perceived the confederate to have, the more negative their perceptions of the confederate, which is consistent with previous work (Howlin et al., 2004; Jobe & White, 2007; Mor & Berkson, 2003). Interestingly, although previous studies have shown that perceptions of individuals with ASD are more positive when individuals were labeled as being autistic (Matthews et al., 2015; Sasson & Morrison, 2019), labeling the confederate as being part of a club associated with autism did not affect perceptions of him in the current work. Social perceptions of an interaction partner may be primarily generated using information provided during the course of the interaction, with little respect to background information or framing of the interaction partner in advance. Negative perceptions of individuals with ASD by neurotypical individuals based on behavior may contribute to the higher rates of social exclusion that they experience compared to their neurotypical peers (Jobe & White, 2007; Welkowitz & Baker, 2005; White et al., 2011). Social exclusion and negative judgments from others may be partly responsible for

contributing to increased rates of anxiety (Gillott & Standen, 2007; Simonoff et al., 2008) and depression (Ghaziuddin et al., 2002; Sterling et al., 2008) in individuals with ASD. University students with ASD are particularly at risk, as studies have found that individuals with ASD who have higher cognitive abilities tend to report more depressive symptoms (Sterling et al., 2008).

In addition to examining perceptions of the confederates, we also coded non-verbal and verbal behavior of the participants; we expected these behaviors would be affected by the confederates' labeling and behavior. For non-verbal behavior, participants who interacted with a confederate acting in a manner consistent with ASD smiled less than those who interacted with a confederate acting in a neurotypical manner. Smiling is a non-verbal behavioral cue that conveys positive emotions and attitudes (McConnell & Leibold, 2001) and thus this finding is consistent with prior research demonstrating that neurotypical individuals can have implicit biases toward individuals with ASD (Dickter et al., 2020) or might be uncomfortable while interacting with students with ASD (Adreon & Durocher, 2007). Contrary to hypotheses, there was no effect of condition for eye contact or for body position, nor did explicit attitudes predict behavior. For implicit attitudes, when both the club and behavior were associated with ASD, participants with more biased implicit attitudes leaned away from the confederate; however, when the behavior was autistic in nature and the club was not associated with ASD, participants with more implicit bias leaned toward the confederate. More biased implicit attitudes were also associated with more smiling when the behavior was neurotypical and the club was associated with ASD but less smiling when the behavior was neurotypical and the club was not associated with ASD. One possible explanation for this outcome is that participants with more biased implicit attitudes who expected interactions with a person with autism were slightly relieved when the displayed behavior was neurotypical and smiled more during the interaction.

For verbal behavior, most of the comparisons yielded negligible effect sizes although there was a small effect for ratings of abruptness. Counter to hypotheses, examination of the means revealed that there was a slight tendency for participants who interacted with a confederate labeled as a member of an ASD student club to be less abrupt with the confederate than those who interacted with a confederate who was not labeled a member of an ASD student club. Location estimates, however, demonstrated that participants were more abrupt with the confederate labeled as ASD than those who were not labeled as ASD. The skewness of the distribution for the NT condition was likely responsible for the differences in comparing means versus location estimates. Future research is warranted to further examine the effects of labeling on verbal behavior, particularly given that although previous work has shown that labeling individuals as ASD may have positive effects on perceptions of individuals with ASD (Matthews et al., 2015; Sasson & Morrison, 2019), no research has examined behavior toward those with ASD. Verbal behavior toward individuals with ASD may be influenced by neurotypical individuals' motivation to behave in a positive manner toward individuals with ASD for social desirability reasons or an internal motivation to see oneself as egalitarian. On the other hand, neurotypical individuals may act abruptly toward individuals with ASD due to stereotypical perceptions. More research using face-to-face verbal interactions between neurotypical individuals and individuals perceived to be autistic needs to be conducted.

With regard to attitude measures, there was an overall implicit bias against individuals with ASD. These findings are consistent with research examining negative attitudes against individuals with various disabilities (Vaughn et al., 2011; White et al., 2006), including autism (Dickter et al., 2020). Participants' explicit attitudes toward individuals with ASD were positive, replicating previous work (Dickter et al., 2020). There was a suggestive, but weak association between implicit attitudes and explicit attitudes, such that higher implicit bias was associated with more negative self-reported bias toward individuals with ASD. This supports the idea that explicit and implicit attitudes are largely distinct constructs, but also gives credence to the idea that they are weakly related (Dickter et al., 2020; Flood et al., 2013).

We had hypothesized that verbal and non-verbal interaction behaviors would be predicted by explicit and implicit attitudes, respectively, based on previous research in the social psychological literature on behavior toward individuals in stigmatized racial groups (e.g., Dovidio et al., 2002). In the current study, explicit attitudes were not predictive of either verbal or non-verbal behaviors. That self-reported attitudes were not associated with verbal behavior is inconsistent with previous research on other social groups (e.g., racial intergroup behavior). This may suggest that the attitude-behavior link for individuals with autism differs from that of individuals of stigmatized racial groups. For implicit attitudes, the

relationships were more complicated, in that implicit bias was associated with either more positive or more negative behavior depending on the label and behavior of the confederate. These findings suggest that labeling an individual as autistic can affect the way that their implicit attitudes affect their non-verbal behavior. As this is the first study to examine these relationships in a face-to-face interaction, more research needs to be conducted, particularly because there is debate within the field of social psychology as to the strength of the ability of the IAT to predict discriminatory behavior in lab settings (e.g., Oswald et al., 2013).

Another result that is inconsistent with previous research and may warrant future research is that our analyses revealed that behaviors consistent or inconsistent with autism drove perceptions, regardless of labeling. Previous research found that perceptions of individuals with ASD differ as a function of whether or not they are labeled as autistic. The inconsistency between previous research and ours is likely due to the situation in which perceivers judge the person labeled as autistic or not. Previous work has examined participants' perceptions through vignettes or videos but have not examined perceptions of an individual with whom they are interacting. If the purpose of research examining perceptions of individuals with ASD is to examine how people will evaluate someone in an interpersonal interaction, the current results suggest that there are likely different factors that affect an in-person interaction versus a situation in which someone reads about or views the behavior of a person with ASD. That is, real-world perceptions with individuals with ASD may be formed more from behavior than identifying a person as autistic with a label. Thus, this research calls into question whether previous theories of impression formation in the realm of autism generalize to real-world interactions. Future research should further examine whether people with ASD and other disabilities are judged differently based on their behavior in one-on-one interactions.

Application of present findings

The present findings provide a foundation for development of applications that could decrease bias against individuals with ASD in the university setting. One general approach would be to present videos that depict students with autism as part of online orientation sessions required by most universities. For example, videos of individuals with ASD discussing their experiences, increasing contact with this group, could potentially decrease implicit and explicit bias toward individuals with ASD. Another approach for these videos could be to present counterstereotypical examples of individuals with autism, an approach that has been effective in decreasing racial bias (Lai et al., 2014; McGrane & White, 2007). For example, the videos could depict students with autism having a positive social interaction with a fellow classmate or successfully delivering a presentation in a class. In addition to being part of online orientation sessions at universities, a short quiz could be given that must be completed to a high degree of accuracy to assure attention to the videos. The efficacy of this intervention can be evaluated with pre- and post-tests of the SATA and IAT used in the present study.

Another intervention to reduce bias toward individuals with autism on university campuses could be training using the autism IAT, which could be administered to university students as part of any general university diversity training. Training with the IAT has been used as a tool to reduce racial bias. For example, showing participants pictures of admired Black individuals and disliked White individuals reduced implicit racial bias (Forscher et al., 2019), as did asking participants to respond more slowly during sessions when "Black and Bad" were paired and to respond more quickly when "White and Bad" were paired (Lai et al., 2014). The present IAT could be adapted with these instructions and assessed for potential changes in implicit bias toward individuals with ASD.

Another approach to decrease bias against individuals with ASD would be to have live interactive sessions with students with autism. Previous research demonstrated that neurotypical adults with more contact with autistic individuals had more positive perceptions of autistic adults (Morrison et al., 2019) and more openness to interacting with an autistic college student (Gardiner & Iarocci, 2014) than those with less contact. Importantly, student autistic groups on campus may be an effective mechanism for identifying students who might be good in these roles. These students could be part of an in-person orientation session or could organize events on campus during the academic year. These events could include the participating students with autism describing their experiences on campus and then moving to a question and answer session between the students with autism and the audience. The sessions during the academic year will reach a more limited audience than videos during orientation, but may be effective because of the in-

person interactions with a smaller audience. For all of these applications, effectiveness will need to be evaluated. Such evaluations could include students completing the IAT prior to starting on campus, later in their freshman year and then perhaps as seniors. The literature regarding reducing implicit racial bias includes mixed evidence for some of the approaches (FitzGerald et al., 2019) emphasizing the need for careful assessment of any strategies to reduce implicit bias toward individuals with autism.

Limitations and conclusions

While the present study offers additional support for research regarding perceptions of individuals with ASD and extends the literature in important ways, some limitations remain. First, the decision to make the study more ecologically valid decreased the degree of experimental control. To increase internal validity, we administered the study in a controlled environment and hired student actors, training them carefully to interact in an identical fashion with participants, but it is possible that there was variability in their behavior. We were able to establish through a manipulation check that participants believed the confederates to be students with ASD in the appropriate conditions; however, the degree to which interactions in the present study model interactions with actual students with ASD is unclear. Furthermore, it is possible that the acting in the ASD condition was more variable than that in the NT condition, as the actors were both neurotypical, which may have led to different interactions and perceptions between conditions. Moreover, our choice to match our two confederates on gender and race to control for non-behavioral factors meant that our findings are premised on interactions with a white, male student believed to have ASD. Future studies should consider using female or nonwhite confederates to portray the experimental condition, to the end of ascertaining whether confederate demographics, as they interact with ASD cues, are a factor in participant judgments and behaviors. Future research should also examine how college students' personal relationships with individuals with ASD predict their behaviors toward individuals with ASD. Nevill and White et al. (2011) found that college students with a relative with ASD were more open to interacting with a student with ASD than those who did not, ostensibly because they were more knowledgeable about autism. Thus, it is possible that individuals with experience with individuals with ASD might behave more positively with individuals with ASD, although Matthews and colleagues (2015) found no association between autism knowledge and behavioral attitudes in university students. Only 15 participants indicated having a relative with ASD in the current sample so lack of power precluded examining this variable. Finally, it should be noted that this is the first study examining the effects of manipulating the label and the behavior of a confederate simultaneously and examining the resulting verbal and nonverbal behavior so the results reported herein should be interpreted cautiously and more research should be conducted. Caution is also warranted given the large number of comparisons conducted, as there is the possibility that some of the effect sizes are due to chance.

In summary, this is the first study to measure face-to-face interactions between neurotypical participants and confederates who were labeled as autistic or not and who behaved in a way consistent or inconsistent with autism. The neurotypical college students in our study had positive explicit attitudes but negative implicit attitudes toward individuals with autism. Further, they made more negative judgments about confederates who depicted behaviors consistent with autism than about confederates who depicted neurotypical behaviors. These participants also smiled less when the confederates depicted behavior consistent with autism than neurotypical behavior. Although we expected explicit attitudes to be associated with verbal behavior, self-reported attitudes toward individuals with autism were unrelated to either verbal or nonverbal behavior. Implicit attitudes predicted some of the non-verbal behaviors but only in specific combinations of labels and behavior which should be explored in future work. Our findings suggest that although the college students in our study held positive explicit attitudes, they showed evidence of negative implicit attitudes toward individuals with autism as well as negative perceptions of a peer who acted in a manner consistent with autism. As college students with ASD can be stigmatized and excluded by their peers (e.g., Gobbo & Shmulsky, 2014), finding ways to reduce neurotypical students' implicit bias and improve their perceptions of their peers with autism is an important future direction.

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