Voicemail Elicitation Task: Potential workplace communication assessment tool for autistic individuals

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A B S T R A C T

Background: Politeness Markers (PMs) are utterances that express politeness which help in keeping positive relationship with the listener. PMs include 2 main categories: Positive (showing appreciation to the listener) and negative (utterances that are used to avoid conflict and show consideration of the listener's feelings).
Aims: Evaluate the Voicemail Elicitation Task (VET) as an assessment tool for (PMs) use in workplace related scenarios in autistic individuals in comparison with neurotypical controls with age range 15–23 years.
Methods and procedures: Parents filled out the Social Responsiveness Scale-2nd (SRS-2) edition and La Trobe Communication questionnaire (LCQ). Language samples were obtained from participants through the VET that is a computerized language sampling procedure that involves four employment related role- play scenarios.
Outcomes and results: There were significant differences between both groups in negative PMs per minute. There were significant negative correlations between total negative PMs per minute and SRS-2 total score as well as (LCQ) total score.
Conclusions and implications: Autistic individuals showed less use of negative PMs in comparison to NTCs which is related to their social communication challenges. Additionally, VET has shown good psychometric properties which indicates that it could be used as a potential tool that could predict performance of autistic individuals in employment settings.

Introduction

Research indicates that autistic individuals face more challenges in obtaining and maintaining employment in comparison with non-autistic individuals (Hendricks, 2010), with over two-thirds of autistic individuals being unemployed (National Autistic Society, n. d.). Further, unemployment and underemployment rates in autistic individuals are significantly greater than in individuals with other disabilities, such as intellectual disability, learning disability, or speech impairment (Howlin et al., 2013; Roux et al., 2013; Shattuck

et al., 2012; Taylor & Seltzer, 2011). Autistic youth, specifically those within 2 years of high school graduation, are at the greatest risk of unemployment (Shattuck et al., 2012). Thus, it is imperative to identify factors which may contribute to unemployment in this vulnerable population.

Obtaining meaningful employment is an essential functional outcome that significantly impacts one's life by providing financial security, feelings of personal achievement, and accomplishment of meaningful life goals (Dodu, 2005). Additionally, employment is associated with increased independence and identity establishment (Luyckx et al., 2008; Waddell and Burton, 2006), enhanced self-esteem (Waters & Moore, 2002), securing finances (Lerner & Henke, 2008), and better social relationships (Saavedra et al., 2016). In the general population, employment is considered one of the protective factors against variable mental health disorders, including depression (van der Noordt et al., 2014). Moreover, the value of employment is even greater for autistic individuals: unemployed autistic individuals have poorer quality of life and health care outcomes, and increased mental health issues, including suicidality (Cassidy et al., 2018; Mason et al., 2018; Walsh et al., 2014).

There are multiple causes for the high rates of unemployment and underemployment that are observed in this population including reduced independent daily living skills (Chan et al., 2018), fewer years of education (Ohl et al., 2017), and reduced vocational skills in the autistic population (Seaman & Cannella-Malone, 2016). However, the autistic community has identified that social communication difficulties are the most common challenge in achieving vocational success (Hendricks, 2010; Müller et al., 2003). A number of reasons may underlie social communication challenges experienced by autistic adults, such as differences in theory of mind skills (i.e., the ability to understand and respond to the emotions and beliefs of others (Baron-Cohen et al., 2000; Happé, 2015)), as well as a lack of mutual understanding between autistic and non-autistic individuals (a phenomenon called the "double empathy" problem; Milton, 2012). In both theory of mind and the theory of double empathy problem, autistic individuals may not conform to the culture and social norms of neurotypicals, which may be construed as "impolite" by neurotypical individuals. Importantly, this "impoliteness" may not be the intention of the autistic individual who may simply not be aware of neurotypical norms.

This perceived "impoliteness" is often observed in autistic individuals' deviation from neurotypical pragmatic language (Jones & Schwartz, 2009). Pragmatics is defined as the effective and appropriate use of language to achieve social goals, manage topics and turns in conversation, and show appropriate degrees of politeness, awareness of social roles, and recognition of others' conversational needs (American Speech-Language-Hearing Association, 2014; Snow & Douglas, 2017). There are several pragmatic differences observed in autistic individuals including: variance in greetings; initiation of conversation; narration (story telling); as well as expressing emotions, wishes, and requests. Other differences include unawareness of someone's social role and position within conversations, shyness, and excessive lack of confidence (Eales, 1993; Mc Tear & C.-R. G, 1992). In employment scenarios specifically, these pragmatic differences may negatively affect the interactions of autistic persons with other employees; they may hinder their engagement within a team, specifically during informal discussions or projects (Hagner & Cooney, 2005; Richards, 2012). These pragmatic differences could provide an explanation for why autistic individuals have career paths that involve multiple transitions between different vocational positions (Baldwin et al., 2014; Jennes-Coussens et al., 2006; Lorenz & Heinitz, 2014; Richards, 2012; Roux et al., 2013; Taylor et al., 2015).

Politeness, an aspect of pragmatics, is defined as an array of concepts that demonstrate consideration in social interactions, and they include showing sympathy to others, being modest and generous, and being thoughtful of others. Politeness is also viewed as the considerate social attitude or etiquette that is used within cultures (Yule, 1996), and thus may change depending on cultural context. Politeness Markers (PMs) are utterances used to express politeness and they provide means to keep a positive relationship with the listener (Wijst, 1996). They include the use of different word categories such as adjuncts and modal verbs which play an important role in improving the cooperative features of communication within connected speech (Halliday & Matthiessen, 2004). Appropriate use of PMs in context requires the speaker to consider social boundaries that include familiarity with the conversation partner, social status as well as the level of demand on the conversation partner and not just linguistic awareness of the words selected (Brown & Levinson, 1987; Halliday & Matthiessen, 2004). The current study will evaluate politeness usage in autistic individuals, specifically within the context of employment.

There are two main categories of PMs: positive PMs and negative PMs. Positive PMs express appreciation or praise to the listener (Hirschová, 2006). Subcategories of positive PMs, for example, include: "on record politeness" which are traditional statements of

Table 1

Different categories and subcategories of PMs (left column). In the right column are examples of these PMs **in bold** used within a sentence. In the left column are examples of different categories and subcategories of PMs. In the right column are examples of these PMs, **in bold**, used within a sentence.

Positive Politeness	Example PMs usage
On Record Politeness: Traditional statements of appreciation/praise to the listener	***Thank you*** *for your help.* ***Please*** *let me know when you can.*
Gratitude: Utterances that praise the potential of satisfying a request	*I really* ***appreciate*** *your effort.*
Well-Wishing: Conveying good will to the listener	***Have a nice day***
Intensifiers: Intensify an expression of gratitude or praise that accompany a request	*I* ***really*** *appreciate your effort.*
Assurances: Positive declaration intended to give confidence	*I am sure* ***we can work this out.***
Negative Politeness	**Example PMs usage**
Understater: Utterances that soften the statement	*Can you free up a* ***little bit*** *of time?*
Downtoner: Speaker limits commitment to the statement and enables the receiver to refuse or disagree	***Could you possibly*** *provide some advice?*
Consultative device: Utterances which seek involvement from the conversation partner	***Would you mind*** *filling this form?*
Forewarners: Utterances that forestall a possible negative reaction	***I'm really sorry to be bothering you.***
Play-down: Syntactic devices that state limit subjective or temporal commitment or negating concepts	***I hope you have taken this into account***

appreciation and praise to the listener such as "*thank you*", "*please*", as well as "intensifiers" which are utterances that intensify the expression of gratitude such as "*certainly*" and "*really*"(Yule, 1996). On the other hand, negative PMs include the use of utterances in which the speaker compromises their own needs with those of their conversational partner to avoid conflict and to consider the feelings of their conversation partner. Subcategories of negative PMs, for example, include: "consultative devices" which are utterances that seek cooperation from the conversation partner such as "*would you mind*" and "understated" which are utterances that soften the statement such as "*little bit*" (See Table 1 for all positive and negative PMs subcategories). A crucial difference between positive and negative PMs is that negative PMs require more monitoring of social boundaries as they necessitate consideration of the conversational partner's potential reactions to statements, and the conversational partner's emotional state (Chen, 2014).

In the context of assessing workplace communication as spoken or written language, there has been a specific focus on PMs as they play an important role in facilitating relationships with employers, customers, and colleagues in the workplace environment (Gunnarsson, 2009; Holmes, 2003; Park: & Routledge, 2013; Thornborrow, 2002). Workplace communication particularly relies on negative PMs, such as awareness of social roles, which involves recognizing the expected level of familiarity in each relationship. For example, understanding that deference should be paid to a superior (supervisor, employer, teacher) is necessary for workplace social decorum. A lack of understanding may result in social difficulty, as being overly familiar or unexpectedly close can indicate lack of respect to others (Hirschová, 2006; Yule, 1996). Another important aspect of politeness is the attempt to maintain a positive relationship between conversational partners (Leech, 1983). For example, choosing polite phrasing in order to make a request (e.g., "*Would you possibly have time to meet later?*") shows respect for the receiver of the request, as opposed to being overly blunt (e.g., "*I need to meet with you immediately*"). This choice in phrasing is influenced by the relationship between speakers, and each of their social roles. While a superior may be able to be blunter and more direct with a subordinate, the reverse (for the subordinate to be blunt and direct with a superior) may have negative social consequences.

To our knowledge, only two studies have examined PMs use in autism, indicating a paucity of work in this domain. In one study, the use of positive PMs was explored in autistic children (ages 8–12 years old) through evaluations of video and audio recordings of the children's daily interactions with family members, peers and teachers (Sirota, 2004). This study provided evidence that autistic children use positive PMs in the form of greetings and compliments, however, due to the absence of a control group, the authors were unable to establish whether PMs use was different in autistic children compared to neurotypical children (Sirota, 2004). This study did not explore the use of negative PMs. In another study where spoken language data from dyadic interactions between autistic adults and neurotypical participants autistic participants were less polite than typically developed participants (Yang et al., 2021). Thus, although there is some evidence that PMs use is different in autistic individuals, the paucity of research on this topic necessitates further study.

In the current study, we aimed to evaluate both positive and negative PMS use in transition age youth within the context of employment using a tool which has been used to study politeness previously: the Voicemail Elicitation task (VET). The VET is a standardized computerized language sampling procedure that is composed of four role-play tasks that prompt language samples (voicemail messages) in which PMs are assessed (Meulenbroek & Turkstra, 2016). Voicemail messages represent a common form of personal and professional communication, especially with rapid technological advancements and a growing mobile society. This tool was used previously to assess PMs use in persons with Traumatic Brain Injury (TBI) and it has demonstrated a potential to be used as a clinical screening tool to detect individuals at risk of job instability related to social communication difficulties. Persons with TBI have shown to use fewer PMs than healthy controls in workplace scenarios. In addition, TBI individuals with unstable work histories tend to produce fewer PMs when compared with stably employed TBI individuals. These findings indicate a direct link between politeness use and employment outcomes represented in employment stability (Meulenbroek & Cherney, 2019).

The aims for the current study were:

The first aim was to evaluate the use of the VET as a tool to detect deficits in PMs use in autistic individuals compared to Neurotypical Controls (NTCs). We hypothesized that autistic individuals would show significantly lower usage of PMs in comparison with NTCs. The second aim was to evaluate initial psychometric properties of the VET by: a) measuring reliability of the VET through assessing interrater reliability and internal consistency, b) evaluating concurrent validity by assessing the correlations between the VET and self- and other- reported measures of social communication, c) estimating criterion validity of the VET by assessing the correlations between the VET and other employment outcomes, such as performance in mock job interviews (assessed by the Autism Mock Interview Rating Scale (A-MIRS) (Smith et al., 2021) as well as employment status. We hypothesized that individuals who have low performance on the VET would show poor performance in the mock job interview. Further, we hypothesized that individuals who have low performance on the VET would have reduced quality of employment outcomes (employment status and number of hours a week employed).

Methods

Participants

We used a case-control design where pilot VET data was collected from a sample of autistic young adults (n = 15) and NTCs (n = 15) who were included in a larger study in which participants were recruited through research match, advertisements at local (XX) special needs schools, social media, and from the local community. The findings obtained from this pilot study are preliminary due to the small sample size. All participants who expressed interest in the study underwent a brief screening interview to determine eligibility in which they were asked questions related to their diagnostic and medical history related to autism or other disabilities, demographics, primary language spoken at home, alcohol and drug history.

Inclusion criteria included

Autistic youth with the age range of 14–26 years old; autism diagnosis based on educational or medical records review; fluency in English; at least a fourth grade reading level; willingness and ability to provide informed consent/ assent (if under the age of 18, with parental consent); and being able to communicate verbally.

Exclusion criteria included

Any medical, psychiatric or developmental disability that may significantly compromise cognition (e.g., moderate or greater TBI; Downs Syndrome) was exclusionary. Uncorrected vision or hearing problems were exclusionary as it may impact the assessments. Severe psychiatric or drug/alcohol use (defined as inpatient stay in the last 6 months for either psychiatric or drug/alcohol use) was also exclusionary.

This study was approved by the XX Institutional Review Board. The following procedures were administered over one or two online sessions after obtaining informed consent (if over the age of 18) /assent (if under the age of 18, with parental consent) from participants. Participants were compensated for their participation.

Study procedures and measures

Demographic characteristics

We collected information about age, gender, and socioeconomic status.

Employment characteristics

Employment status, and number of hours a week employed.

ASD diagnosis

The diagnosis was confirmed through educational, medical records or t-score of 60 or greater via a parent report on the Social Responsiveness Scale-2nd edition (SRS-2). It is composed of 65 items and can be completed in 15–20 min. The SRS-2 asks parents to rate symptoms that they have noticed over time in their children. In addition to a total score that reflects the severity of social difficulties, the SRS-2 also gives scores for five subscales: Social Awareness, Social Cognition, Social Communication, Social Motivation, Restricted Interests, and Repetitive Behavior (Constantino & Gruber, 2012).

Reading

Fourth grade reading level was determined using the with the Reading Comprehension sub-test of the Wechsler Individual Achievement Test (WIAT) – 3rd edition (Wechsler, 2009).

Politeness evaluation

The Voicemail Language Elicitation Task: The VET is composed of four role-play voicemail scenarios that are administered through a computer. Each voicemail role-play scenario prompts two frequent workplace spoken communication behaviors: (a) informing and (b) requesting (Austin, 1975; Bach & Harnish, 1982). For example, one of the scenarios requires the participant to tell a colleague that her/his car has broken down (informing) and to ask the colleague for a ride to work (requesting). The voicemail role-play scenarios (S) address four work-related recipients that differ in their familiarity and status levels (superior (S1), friend (S2), subordinate (S3), and colleague (S4)). The VET was conducted and recorded via Zoom. The participants were given instructions about the procedures of recording their voicemail messages before they started. They were told that each scenario will appear on the screen, and they are required to read it first, and that they were allowed to write any notes that could be used throughout the task, but they were not allowed to script any response to be read aloud. Scenario instructions were always presented on the screen to avoid any confusion. When the participants were ready, they pressed the record button, which prompted a ringtone followed by a message from the imaginary voicemail recipient. This process took approximately 10 min to complete. The resulting voicemail recordings were transcribed verbatim and then coded for PMs using the codebook that was developed from sociolinguistic classifications for requesting and informing conditions (Halliday & Matthiessen, 2004; House & Kasper, 1981; Soler et al., 2005; Trosborg, 1995). We evaluated the total PMs used as well as the subcategories for positive and negative PMs. Positive PMs subcategories include on record politeness (formulaic utterances denoting politeness), gratitude (to show appreciation), well-wishing (convey good will to the listener and intensifiers (intensify an expression of gratitude). Negative PMs subcategories include understaters (used to underrepresent a proposition), downtowners' (used to allow the speaker to not be fully committed to the proposition), play-down (soften perlocutionary effect), consultative devices (seek involvement from the listener) and forewarns (utterances that forestall a possible negative reaction).

Coding the VET data was done by the first and third author after training with Dr. Meulenbroek. They were blinded to the participants' conditions (whether autistic or NTC). Between-rater reliability for total PMs counts was at around 88 % agreement for seven out of 30 (23 %) randomly assigned transcripts that were double coded by both coders after training. The remaining 12 % were resolved through consensus between both coders.

Other-report social communication

La Trobe Communication questionnaire (LCQ) is a 30-item questionnaire that measures perceived communication abilities, and it was originally developed to be used with persons with TBI and was used in the current study to evaluate communication abilities in autistic individuals either based on Self- Report or Other- Report. We used Other- Report in the current study from parents of participants. It

has four subscales:1) Initiation/Conversational which involves items related to difficulties with starting and maintaining conversations, 2) Disinhibition/Impulsivity which includes items that represent impulsive or disinhibited conversational behaviors, such as saying rude or embarrassing things, 3) Conversational Effectiveness which includes items related to the effectiveness of conversation, such as being accurate and logical in expression and having the ability to change speech style easily, and 4) Partner Sensitivity which includes items related to sensitivity to a conversational partner's needs, such as repeating information, talking about things for too long and switching topics too quickly (Struchen et al., 2008). We evaluated the relationship between LCQ total score, its four subscales and performance in VET.

Employment outcomes

The employment outcomes assessed were employment status (whether currently employed or not), number of hours employed and performance on the A-MIRS. The A-MIRS is a tool that was used to evaluate job interview skills and their relationship with politeness use. A-MIRS (Smith et al., 2021) is a role play assessment performed by a trained research staff. The participants are presented with six positions (i.e., cashier, food services, security, clerical, childcare, and assistant web developer) and asked to choose one for the job interview role-play. The participants are then asked 18 questions in a natural manner. The job interview role-plays are video recorded and later coded on 12 domains by trained raters. The domains include: 1. Overall likeliness to be hired (assessed after first watch and after second watch of the videos), 2. Engagement, 3. Being confident, 4. Being positive, 5. Being professional, 6. Showing interest, 7. Being honest, 8. Being dependable/hardworking, 9. Working well with others, 10. Sharing strengths and skills, 11. Sharing relevant past experiences, 12. Sharing how weaknesses have been improved, and 13. Overall rapport with interviewer. We evaluated the relationship between A-MIRS total score, overall likeliness to be hired after second watch and performance in VET.

Data analysis

We analyzed data using IBM SPSS version 26. Demographic variables were compared between groups using either *t*-test or chi square. We also compared means of positive, negative and total PM per minute between both groups using an independent sample t-test and we used the Pearson correlation coefficient to correlate VET variables with other measures (SRS, LCQ, A-MIRS and employment variables) used in the study. Because of the small sample size, we have reported effect sizes (Cohen's d).

PMs calculations

Rates of PMs use, PMs per minute, were measured based on the previous study that was done in TBI patients. PM per minute have been used instead of simple PMs count to put into consideration the amount of time taken by every participant to leave the voicemail message. It was also found that simple PMs count could skew the data because some participants could be more talkative than others. We calculated the following:

Total PM per minute

We calculated the total PMs (both positive and negative PMs) used in all four scenarios and the total speaking time (in minutes) for the four scenarios. The speaking time was calculated for each scenario, excluding the silence before and after the VET recording. We also calculated the total PMs per minute for every scenario, which is the sum of positive and negative PMs in each scenario divided by the speaking time for that scenario.

Negative PM per minute

Total negative PMs per minute was calculated by dividing negative PMs in all four scenarios by the total speaking time in all four

Table 2
Demographic characteristics for the ASD and NTC groups.

Variable	ASD (n = 15)	NTC (n = 15)
Gender (n, %)	9 (60 %) Male	4 (26.7 %)
Age (M, SD)	18.13 (1.95), Range 15–23	17.13 (1.55) Range 15–20
SRS (M, SD)	70.86 (5.74)	42.80 (4.82)
Ethnicity (n, %)		
Hispanic/Latinix	2 (13.3 %)	1(6.7 %)
Non-Hispanic/ Latinix	13(86.7 %)	11(73.3 %)
Missing	-	3(20 %)
Race (n, %)		
White	9(60 %)	9 (60 %)
Black/ African American	1(6.7 %)	2(13.3 %)
Asian	1(6.7 %)	1 (6.7 %)
Caucasian	4(26.7 %)	3 (20 %)
Grade Level (n, %)		
Freshman	3(20 %)	2(13.3 %)
Sophomore	3(20 %)	2(13.3 %)
Junior	-	7(46.7 %)
Senior	2(13.3 %)	3(20 %)
Adult transitional	7(46.7 %)	1(6.7 %)

scenarios. We also calculated the negative PMs per minute for every scenario by dividing the negative PMs in each scenario by speaking time. We did this because we were interested in knowing whether negative PMs use changes across different scenarios that address different recipients with variable social roles and degrees of familiarity.

Positive PM per minute

Total positive PMs per minute was calculated by dividing positive PMs in all four scenarios by the total speaking time in all four scenarios. We also calculated the positive PMs per minute for every scenario by dividing the positive PMs in each scenario by speaking time for that scenario.

Results

Differences between autistic and NTC groups

Demographics and employment characteristics

Demographic characteristics for participants in the autistic and NTC groups are presented in Table 2. There were no significant differences regarding sex $\chi 2 = 3.394$, $p = .065$ and age between the autistic group ($M = 18.13$, $SD = 1.95$) and the NTC group ($M = 17.13$, $SD = 1.55$), $t (28) = 1.549$, $p = .133$. The age range in both groups was 15–23 years. Regarding employment, 6 participants in the autistic group had a job previously but none of them was employed at the time of the study. In the NTC group, 13 participants had a job previously and 4 of them were still working in their job at the time of the study. There were no significant differences regarding the employment status (employed or not between groups), $\chi 2 = 2.338$, $p = .126$. There were no significant differences in the number of hours of work per week between the autistic group, ($M = 20.1667$, $SD = 13.49$) and the NTC group, n = 13, ($M = 17.46$, $SD = 12.05$), $t (17) = .438$, $p = .621$.

PMs and its subcategories

When comparing PMs and its subcategories, in addition to reporting significance levels, we reported Cohen's d effect sizes to inform future power analyses. Comparing the means of positive, negative, and total PMs per minute between both groups revealed significant differences in negative PM per minute, $t (28) = - 2.36$, $p = .026$, ($d = .86$, large effect size). (See Table 3). Regarding comparison between total PMs per minute in the four different scenarios, there was a significant difference between the autistic group ($M = 14.74$, $SD = 5.65$) and the NTC group ($M = 19.84$, $SD = 5.88$), $t (28) = - 2.41$, $p = .022$, ($d = .88$, large effect size), in S4 (colleague) only, while there were no significant differences between both groups in the other three scenarios. As for the subcategories of positive and negative PMs in all scenarios, for positive PMs subcategories, there was a significant difference in intensifiers between the autistic group ($M = .25$, $SD = .43$) and NTC group ($M = .96$, $SD = .94$), $t (28) = - 2.64$, $p = .016$, $d = .96$, a large effect size. For negative PMs, there was a significant difference in consultative devices between the autistic group ($M = 3.0$, $SD = 1.06$) and the NTC group ($M = 5.0$, $SD = 2.26$), $t (28) = - 3.090$, $p = .006$, $d = .80$, a large effect size. There were no significant differences between groups in the other negative and positive PMs subcategories. (See Table 4).

Psychometric properties of VET

To assess concurrent validity of the VET, we assessed the correlation between positive, negative, total PM per minute and tools that assess social communication through parent report (SRS and LCQ) across the whole sample. We found significant negative correlations between total negative PMs per minute and SRS total score as well as SRS subscales, social communication and interaction, social awareness, social cognition. There was negative correlation as well between negative PM per minute and LCQ subscales, initiation, disinhibition, partner sensitivity subscales as well as its total score. (See Tables 5 and 6).

To assess criterion validity, correlations between the VET and other employment outcomes, including performance in mock job interviews assessed by the (A-MIRS) as well as employment status (employment status and number of hours a week employed). A Pearson correlation coefficient was computed to assess the linear relationship between positive, negative, total PM per minute, and likeliness to be hired that was obtained from A-MIRS. We found a significant positive correlation between likeliness to be hired and negative PMs per minute, $r = .475**$, $p = .009$, as well as total PM per minute, $r = .468*$, $p = .011$. Additionally, there was a significant positive correlation between A-MIRS total scores and negative PM per minute, $r = .428*$, $p = .021$ and total PMs per minute, $r = .402*$,

Table 3

Independent Sample t-test to compare the means of positive, negative, and total PM per minute (PMpM) and effect sizes (Cohen's d).

Variable	ASD (n = 15) Mean (SD)	NTC (n = 15) Mean (SD)	Mean diff. (95 % CI)	t-stats (df)	p-value	d
Total Positive PMpM	7.65 (3.67)	7.90 (3.50)	− .25 (− 2.94, 2.42)	− .19 (28)	.847	.07
Total Negative PMpM	7.12 (3.02)	10.26 (4.16)	− 3.14 (− 5.86, − .40)	− 2.36 (28)	**.026**	**.86**
Total PMpM	14.77 (5.13)	18.17 (5.99)	− 3.39 (− 7.57,.78)	− 1.66 (28)	.107	.60

P < 0.05 *
P < 0.01 * *

Table 4
Comparison between the means of different positive and negative PM per minute (PMpM) subcategories and effect sizes (Cohen's *d*).

	ASD (n = 15) Mean (SD)	NTC (n = 15) Mean (SD)	Mean diff. (95 % CI)	t-stats (df)	p-value	d
Total On Record Politeness PMpM	6.57 (3.4)	5.51 (2.03)	1.05(− 1.04,3.15)	1.03 (28)	.31	.377
Total Gratitude PMpM	.27 (.46)	.76 (1.02)	− .49(− 1.09,.10)	− 1.69 (28)	.10	.62
Total Well-wishing PMpM	.45 (.76)	.59 (.92)	− .14(− .77,.49)	− .45 (28)	.65	.16
Total Intensifiers PMpM	.25 (.43)	.96 (.94)	− .71(− 1.26, − .16)	− 2.65 (19.57)	**.01**	**.96**
Total Assurances PMpM	.09 (.18)	.05 (.21)	.03(− .11,.18)	.46 (28)	.64	.17
Total Understaters PMpM	.42 (.65)	.46 (.55)	− .03 (− 49,.41)	− .17(28)	.86	.06
Total Downtoners PMpM	2.56 (1.75)	3.79 (2.24)	− 1.2 (− 2.7,.27)	− 1.67 (28)	.10	.61
Total Consultative PMpM	2.02 (1.01)	3.01(1.40)	− .98 (− 1.90, − .06)	− 2.2 (25.53)	**.03**	**.80**
Total Forewarners PMpM	.76 (.65)	1.0 (.78)	− .23 (− .77,.30)	− .88 (28)	.38	.32
Total Play-down PMpM	1.30 (1.25)	1.76 (1.72)	− .45 (− 1.58,.66)	− .83(28)	.41	.30

Table 5
Correlation between total negative PM per minute (PMpM) in the whole sample and SRS total and subscales (*t*-score).

	Social Communication and Interaction	Social Awareness	Social Cognition	Social Communication	Social Motivation	SRS Total
Total Negative PMpM						
Pearson correlation	− .432*	− .406*	− .495**	− .392*	− .319	− .447*
Sig.(2-tailed)	.017	.026	.005	.032	.085	.013

P < 0.05 *.
P < 0.01 **.

Table 6
Correlation between negative PM per minute (PMpM) in the whole sample and La Trobe communication questionnaire total and subscales.

	Initiate/conversation flow	Disinhibit/impulse	Conversation effective	Partner sensitive	Partner - total
Total Negative PMpM					
Pearson correlation	− .463**	− .497**	− .091	− .441*	− .446*
Sig.(2-tailed)	.010	.005	.632	.015	.013

P < 0.05 *.
P < 0.01 **.

$p = .031$. We computed a Point-biserial correlation coefficients between positive, negative, total PMs per minute and number of hours a week employed and we found only a statistically significant negative correlation between negative PMs per minute and employment status (employed or not), $r = − .474, p = .040$.

Discussion

High unemployment rates in the autistic population have been well-documented and among the important causes of this phenomenon is the social communication challenges that autistic individuals face (Hendricks, 2010). Although there has been extensive research on the social communication difficulties that are seen in the autistic population, politeness use, which is an aspect of social communication skills, has not been adequately addressed. Given the gaps in previous research and impact of social communication challenges in the interactions of autistic individuals with employees in the workplace environment, we aimed to evaluate politeness use by comparing autistic individuals with non-autistic individuals (Hagner & Cooney, 2005; Richards, 2012).

The current study revealed significant difference between the autistic and NTC groups in terms of total negative PMs per minute; however, there were no differences between groups in total positive PMs per minute. Our findings on positive PMs usage are consistent with what has been found by one other existing study on PMs usage in autistic individuals that showed that autistic children are able to use positive PMs (Sirota, 2004). Regarding the demonstrated differences in negative PMs between groups, this finding could be attributed to the nature of negative PMs which necessitate more observance of social boundaries as well as more attention to the conversational partner's emotional state and their potential reactions to statements (Chen, 2014).

There was a significant difference between groups in negative PM per minute in the S4 of the VET (the voicemail was directed to a colleague at work). This finding was consistent with a previous study that was conducted on high functioning autistic adults and typically developing adults (TD), where spoken language data was collected from collaborative dyadic settings between participants (Yang et al., 2021). Each autistic adult or TD adult was paired with a TD conversational partner where they participated in a joint task that involved verbal communication. Participants were involved in two tasks: one involved giving directions to the conversational partner to reach a specific place and the other involved discussions with the conversational partner to reach an agreement on items to take on a trip. Autistic participants were more polite in the task that involved giving directions and less polite in the task that involved

reaching an agreement with similar role partners when compared to TD participants. The current study has shown similar findings, where autistic individuals showed less use of negative politeness in comparison with non-autistic individuals in the S4 where they were required to leave voicemail message to a colleague.

Additionally, we evaluated the concurrent validity of the VET across the whole sample, which is the extent of agreement between a new assessment (the VET) and another assessment that has been already tested and proven to be valid as SRS and LCQ. There was a significant negative correlation between negative PMs per minute and SRS total t-score, and subscales, social communication and interaction, social awareness, social cognition, social communication as well as social motivation. These findings indicate that the higher the scores obtained on the SRS, which means more social difficulty, the less negative PMs per minute. These findings provide evidence for the concurrent validity of the VET as a tool to assess politeness use (an aspect of social communication) when compared with the SRS, which measures degree of social difficulty. Additionally, there was significant correlation between negative PMs per minute and total LCQ score and all if its subscales (initiation of conversation, disinhibition, partner sensitivity) except for conversational effectiveness subscale. These findings show consistency between the social difficulty perceived by parents through the SRS, LCQ and reduced politeness use in the VET.

Regarding criterion validity to determine whether the VET predicts performance or behavior in employment, we examined performance on a mock job interview, as well as employment status and number of hours employed per week in the current study. There was a significant positive correlation between sum scores on the A-MIRS and the likeliness to be hired item with negative PMs per minute, which indicates that better use of negative PMs is associated with better performance on job interviews in general as well as higher chances of getting hired. Additionally, there was a significant correlation between total negative PMs per minute and employment status. This finding indicates that more use of negative PMs is associated with higher likelihood of being currently employed. Therefore, VET could be considered as a potential tool that could predict performance of autistic individuals in employment settings.

The current study sheds light on politeness use in autistic individuals. However, these results should be considered within the context of the "double empathy" problem (Milton, 2012). While research on autistic individuals is often seen through the lens of neurotypical culture and social norm, there should be emphasis on understanding the autistic culture and social norms. While politeness is universally valued, it can be expressed in different ways across cultures. An honest but blunt comment, for example, might be welcomed in certain cultures but may be considered rude in others. This same phenomenon may exist in autistic vs. non-autistic culture, and thus more research is needed to parse out communication and cultural differences that would impact the use and reception of politeness. Further, while politeness differences are worthy of study, there should be equal focus on building awareness in neurotypical individuals that autistic language and communication may fundamentally differ from their own. Building awareness in both neurotypical and autistic individuals that these communication styles differ, and thus, neither is "wrong" may create a more inclusive workplace.

Limitations

Although the current study has provided valuable insights about politeness use in the autistic population in employment related scenarios, the sample size used in our study was small. Including a larger sample size that is more diverse in terms of age with the inclusion of a wider age range, race and gender will help us to evaluate the relation between different variables measured using the SRS, LCQ, AMIRS, and VET in each group independently as we only found significant relations between them in the sample as a whole. Incorporating self-assessment reports would help in the identification of social communication challenges from the views of autistic individuals themselves as we have relied on parent reports only in the current study. Because this study was focused on language usage, it would have been helpful to assess whether or not our participants were bilingual (rather than just asking about whether English was their first language). In future work, the impact of bilingualism should be addressed as it could have an impact on politeness use. Additionally, another possible limitation is that participants specifically adolescents/ young adults might not have much experience or practice on leaving voicemail messages which could impact their performance on this task. Finally, the age range in the current study was 15–23. However, given the fact that social cognition and communication abilities are still developing in this age range, there may be differences in abilities that could be attributed to age, experience with voicemails, and employment history. Thus, in future work, age should be considered as an important factor and looking at how politeness markers may be used differently in older teens with more experience compared to younger teens.

Future directions

Future research should work towards establishing the validity of the VET by comparing it with other measures that evaluate pragmatics as well as self-report social communication tools. Additionally, the VET was originally designed for patients with TBI, therefore exploring other autism-centric behaviors such as inappropriate initiation / termination of messages and lack of providing sufficient details that occur during leaving voicemail messages would be essential. In this study, VET has shown initial good psychometric properties (validity and reliability) which indicates that it could be used as a potential screening tool to predict performance in workplace settings. Evaluation of politeness use in the autistic population could be further explored in written text, such as emails in workplace environment, as well as text messages, given the importance of politeness use in these written contexts in establishing and maintaining relationships in employment settings. Finally, after demonstrating the challenges that autistic individuals face in terms of politeness use, it would be essential to design interventions that target these difficulties, which could potentially result in better employment outcomes in this population.

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CRediT authorship contribution statement

Zuzanna Myszko: Writing – review & editing, Project administration, Investigation, Data curation. **Peter Meulenbroek:** Writing – review & editing, Validation, Supervision, Software, Resources, Methodology, Investigation, Conceptualization. **Genova Helen M:** Writing – review & editing, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Katarina Reduzzi:** Writing – review & editing, Visualization. **Elsayed Heba E:** Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of Competing Interest

None.

Data availability

Data will be made available on request.

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