I'm convinced! Persuasive discourse in autistic and non-autistic adolescents: The role of content and manner of delivery in convincing peers

Jovia Hin Lam Wong

Integrated Program in Neuroscience

McGill University, Montreal

July 2024

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of Master of Science.

Table of Contents

Abstract

Developing persuasive skills can be difficult for neurotypical (Heilmann et al., 2020) and autistic adolescents. The latter produced fewer supporting arguments and counterarguments than their neurotypical peers (To et al., 2016), suggesting that the *content* (or *macrostructure*) of persuasive discourse may be affected by autism. It is also important to consider *manner of delivery*, because for the same persuasive discourse, content and manner of delivery may lead to different impressions: neurotypical raters had negative first impressions of autistic speakers based on audiovisual clips, but not based on transcripts alone (Sasson et al., 2017). I examined whether content and manner of delivery play a role in how convinced a listener was to make a proposed change (*convincingness*) in both autistic and non-autistic adolescents.

Twenty-seven (11 autistic and 16 non-autistic) French-speaking adolescents, aged 14 to 19, persuaded a listener to do something (e.g., switch work shifts). To assess content, their transcripts were analyzed for macrostructure elements (Heilmann et al., 2020). To assess manner of delivery, a listener rated participants' confidence, body language, and tone of voice. To assess convincingness, another listener rated how convinced they were to make the proposed change.

The two groups did not differ significantly on content, manner of delivery, or convincingness scores. Across all participants, manner of delivery (but not content) positively and significantly predicted convincingness. The relationship between manner of delivery and convincingness differed significantly between the two groups: for the non-autistic group, higher manner of delivery scores resulted in the listener being more convinced, possibly due to following neurotypical or 'standard' ways of speaking. However, for the autistic group, manner of delivery scores were unrelated to how convinced the listener was.

This study informs us about the factors that may ultimately determine whether an adolescent can achieve their goals when interacting with peers.

Résumé

Développer des compétences persuasives peut être difficile pour les adolescent·e·s neurotypiques (Heilmann et al., 2020) et autistes. Ces dernier·ère·s ont produit moins d'arguments et de contre-arguments que leurs pair·e·s neurotypiques (To et al., 2016), suggérant que le *contenu* (ou la *macrostructure*) du discours persuasif serait peut-être affecté par l'autisme. Il est également important de prendre en compte la manière dont le discours est présenté (*force de présentation*), parce que pour un même discours persuasif, le contenu et la force de présentation peuvent susciter des impressions distinctes : les évaluateur·rice·s neurotypiques ont formé des premières impressions négatives des locuteur·rice·s autistes sur la base des clips audiovisuels, mais pas sur la base des transcriptions seules (Sasson et al., 2017). J'ai cherché à savoir si le contenu et la force de présentation jouaient un rôle dans la détermination à quel point l'auditeur était convaincu par l'argument pour apporter un changement proposé (*force de persuasion*) chez les adolescent·e·s autistes et non-autistes.

Vingt-sept adolescent·e·s francophones (11 autistes et 16 non-autistes), âgés de 14 à 19 ans, ont dû persuader une auditrice de faire quelque chose (par exemple, de changer de quart de travail). Afin d'évaluer le contenu, leurs transcriptions ont été analysées pour les éléments de macrostructure (Heilmann et al., 2020). Afin d'évaluer la force de présentation, une auditrice a évalué la confiance en soi, le langage corporel et le ton de la voix des participant·e·s. Afin d'évaluer la force de persuasion, un autre auditeur a évalué à quel point il était convaincu par le changement proposé.

Les deux groupes ne différaient pas significativement quant aux scores du contenu, de force de présentation ou de force de persuasion. Pour l'ensemble des participant·e·s, la force de présentation (et non le contenu) prédisait de manière positive et significative la force de persuasion. La relation entre la force de présentation et la force de persuasion différait

significativement entre les deux groupes : pour le groupe non-autiste, lorsque les scores de force de présentation étaient plus élevés, l'auditeur était plus convaincu, peut être en raison de la production de styles de discours neurotypiques ou 'standard'. Toutefois, pour le groupe autiste, il n'y avait pas de lien entre les scores de force de présentation et à quel point l'auditeur était convaincu.

Cette étude nous renseigne sur les facteurs qui permettent de déterminer si un·e adolescent·e peut atteindre ses objectifs lorsqu'il·elle interagit avec ses pair·e·s.

Acknowledgements

First and foremost, I would like to express my deep and sincere gratitude to my research supervisor, Dr. Aparna Nadig, for her invaluable support and guidance throughout my graduate studies. Dr. Nadig's mentorship contributed significantly to both my personal and professional development. She pushed me to excel through her trust, honesty, and commitment to both scientific rigor and to collaborative and inclusive research and spaces. I am honored to have had the opportunity to work with her. I would also like to thank my advisory committee members, Dr. Gigi Luk and Dr. Kristine H. Onishi, for their invaluable and insightful feedback that have pushed me to critically think and assess the research I conducted.

I would also like to thank the co-investigators of the larger project from which this thesis was based, namely, Dr. Mayada Elsabbagh, Dr. Gigi Luk, Dr. Elizabeth Allyn Smith, and Dr. Myriam L. H. Beauchamp. Their expertise and contributions to the larger project's research design were instrumental in shaping the foundation of this thesis.

I am grateful to have had the unwavering support and encouragement from my colleagues at the School of Communication Sciences and Disorders at McGill University, and in particular, my colleagues at the Psychology of Pragmatics Laboratory, Angela MacDonald-Prégent, Nariman Amantayev, and Kouro-Maïram Baro. Their willingness to share knowledge and their expertise, offer feedback, and lend a helping hand have made challenges surmountable and successes sweeter. They welcomed me with open arms at the beginning of my graduate studies, and continue to foster an uplifting atmosphere, both inside and outside of the department. I would also like to thank Angela MacDonald-Prégent and Kouro-Maïram Baro for their help in reviewing the French abstract of this thesis.

This thesis would not be possible without the help of the research assistants at the lab who contributed to data collection, namely, Suki Wang, Mélanie Côté, Dougo Coulibaly, and Ana Paquin Domingues. In particular, Ana Paquin Domingues played an instrumental role in transcribing and coding participants' persuasive language samples. Adriana Pavone and Justin Côté played an important role in providing their gut judgement ratings.

To my parents and brother, I am indebted to your unwavering confidence in my abilities and for your endless love, support, and sacrifices so that I am fortunate to have the opportunities I have today. My family and close friends have been my cheerleaders from 550 kilometers away, but I am fortunate that I could count on them and their support during the highs and lows of this journey. They have been a constant source of strength, motivation, and inspiration, and I am grateful for their presence in my life as I continue to grow and learn.

Contribution of Authors

The research presented in this thesis was conducted in the Psychology of Pragmatics Laboratory, directed by Dr. Aparna Nadig in the School of Communication Sciences and Disorders at McGill University. Dr. Nadig is the principal investigator of the larger project from which this thesis was based. The co-investigators include Dr. Mayada Elsabbagh, Dr. Gigi Luk, Dr. Elizabeth Allyn Smith, and Dr. Myriam L. H. Beauchamp. They secured research funding from the Social Sciences and Humanities Research Council of Canada (SSHRC). For the larger project, they conceptualized, created, and refined the research study and design; selected and adapted the measures; and identified the statistical tests and analyses that will be conducted.

Dr. Nadig supervised the conducted research and progress, and Dr. Gigi Luk and Dr. Kristine H. Onishi were members on my advisory committee, who all provided insightful feedback throughout the development of this thesis. I conducted literature searches to identify my research interests within the larger study. Once I conceptualized the thesis topic and formulated the research questions, I conducted an in-depth review of the existing literature. To address a gap in the literature, Dr. Nadig and I developed a new measure on listener perception of persuasive arguments. Dr. Nadig, Dr. Luk, Dr. Onishi and I determined how we would derive the independent and dependent variables. Their expertise, as well as that of Dr. Morgan Sonderegger, were sought to determine the best methods to conduct statistical analyses.

I, along with Nariman Amantayev (Ph.D. candidate), recruited and trained research assistants to administer the larger study's protocol to collect data from participants. We also led participant recruitment efforts.

I was responsible for scoring and entering the data relevant to this thesis. I conceptualized and documented the workflows needed to prepare participants' persuasive language samples to

be transcribed, coded, and rated. I trained research assistants on the transcription process, coding schemes and the rating measure. Ana Paquin Domingues was responsible for transcribing the persuasive language samples, and she and I coded them following a coding scheme. Adriana Pavone and Justin Côté rated the persuasive language samples. I wrote the R/RStudio code with Nariman's support and conducted data analyses. Dr. Nadig supported my interpretation and discussion of the results. I was also responsible for writing each section of this thesis, under the supervision of Dr. Nadig. I responded to Dr. Luk and Dr. Onishi's suggestions and feedback on the conducted research and the written thesis.

Preliminary findings from this thesis were presented at the following research conferences, for which, Drs. Beauchamp, Luk, Smith, Onishi, and Nadig provided feedback on the abstracts and poster presentations: School of Communication Sciences and Disorders (SCSD) Research Day in Montreal, Canada, held on February 23, 2024; Meeting on Language in Autism (MoLA) in North Carolina, USA, held on March 15, 2024; and Centre for Research on Brain, Language and Music (CRBLM) Symposium in Montreal, Canada, held on April 11, 2024.

List of Tables

List of Figures

List of Abbreviations

Abbreviation	Definition
AIC	Akaike information criteria
CELF-5-CDN-F	*Évaluation Clinique des notations langagières fondamentales- Cinquième édition : Version pour francophones du Canada* (Wiig et al., 2019)
ÉVIP	*Échelle de vocabulaire en images Peabody* (Dunn et al., 1993)
Leiter-3	Leiter International Performance Scale- Third Edition (Roid et al., 2013)
LSBQ	Language and Social Background Questionnaire, adapted from Anderson et al. (2018), Rideout and Robb (2019) and Lu et al. (2019)
MS Transcribe	Microsoft Transcribe
NVIQ	Nonverbal IQ
PSS	Persuasive Scoring Scheme (Heilmann et al., 2020)
RA	Research assistant
SCQ	Social Communication Questionnaire (Rutter et al., 2003)
SRS-2	Social Responsiveness Scale, Second Edition (Constantino, 2012)

Notes on Terminology

I would like to make a note on the terminology used in this thesis. I applied the framework of the neurodiversity paradigm, which, according to Walker (2014), views the range of differences in neurocognitive functioning as part of natural human diversity, as cited in Milton et al. (2020). This includes both neurodivergent people, defined as those "with a condition that renders their neurocognitive functioning significantly different from a 'normal' range", and neurotypical people, defined as those "within a socially acceptable range" (Kapp, 2020, p. 2).

This thesis focused on both the autistic and non-autistic communities. As I am not autistic, I defaulted to self-advocates and research informed in collaboration with autistic individuals for the language to use. Following the recommendations on the use of terminology for autism (Botha et al., 2023; Bottema-Beutel et al., 2021; Canadian Autism Spectrum Disorder Alliance, 2020), I used identity-first terms (e.g., *autistic person*) or neutral terms (e.g., *person on the autism spectrum*), as opposed to person-first language (e.g., *person with autism*).

I used the term *neurotypical* to refer to participants in comparison groups when reviewing studies to reflect the authors' screening procedures, as well as to refer to the larger population for which I had no specific profile in mind. I used the term *non-autistic* to refer to participants in this thesis. This included participants with an absence of any diagnosis, including autism, and those who were neurodivergent in ways other than autism, such as reporting an ADHD diagnosis.

My language choice aligned with the framework of the neurodiversity paradigm and considered autistic perspectives and the implications of such choices for inclusivity and representation. I adopted an anti-ableist stance with the aim of reducing stigmatization, misunderstanding, and exclusion of autistic people and to improve inclusivity and accessibility in research.

1.0 Introduction

Adolescence is an important developmental stage in which individuals experience psychological and social transformations. Adolescents' sense of identity matures, and they establish and build deeper and higher-quality relationships with their peers. At the same time, adolescents are especially sensitive to peer acceptance, rejection, and approval. To avoid social exclusion, adolescents may be pressured to not only avoid peer rejection, but to pursue and seek peer acceptance and approval as well (Orben et al., 2020). For example, they may need to convince their peers for an invitation to attend a social event or party. To do so, they will need to draw on their social communication skills and persuasive skills. The influence will flow bidirectionally when the adolescent first intends to alter their peers' thoughts, and their responses, in turn, affect the adolescent's subsequent persuasive attempts (Prislin, 2010). Persuasion, or persuasive discourse, is the use of argumentation to convince another person to change their behaviours or to accept the point of view desired by the persuader (Nippold, 2007; Rocklage et al., 2018), and may include elements such as the identification of an issue and a desired change, supporting reasons, counterarguments, compromises, and a conclusion (Heilmann et al., 2020).

Persuading others is an undeniably complex skill to learn and to execute. These skills begin early in typical development and become more refined in adolescence (Heilmann et al., 2020). However, developing such skills can be difficult for adolescents on the autism spectrum who have challenges with social communication, such as the appropriate use and interpretation of nonverbal cues and facial expressions, or engagement in reciprocal conversations, both of which are necessary to achieve effective persuasion. Indeed, autistic adolescents' persuasive discourse has been found to contain fewer supporting arguments and counterarguments than that

of their neurotypical peers (To et al., 2016), suggesting that the *content* (or *macrostructure*) of persuasive discourse may be affected by autism. However, not only is the content of persuasive discourse important, but it is also important to consider the way the discourse is presented (*manner of delivery*). Content and manner of delivery may lead to different impressions: neurotypical raters did not distinguish between autistic and neurotypical speakers based on transcripts of their persuasive discourse (i.e., content). However, when given audiovisual clips (i.e., access to both content and manner of delivery), neurotypical raters had negative first impressions of autistic speakers (Sasson et al., 2017). It may be possible that content and manner of delivery extend to play a role in how convinced a listener may be to make a proposed change (*convincingness*) and thereby play a role in social interactions between autistic and neurotypical communication partners.

The background literature has analyzed persuasive discourse at two levels, namely, microstructure (within-sentence linguistic complexity and across-sentence measures) and macrostructure (the hierarchical organization of a discourse, both between sentences and over a whole discourse; also known as *content* in this thesis). A third level of analysis that has yet to be studied is that of listener perception. This level goes beyond analyzing discourse at the textual level, as do microstructure and macrostructure, to consider the listener's evaluation of the discourse or communicated message. In the context of persuasive discourse, this can be thought of as how convinced the listener was to make the proposed change (*convincingness*). This is important for not only the neurotypical population, but for the autistic population as well, as social communication breakdowns arise not only from language production abilities, but from the way autistic individuals are perceived by their communication partners as well.

To understand communication partners' perception, I expanded on prior work that has focused on analyzing discourse at the microstructure and macrostructure levels to analyze the proposed third level of listener perception, namely, how convinced the listener was to make the proposed change (convincingness). I did so by developing and including a rating measure that assessed the listener's perception (i.e., subjective gut feelings) of different aspects of the persuasive argument they heard and how convinced they were to make participants' proposed change. My first research question was: do the content, manner of delivery, and convincingness scores differ between autistic and non-autistic adolescents? My second research question was: how do content and manner of delivery compare in predicting convincingness? Does this relationship differ for autistic and non-autistic adolescents?

The first research question allows us to investigate and understand the differences in language production abilities between autistic and non-autistic adolescents. The second research question goes beyond understanding these potential differences in language production abilities to examine how persuasive arguments are perceived by the listener, ultimately highlighting the dyadic nature of social communication and the role of the listener. Understanding how content and manner of delivery compare in predicting convincingness allows us to determine whether one factor may be more important than the other, or whether both factors are important in order to successfully convince a peer. The factors that do predict convincingness may be the factors that warrant more attention and weight when both autistic and neurotypical adolescents learn about and develop their persuasive skills so that they may achieve their goals.

2.0 Background

2.1 Social communication skills in adolescents

Social communication refers to using language to interact with others in social situations (American Speech-Language-Hearing Association, 2023). According to the American Speech-Language-Hearing Association, in childhood, social communication skills allow individuals to establish friendships and to understand the unspoken rules of conversation. For example, when children engage in social communication with others, their appropriate use of pragmatic skills, such as responding promptly when spoken to and maintaining the conversation flow, can be related to one's popularity and likeability (Place & Becker, 1991). In adolescence, social communication skills are essential for outcomes including school success (Elliott et al., 2001; Hudry et al., 2010), friendship building, such as collaborating and working with peers (Mok et al., 2014), and psychosocial well-being (Anderson et al., 2007; Baghdadli et al., 2007). In adulthood, these skills are important for employability (Dillon et al., 2021; Simms & Jin, 2015) and independence (Coutinho et al., 2018). Social communication skills are therefore necessary for various life outcomes at all stages of development.

Prevalent in many domains of daily life, persuasion is a social communication skill in which children, adolescents, and adults all engage. Persuasion, or persuasive discourse, is the use of argumentation to convince another person to change their behaviours or to accept the point of view desired by the persuader (Nippold, 2007; Rocklage et al., 2018). Persuasive discourse may include elements such as the identification of an issue and a desired change, supporting reasons, counterarguments, compromises, and a conclusion (Heilmann et al., 2020). The influence flows bidirectionally when the persuader first intends to alter the listener's thoughts or behaviours, and

the listener's responses, in turn, affect the persuader's subsequent persuasive attempts (Prislin, 2010). Persuading a listener goes beyond asserting one's opinion. While asserting an opinion involves stating one's position clearly, it is more socially challenging (i.e., demanding) in that the persuader must advance their position to influence the listener's perceptions or actions to achieve convincingness. Advancing a position requires the persuader to engage with the listener's perspective, to provide compelling reasons, and to strategically address counterarguments. The increased demands require that the persuader engages in an interaction and adapts based on their listener's responses.

Adolescence is a period of development between the ages of 10 to 19 characterized by rapid physical, cognitive and psychosocial growth (World Health Organization, n.d.). During this developmental stage, peer interactions become an increasingly important part of daily life (Nippold, 2007) as adolescents spend more time with their peers and want to establish relations with them as equals (Fumero et al., 2021; Rubin et al., 2008). To establish such relationships, adolescents become more sensitive to peer acceptance, rejection, and approval than at any other developmental stage (Orben et al., 2020). To avoid social exclusion, adolescents may, for example, face social pressures to convince a peer to include them in their weekend plans. Adolescents are also negotiating their independence from their caregivers (Fumero et al., 2021), which may require them to, for example, persuade their caregivers to allow them to pursue a driver's license.

In comparison to expository discourse (which aims to inform the audience) and narrative discourse (which involves telling a story or a series of related events), adolescent persuasive discourse samples have been found to contain the greatest morphosyntactic complexity and expression of complex thoughts (Hill et al., 2021). Even with a growing complexity in the

language used, persuasive discourse is still a complex skill to learn and to execute. For example, persuasive discourse requires logical thinking and perspective-taking (Nippold, 2007), as well as the use of persuasive strategies such as justifying one's critiques, an area in which adolescents have had difficulty developing (Felton et al., 2015). My focus on adolescents' persuasive skills is therefore motivated by the demanding nature of persuasive discourse, the pressure to convince others to make social gains in adolescence, and the growing complexity in the language used when attempting to convince others.

2.2 Autism and the neurodiversity framework

The complex skill of persuading others is challenging not only for neurotypical adolescents, but for adolescents on the autism spectrum as well, as they experience social communication challenges. Specifically, autism is classified as a neurodevelopmental disorder that affects an individual's social and communication skills. It is diagnosed by a set of observable behaviours, as outlined in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2022). According to the American Psychiatric Association (2022), individuals on the autism spectrum have difficulties with social communication, social interaction, and communication skills, and exhibit repetitive, restricted, and stereotyped patterns of behaviours and interests in activities. These difficulties can impact school success, employment, social inclusion, and other domains (Kelly et al., 2018). It is important, however, to note that this definition of autism and the challenges autistic individuals face are clinical descriptions. A new framework, called the neurodiversity paradigm, seeks to change how we think about autism. Neurodiversity refers to variation in neurocognitive function, which includes those who are neurodivergent, defined as those "with a condition that renders their neurocognitive functioning significantly different from a 'normal' range", and those who are

neurotypical, defined as those "within that socially acceptable range" (Kapp, 2020, p. 2). In other words, neurodiversity is the range of differences in the way humans' brains work and their neurological makeup. Specifically, individuals take in and process information in different ways, and therefore, behave in different ways. Individuals' experiences of and responses to the world, in turn, also vary.

Within the neurodiversity paradigm, disability has been viewed as an interaction between the individual's characteristics and the environment around them. It can be addressed by reshaping environments and society (e.g., by working to reduce stigma) or by changing an individual (e.g., by teaching them adaptive skills), but the goal should not be to cure or to normalize the individual, as there is value in the diversity of minds and brains, and we should accept individuals with neurological disabilities for who they are (Dwyer, 2022).

Rather than viewing autism following the medical model of disability that seeks to diagnose an individual with core deficits, I follow the strengths-based social model of disability. This model is in line with the framework of the neurodiversity paradigm in that it focuses on how society, or the environment, can adapt to fit the needs of the individual (Fletcher-Watson, 2022). Consistent with the range of differences in the way brains work, autism presents heterogeneously with support needs varying across domains. For example, an individual may require more support to participate in unstructured recreational activities, but minimal support to complete academic work (Bottema-Beutel et al., 2021).

Similar to a wide range of support needs, autistic individuals have a broad spectrum of intellectual abilities (Mottron & Bzdok, 2020; Wolff et al., 2022). While it has been reported that 30% to 40% of those on the autism spectrum have an intellectual disability (Shenouda et al.,

2023), many have intellectual abilities in the normal range with an intelligence quotient[1] greater than 70 (Simms & Jin, 2015). Autistic individuals also have variable language abilities. Some autistic children may be minimally speaking (Norrelgen et al., 2015; Rose et al., 2016), which refers to the use of some words, but significantly fewer than expected, relative to one's age (Koegel et al., 2020). Most children on the autism spectrum acquire language during the preschool years (Anderson et al., 2007; Howlin et al., 2009), typically by five years of age (Volkmar et al., 2014), and then can have language abilities in the normal range (Kim et al., 2014; Kjelgaard & Tager-Flusberg, 2001). However, even those with language abilities in the normal range may have difficulties with aspects of daily life, including communication, and therefore, may still have difficulties with persuasive discourse. By virtue of my focus on persuasive discourse, participants must be able to provide a persuasive language sample. For this reason, I focused on speaking autistic adolescents.

2.3 Persuasive discourse in autistic and neurotypical individuals: the role of *content*

Prior work has examined speaking autistic and neurotypical individuals' expressive language samples and their ability to tell stories (narrative discourse), but to a lesser extent, both populations' ability to verbally make a persuasive argument (persuasive discourse). The background literature has analyzed persuasive discourse at two levels, namely, microstructure and macrostructure. Microstructure refers to both within-sentence linguistic complexity (e.g., the number of different words produced, and lexical-semantic and syntactic complexity) and across-sentence measures (e.g., appropriate use of referential terms). On the other hand, macrostructure

[1] Intellectual ability is measured by intelligence quotient as it is the best predictor of functional outcomes for autistic individuals (Shenouda et al., 2023).

emphasizes the hierarchical organization of a discourse, both between sentences and over a whole discourse, such as the coherent sequencing of information (Hill et al., 2021; Justice et al., 2006; McIntyre et al., 2020).

Among the few studies to my knowledge about persuasive microstructure, adolescents' persuasive language samples have been found to elicit complex syntax (Heilmann et al., 2020). Indeed, adolescents produced more clauses (and thus more complex syntax and sentences) in persuasive than in expository discourse (Brimo & Hall-Mills, 2019). This might have been observed because persuasive discourse requires the provision of more arguments than definitions of key terms or descriptions of concepts that would typically be seen in expository discourse. In addition, the nature of persuasive discourse (i.e., providing arguments) may elicit more complex sentences. For example, microstructural elements such as full propositional complement clauses (e.g., 'I think they're smart because they have good problem-solving skills') were provided by adolescents to support the expression of cause-and-effect relations (Brimo & Hall-Mills, 2019). In addition, mental state verbs may have been elicited to support the expression of the persuader's point of view (e.g., 'I think that having a part-time job is good to teach time management and responsibility'). Therefore, in order to provide a successful persuasive argument, which often includes macrostructural elements such as supporting reasons, microstructural elements and syntactic argument structures specific to persuasive discourse, may be elicited. This illustrates a varied repertoire of microstructural elements and syntactic argument structures that adolescents have used and are available to them when persuading a listener. Adolescents can employ these syntactic argument structures to clearly articulate and advance their position to achieve their goals. The variety of structures also allow adolescents to tailor

their messages specific to their goals and audiences, potentially increasing the likelihood for successful persuasion.

Successful persuasion may also be influenced by the quantity of language used. The number of total words, the use of certain word classes, and the number of supporting reasons has been found to increase with age in persuasive discourse, which can lead to increases in the number of words provided (Nippold et al., 2005). An increased quantity of words provided in persuasive discourse can allow the persuasive argument to be more comprehensive. This may involve elaborating on key points or providing ample evidence to lend to the credibility of the argument, ultimately increasing the likelihood that the persuader can successfully convince their listener. This further highlights the relationship between microstructure elements such as number of total words and number of different words, also referred to as *productivity* (Justice et al., 2006) and macrostructure elements (e.g., supporting arguments) in persuasive discourse. This is especially important given that prior work has recommended to consider and to analyze both microstructure and macrostructure in discourse (Karasinski, 2023).

In addition to analyzing persuasive discourse at the sentence level (microstructure), analyses can also be conducted at the next level, that is, of the organization of the whole discourse (macrostructure). Macrostructure differences have been found in children, adolescents and adults' persuasive language samples. Child participants provided one-sided arguments; adolescent participants expressed both sides of the argument; and adults provided not only supporting reasons and different points of view, but they even offered solutions to the problems they raised (Nippold et al., 2005). Adolescents' persuasive language samples were thus more sophisticated than that of child participants, and adults' persuasive language samples were more

sophisticated than that of adolescent participants, illustrating that macrostructure can get increasingly complex with age.

Microstructure and macrostructure complexity in persuasive discourse has been examined in the neurotypical population, but less research is available about microstructure and macrostructure complexity in the autistic population. Autistic individuals' social communication challenges may make it difficult for them to provide complex microstructure and macrostructure in their persuasive discourse. Indeed, autistic discourse has been found to contain less complex morphosyntax and syntactic structures (Peristeri et al., 2017) than their neurotypical peers. In addition, autistic individuals tend to perseverate on topics and misjudge the needs of their communication partner, according to Tager-Flusberg and Anderson (1991), as cited in McGregor et al. (2012). A simpler use of syntactic structures can impact autistic individuals' ability to employ, for example, full propositional complement clauses and to clearly articulate their supporting reasons. Moreover, difficulties with perseverance can impact the organization, sequence, and coherence of the persuasive argument. Finally, autistic individuals' misjudgement of the needs of their communication partner can impact how relevant the listener believes the persuasive argument may be for them, ultimately leading the listener to judge the persuasive argument to be less convincing.

To my knowledge, there is only one study that examined persuasive discourse in the autistic population. It is also one of the few studies that examined persuasive discourse at the macrostructural level. To et al. (2016) evaluated school-aged children, aged 7 to 12, on the autism spectrum and their neurotypical peers, matched on gender, age, and language skills (specifically, grammatical ability). Neurotypical adolescents provided numerous sophisticated persuasive strategies that addressed the listeners' concerns and provided appropriate

counterarguments. Autistic adolescents provided fewer supporting arguments or counterarguments, illustrating that the macrostructure (i.e., *content*) in persuasive discourse may be affected by autism. While these results can be attributable to difficulties in engaging in persuasive techniques, the absence of arguments in autistic individuals' discourse may also reflect the unique communicative style often associated with autism, which is characterized by directness, efficiency, and objectivity (Perry, 2022). Specifically, autistic individuals may prefer to streamline their persuasive discourse to convey only the essential information, omitting extraneous content such as emotional appeals, supporting details or alternative viewpoints that they perceive as unnecessary to achieve their goals. Therefore, a direct, efficient, and objective communicative style may be observed in autistic individuals' persuasive discourse and may explain the provision of fewer supporting arguments or counterarguments.

2.4 Social communication is a two-way street: the role of *manner of delivery* and the relevance of the *double empathy problem*

The limited background literature in persuasive discourse emphasizes how autistic adolescents typically perform worse than their neurotypical peers with respect to neurotypical expectations for persuasive discourse. However, it has been proposed that autistic individuals have a unique communicative style characterized by directness, efficiency, and objectivity (Perry, 2022). Understanding this unique communication style is essential, as it can not only affect and explain similarities and differences in the persuasive macrostructure provided by autistic individuals, but it can also shape how they're perceived by neurotypical listeners.

It has been reported that neurotypical individuals may have negative implicit social biases against autistic individuals, such that they judge autistic discourse to be far less favorable than

that of their neurotypical peers (Cage & Burton, 2019; Sasson et al., 2017). In the study conducted by Sasson et al. (2017), adult neurotypical raters watched neurotypical and autistic stimulus participants engaging in the High Risk Social Challenge Task (Gibson et al., 2010), where they performed a mock 45-second audition for a reality show and demonstrated (i.e., persuaded) why they should be chosen for the show. The neurotypical raters watched stimulus participants perform this task in various modalities: audio only (access to speech and conversational content only), visual only (observing movement and gestures only), audio-visual (access to speech, conversational content, movement and gestures), static image (of a participant sitting upright with their eyes open and not speaking or gesturing), or a transcript of the speech content. Crucially, adult neurotypical raters did not distinguish between autistic and neurotypical speakers based on transcripts of their persuasive discourse. However, when given audiovisual clips, neurotypical raters had negative first impressions of autistic speakers (Sasson et al., 2017), suggesting that the way in which the speech content was delivered (i.e., *manner of delivery*), rather than its content, drove the negative impressions formed. Therefore, evaluations of discourse can depend on the manner of delivery of an argument.

Moreover, both neurotypical and autistic raters formed less favorable impressions of autistic individuals' discourse competence in comparison to their neurotypical peers (Geelhand et al., 2021). Linguistic features related to discourse style, specifically, fluency, coherence, and pedantic style (i.e., manner of delivery), and structure, specifically, referential cohesion (i.e., content) both impacted these negative first impressions. Therefore, both content and manner of delivery, as illustrated by discourse structure (Geelhand et al., 2021), as well as presentation modality (Sasson et al., 2017) and discourse style (Geelhand et al., 2021), can contribute to neurotypical individuals rating autistic discourse to be less desirable.

Neurotypical individuals' negative implicit social biases of autistic individuals have been explained by researchers as being due to autistic individuals' social communication challenges. In the context of these interactions or relationships between autistic and neurotypical individuals, the root of any social communication breakdown has traditionally been assigned to the autistic individual. While autistic individuals' social communication difficulties may contribute to, they are not solely responsible for, social interaction breakdowns and its influence on forming and maintaining relationships. This is because communication is a two-way street, and it is important to consider the contribution of neurotypical individuals in shaping social interactions and relationships (Dwyer, 2022).

Undoubtedly, autistic and neurotypical individuals experience everyday norms and practices very differently and have different expectations from previous social experiences. For example, autistic individuals may find it exhausting and confusing to understand neurotypical ways of communicating, as, following the medical model of disability, they are often told to adapt their communication preferences to the neurotypical 'standard'. To a similar extent, neurotypical individuals might feel uncomfortable around autistic individuals because their usual ways of communicating don't work well. This mismatch between social expectations and experiences can lead to communication breakdowns between autistic and neurotypical communication partners, making it more difficult for them to connect, share experiences, and empathize with each other. Such a breakdown in mutual understanding has been referred to as *the double empathy problem*, in that, building understanding and empathy is a double problem—both autistic and neurotypical individuals struggle to understand each other's thoughts, feelings, behaviour, and differences (Crompton et al., 2021). In other words, autistic people have trouble understanding and empathizing with neurotypical people, and vice versa (Dwyer, 2022), thereby

making the problem mutual. While the double empathy problem can be applied to any two people, it occurs more commonly between autistic and neurotypical individuals, as mutual understanding is often already established between dyads who share the same neurotype (e.g., interactions between two neurotypical individuals or between two autistic individuals).

Understanding the ways that autistic and neurotypical individuals communicate and interact can help both communication partners better understand each other. This may help autistic individuals feel more at ease when spending time with neurotypical friends and family, which can extend to interactions with educators, physicians, and employers. It may also help mitigate neurotypical individuals' tendency to make negative assumptions about autistic individuals.

As disability can be viewed as an interaction between the individual's characteristics and the environment around them, I focused on how the environment can be shaped. One way of doing this is by changing how neurotypical individuals perceive their autistic communication partners, which, in turn, can reduce the negative implicit social biases observed in the literature. Before being able to change these perceptions, insight is needed as to how neurotypical individuals can better understand and empathize with their autistic communication partners. In the context of my thesis, I proposed a level of analysis called *listener perception* that may provide such insight. Through persuasive discourse, I examined how convinced neurotypical listeners were to make the change (i.e., their perception of convincingness), proposed by autistic and non-autistic participants. By doing so, insight was gained as to what factors (e.g., content and manner of delivery) drew neurotypical listeners to be more convinced, and whether different patterns of contribution (between content and manner of delivery) exist for autistic and non-autistic participants. This analysis goes beyond the existing literature that focused on differences

in language production abilities to highlight the role of the listener. Specifically, identifying the factors that led individuals to be more convinced can provide the opportunity for neurotypical listeners to learn about autistic communication preferences. This understanding can help them adapt to their autistic communication partners to ultimately promote mutual understanding.

2.5 Listener perception as a new level of analysis (*convincingness*)

As seen from the background literature, persuasive discourse has been analyzed at the first level, microstructure, and at the second level, macrostructure. A third level of analysis that has yet to be studied is that of listener perception. This level goes beyond analyzing discourse at the textual level, as do microstructure and macrostructure, to consider the listener's evaluation of the discourse or communicated message. In the context of persuasive discourse, this can be thought of as how convinced the listener was to make the proposed change (*convincingness*). For example, the ways in which a listener perceives the content of the persuasive argument (e.g., strong supporting reasons and evidence; relevance to the listener; credibility), as well as how it is delivered (e.g., use of voice and body language) can be important for how convincing the persuasive argument is and for any social gains that can occur.

A few studies provide evidence to support the claim that the manner of delivery of persuasive discourse is important for convincingness. In persuasive discourse, prosody (the suprasegmental acoustic features of speech, namely, pitch, loudness, voice quality and rhythm, that speakers modulate, intentionally or not, to express meanings, emotions, and attitudes in their voice) can 'tag' verbal information as important and increase the speaker's convincingness, even if the content of the argument is not credible, illustrating the importance of manner of delivery for convincingness (Mauchand & Pell, 2021). In addition, when one attempts to persuade a listener, modulating one's voice using prosody influences listeners' attitudes and choices.

Specifically, when persuaders speak louder and vary their volume during a persuasive argument, the persuader is perceived to be more confident, as it signals that they more strongly endorse the stance they take, which in turn, can facilitate convincingness (Van Zant & Berger, 2020). To a similar extent, participants' decisions to trust a persuader have been found to be modulated by the speaker's confident tone of voice (Jiang et al., 2020), in comparison to a doubtful or a neutral voice (Caballero & Pell, 2020).

I expanded on prior work that has examined persuasive discourse at the microstructure and macrostructure levels to analyze the third level of listener perception. In the context of persuasive discourse, this can be thought of as how convinced the listener was to make the proposed change (*convincingness*). I did so by developing and including a rating measure where neurotypical listeners rated how convinced they were to make the proposed change, as desired by both autistic and non-autistic participants. This allowed me to highlight the role of the neurotypical listener in adapting to others (in the context of my thesis, autistic and non-autistic adolescents) and to consider how factors such as content and manner of delivery can contribute to convincing a listener. These factors can determine whether an adolescent is able to achieve their goals when interacting with peers.

3.0 Rationale, aims, and hypotheses

Adolescence is an important developmental stage in which individuals risk being vulnerable to social exclusion. To avoid this, adolescents may face social pressures to convince their peers to make social gains. To do so, they will need to draw on their social communication skills and persuasive skills. While persuasive skills can be challenging for neurotypical adolescents to learn and to execute, it can be especially challenging for autistic individuals due to

their challenges in social communication. For example, after an autistic individual made their first persuasive attempt, they will need to interpret their listener's nonverbal cues and to take this into consideration when making their next persuasive attempt. Difficulties interpreting such cues may make it challenging for the autistic persuader to address the needs of the listener (e.g., the listener indicated through nonverbal cues that they're not convinced and need more supporting reasons or evidence).

Prior work has shown that the content of persuasive discourse is integral (Geelhand et al., 2021; Heilmann et al., 2020). In addition, various factors, such as manner of delivery, contribute to neurotypical individuals rating autistic persuasive discourse to be less favorable than that of their neurotypical peers (Sasson et al., 2017). The patterns of contribution for both content and manner of delivery in persuasive discourse may differ between autistic and non-autistic adolescents. These different patterns of contribution may drive different impressions of how convinced a listener will be to make a proposed change. To investigate this, I examined how the content and manner of delivery of adolescents' persuasive discourse contribute to how convinced the listener was to make the proposed change (convincingness). Specifically, my first question was: do the content, manner of delivery, and convincingness scores differ between autistic and non-autistic adolescents? My second question was: how do content and manner of delivery compare in predicting convincingness? Does this relationship differ for autistic and non-autistic adolescents?

For the first question, I hypothesized that the persuasive discourse's content would be less complex for autistic participants than non-autistic participants, as the comparison group in the study conducted by To et al. (2016) provided multiple persuasive strategies that addressed the listeners' concerns and they provided appropriate counterarguments, relative to the autistic

group, who provided fewer supporting arguments and counterarguments. This hypothesis can be explained by autistic individuals' discourse tending to be directed and efficient (Perry, 2022). They may prefer to convey only the essential information in their persuasive discourse and omit extraneous content such as emotional appeals, supporting details or alternative viewpoints (Grossman et al., 2019) that they perceive as unnecessary to achieve their goals.

Moreover, I predicted that the neurotypical raters in the study would rate manner of delivery less positively in autistic participants, relative to non-autistic participants. This is because prior work has found that neurotypical individuals have more negative implicit social biases towards autistic individuals (Cage & Burton, 2019; Sasson et al., 2017), and manner of delivery, rather than content, has been found to drive the negative impressions formed (Sasson et al., 2017). This hypothesis can be explained by the prevalence of neurotypical communication patterns. Specifically, as there is a higher proportion of neurotypical individuals relative to autistic individuals, both neurotypical and autistic individuals may interact with neurotypical communication partners more than autistic communication partners. Irrespective of personal or individual communication preferences, these interactions with predominantly neurotypical individuals may expose others to neurotypical communication patterns. These patterns are often perceived as the norm due to their prevalence and familiarity. As individuals tend to favor what is most familiar to them (Montoya et al., 2017), neurotypical communication patterns might be perceived to sound better, and consequently, may be rated higher. For this reason, I predicted that non-autistic participants' manner of delivery would be rated more positively. In contrast, as the raters in the study are neurotypical, it may still hold that they interact with neurotypical communication partners more than autistic communication partners. As a result, autistic communication patterns may not be perceived to be the norm for these neurotypical raters due to

their low prevalence and familiarity. Consequently, autistic communication patterns may be perceived to be different from the expected norm and may be rated lower. For this reason, I predicted that autistic participants' manner of delivery would be rated less positively.

Finally, I predicted that autistic adolescents' persuasive discourse would be judged to be less convincing than non-autistic adolescents. There has not been any prior work examining convincingness as an outcome variable. Instead, prior work has focused on examining social evaluation (e.g., likeability, awkwardness) as an outcome, such that it has been rated less positively in autistic individuals in comparison to neurotypical individuals (Sasson et al., 2017). Social evaluation and convincingness may be closely related, as positive judgements about an individual's credibility, trustworthiness and likeability, for example, can impact how convinced a listener may be (e.g., a persuader may be more convincing because their listener perceives them as reliable, knowledgeable, and credible). Given this potential relationship between social evaluation and convincingness, I expect to find a similar result to that reported in Sasson et al. (2017), in that, autistic adolescents' persuasive discourse would be judged to be less convincing than that of non-autistic adolescents.

For the second question, I predicted that manner of delivery, but not content, would play a more important role in how convinced the listener was to make the proposed change for autistic adolescents, relative to non-autistic adolescents. While prior work has not examined convincingness and how content and manner of delivery may contribute to it, prior work has shown that the way in which speech content was delivered (i.e., manner of delivery), rather than content, drove neurotypical raters to have negative first impressions of autistic speakers (Sasson et al., 2017). This prior work, while examining social evaluation as an outcome rather than persuasive discourse, informed my hypothesis. An explanation for this hypothesis is that the

listener judging the convincingness of participants' persuasive discourse is neurotypical, and they may still be concerned with (i.e., expect, or be biased towards) neurotypical social and communication norms (Zamzow, 2021). Norm violations may affect convincingness by creating a sense of unfamiliarity or discomfort for the listener, which can undermine the persuader's perceived credibility, trustworthiness, or competence, making the persuasive discourse less convincing.

My thesis contributes to understanding the ways that both autistic and non-autistic individuals communicate and how their communication is perceived by listeners. Specifically, I investigated the role of content in persuasive discourse and its manner of delivery in convincing a peer listener. The prior literature, which has focused on differences in language production abilities between autistic and non-autistic youth, can be viewed as following the medical model of disability. In contrast, I attempt to lay the basis for a different line of investigation that focuses on how autistic and non-autistic adolescents' persuasive arguments are perceived by the listener, highlighting the dyadic nature of social communication. This aligns more with the social model of disability, where the environment (in the case of my thesis, the listener) can adapt to fit the needs of the individual. Insights gained from this analysis about how content and manner of delivery contribute to convincing a listener can allow us to promote effective communication and mutual understanding between communication partners. Specifically, better communication could be promoted by educating individuals, such as neurotypical listeners, about differences in the content and manner of delivery in autistic discourse. By promoting better communication through such education, we can increase mutual understanding between communication partners so that adolescents can achieve their goals when interacting with peers.

4.0 Method

4.1 The larger study

The data collected and reported in this thesis are part of a larger study that examines French language development, cognitive development, and well-being in multilingually-exposed neurotypical and autistic adolescents. A portion of the sample included children previously tested at school age, ranging from 5 to 10 years old. However, longitudinal data and analyses were not the focus of this thesis. In the larger study, adolescent participants attended two separate two-hour visits, spaced two weeks apart. All tasks and measures from which data were collected and reported in this thesis, including a persuasive argument elicitation task and a listening rating measure, were administered in the first visit. The data collected in the second visit were not reported in this thesis. Adolescent participants' caregivers also participated in the larger study. They completed a total of four questionnaires online, either in person on an electronic device if they accompanied their adolescent to the laboratory, or using a personalized link sent to their emails that they completed on their own time.

Ethics approval was given by the McGill University Research Ethics Office (Institutional Review Board). Given that participants were at least 14 years old, under the consent law for medical decisions in Quebec, participants provided written consent for their own participation in the first visit and before the study's protocol was administered. Consent from participants' caregivers were not required.

To thank participants for their time and contribution, each adolescent participant received a $25 gift card of their choice at the end of each visit. Caregiver participants received a $15 gift card of their choice upon completing all four questionnaires. It was distributed to the caregiver at

the end of the adolescent's visit, or it was distributed electronically via email if they completed the questionnaires on their own time. Depending on the mode of transportation, public transportation passes or parking passes were given out to the adolescent and caregiver participants to reimburse them for their travel.

4.2 Participants

Thirty-one adolescents participated in the study at a university laboratory in Montreal, Canada. The inclusion criteria for all participants were to be between 14 and 19 years old; able to complete the study protocol in French; have nonverbal intelligence scores equal to or greater than 70 on the Leiter International Performance Scale- Third Edition (Leiter-3; Roid et al., 2013); and an absence of physical disabilities that would interfere with completing the study procedures.

While Montreal is a multilingual city, all public education, including English-language schools, involves significant French language instruction, as it is the official and majority language of the province. Therefore, French was the common language of the sample, and it was the language in which the participants were tested. Participants living in Francophone households, as well as households where the home language was a language other than French (i.e., minority language speakers of English, Spanish, or Arabic, for example), were included. Participants reported using French in their daily life from 42% to 92% of the time. Of note, the entire sample reported speaking at least two languages with many participants speaking three or more languages.

The initial aim of the larger study was to recruit both neurotypical and autistic adolescents. However, from the 31 participants with available data, 14 participants (45%) had diagnoses other than autism by caregiver report, such as ADHD and dyslexia. For this reason, the

term *non-autistic* was appropriate and used for this group. As outlined below, it was ensured that the autistic group met criteria for current reciprocal social behaviour symptoms that are in the clinical range, while the non-autistic group did not, making the two groups distinct with respect to autism symptomology. Group membership was operationalized as follows.

To be included in the autistic group, adolescents' caregivers reported that the adolescent had an autism diagnosis. Following this, autism diagnosis was confirmed using the Social Responsiveness Scale, Second Edition (SRS-2; Constantino, 2012), where a *T*-score of 60 and above indicated current reciprocal social behaviour symptoms that are clinically significant. For any participants who did not meet this criteria (n = 3; e.g., those with scores of 58 or 59, just below clinically significant), autism diagnosis was confirmed using Social Communication Questionnaire (SCQ; Rutter et al., 2003) scores, which reflect social communication symptoms in early development, using the adapted[2] cut-off score of 11 or above (Moody et al., 2017; Schendel et al., 2012; Wiggins et al., 2015). When these criteria were met, participants were assigned to the autistic group.

To be included in the non-autistic group, adolescents' caregivers reported that the adolescent had no autism diagnosis. However, they may have reported other developmental disabilities. Participants' non-autistic group membership was first confirmed with their SRS-2 *T*-score, which had to be 59 or below (in the typical range) to differentiate them from autistic participants with respect to reciprocal social interaction symptoms. Participants' non-autistic

[2] Prior research conducted by Allen et al. (2007) and Barnard-Brak et al. (2016) have shown that scores of 11 and above are appropriate for populations with fewer support needs and in populations with older individuals (i.e., secondary school-aged individuals), as cited in Higgins et al. (2023), which was the case for our sample. Although scores of 15 or above on the SCQ are consistent with an autism diagnosis, lower cut-off scores are recommended based on age and purpose, and in combination with other measures (Corsello et al., 2007), which was the case with the tiered approach in operationalizing group membership.

group membership was then confirmed with their SCQ score, which had to be 10 or below. When these criteria were met, participants were assigned to the non-autistic group.

From the 31 participants with available data, one participant was excluded because they did not meet criteria for membership in either group. Another participant was excluded as they did not complete the persuasive argument elicitation task. With respect to expressive French grammatical ability, measured using the *Construction de phrases* subtest (Sentence Assembly; CELF-5-CDN-F; Wiig et al., 2019), and self-report percentage of French usage in the community on the Language and Social Background Questionnaire (LSBQ), adapted from Anderson et al. (2018), Rideout and Robb (2019) and Lu et al. (2019), two participants were two standard deviations below the mean on expressive French grammatical ability, and had the lowest percentages of French usage in the community. Given these two participants' low expressive French grammatical ability and French usage in the community, they were removed from analyses. Of the four participants who were excluded, two were autistic, one was non-autistic, and one was not assigned a diagnostic group because they did not meet the criteria for either group. Consequently, the analysis sample included twenty-seven (11 autistic and 16 non-autistic) adolescents who were 14 to 19 years old.

Of these 27 adolescent participants, the caregivers of 10 autistic and 15 non-autistic adolescent participants completed the questionnaires, for a total of 25 caregiver participants. There is missing data from two caregivers: one for an autistic adolescent participant and another for a non-autistic adolescent participant. For the two participants without SRS-2 *T*-scores and SCQ scores, group membership relied on caregivers' reports at intake regarding a presence or absence of an autism diagnosis.

4.3 Measures

4.3.1 Language and Social Background Questionnaire (LSBQ)

The Language and Social Background Questionnaire (LSBQ) was adapted from the questionnaires developed by Anderson et al. (2018), Rideout and Robb (2019) and Lu et al. (2019). It was adapted with the larger study's sample in mind, namely, speakers of French in Montreal, Quebec. The LSBQ is a 16-item self-report questionnaire administered on Qualtrics that asked participants about their demographic information (e.g., current gender identity, visible minority status, current grade at school), the languages they speak, the individual and community contexts in which they speak French, and how often they do so. It takes approximately 10-15 minutes to complete the questionnaire.

A total of three variables were derived from the LSBQ. The first variable pertained to participants' current gender identity. Participants were asked to indicate their current gender identity with the following options: 1) Female or feminine; 2) Male or masculine; 3) Non-binary; 4) Other (please describe below); and 5) Prefer not to disclose. If participants selected the fourth option, a text box was available for them to provide further details about their current gender identity. The variable was expressed as a proportion of the sample that identified as being male or masculine. The second variable pertained to participants' visible minority status. Participants were asked whether they were a visible minority and could select yes or no. The variable was expressed as a proportion of the sample who identified as a visible minority.

The third and key variable derived from the LSBQ was the percentage of French usage (the majority language) across 5 domains in the community, which ranged from 42% to 92%. To obtain the percentage of French usage in the community, participants were asked to 'indicate which language [they] generally use in the following situations, choosing between French or any

other language(s): 1) at home; 2) at school or doing school work outside of school; 3) work (e.g., part-time job); 4) social activities outside of school (e.g., hanging out with friends, hobbies, sports, volunteering, activities with a religious or cultural group); and 5) community activities (e.g., shopping/ going to restaurants/ using health or social services)'. For each domain (i.e., at home; at school or doing school work outside of school; at work; participating in social activities outside of school; and participating in community activities), participants could respond with either 'N/A' (score of 1), 'only other languages' (score of 2), 'mostly other languages' (score of 3), 'half French, half other language' (score of 4), 'mostly French' (score of 5), or 'only French' (score of 6). If participants responded with 'N/A', both the score and the domain were not considered in the calculation of the overall (i.e., mean) amount of French usage across all domains in the community, expressed as a proportion. The proportion was subsequently converted into a percentage to facilitate the interpretation of the results. This third variable from the LSBQ was used to ensure that participants in the sample had sufficient French usage to provide a persuasive language sample and to ensure that low French usage did not impact their ability to do so.

4.3.2 *Échelle de vocabulaire en images Peabody* (*ÉVIP*)

French receptive vocabulary was measured using the *Échelle de vocabulaire en images Peabody* (*ÉVIP*; Dunn et al., 1993). It is the French adaptation of the Peabody Picture Vocabulary Test- Revised. Despite the availability of the *Échelle de vocabulaire en images Peabody—Cinquième édition : Version pour francophones du Canada* (PPVT-5-CDN-F), the ÉVIP was selected because it was used at the previous time point when children were tested at school age in the larger study. As the larger study will conduct analyses to examine French language development over time from childhood to adolescence, including French receptive

vocabulary, the same measure was administered in both childhood and adolescence to ensure continuity.

Each item on the ÉVIP involves four black and white pictures, presented all on the same stimulus sheet. The participant picked one of the four pictures that best illustrated the word provided to them orally by the examiner. It takes approximately 8 to 15 minutes to administer. The test was normed with a sample of 2038 individuals for Canadian participants between 2.5 to 18 years old whose first language is French. Participants' raw scores can range from 1 to 170 and were used to describe the sample's French receptive vocabulary.

4.3.3 Leiter International Performance Scale- Third Edition; Leiter-3

The Leiter International Performance Scale- Third Edition (Leiter-3; Roid et al., 2013) assesses cognitive functions in children, adolescents, and adults from ages 3 years to 75+ years. The Leiter-3 consists of two batteries, namely, the Cognitive Battery and the Attention/ Memory Battery. The purpose of administering the Leiter-3 was to obtain a measure of cognitive ability, which can be captured with an estimate of nonverbal IQ (NVIQ). The estimate provides an indication of a participant's fluid reasoning (Western Psychological Services, n.d.) and visual-spatial processing. The nonverbal IQ estimate can be obtained by administering the Cognitive Battery alone. As the Attention/ Memory battery did not have to be administered in order to calculate nonverbal IQ, it was not administered in the larger study.

Of the five subtests in the Cognitive Battery, only four were administered, as the fifth was optional and not required to calculate nonverbal IQ. The subtests assess nonverbal IQ related to visualization and reasoning, and it can be administered in 45 minutes. Participants identified hidden figures or designs within a complex stimulus; recognized a 'whole object' from a randomly displayed array of its fragmented parts; categorized objects or geometric designs and

identified matrix analogies; and ordered pictorial or figural objects in a logical progression/ order. The nonverbal IQ estimate was calculated from the sum of the four subtests' scaled scores. The Leiter-3 was normed with a sample of 1603 individuals in the United States. Across all subtests, participants' raw scores can range from 30 to 170 and were used to describe the sample's nonverbal IQ.

4.3.4 *Construction de phrases* (Sentence Assembly)

Construction de phrases (Sentence Assembly) is a subtest in the *Évaluation Clinique des notations langagières fondamentales- Cinquième édition : Version pour francophones du Canada* (CELF-5-CDN-F; Wiig et al., 2019). It is the French adaptation of the Clinical Evaluation of Language Fundamentals- Fifth Edition. The language structure subtest assesses expressive French grammatical ability and participants' ability to produce sentences that are grammatically correct, using a variety of syntactic elements. Participants were shown disarranged words and phrases and were required to rearrange them to produce two semantically and syntactically correct sentences for each item to receive one point. To do so, participants manipulated, assembled, and used syntactic structures such as prepositional phrases, negatives, direct and indirect objects, subordinate clauses, relative clauses, and many others. The measure is used for children and adolescents between 9 to 16 years old and it was administered electronically using an iPad. It takes 11 to 15 minutes to administer. As the participants in the sample fall outside of this age range, rather than using scaled scores, participants' raw scores are used, which can range from 0 to 20. The raw scores were used to ensure that the participants in the sample had sufficient expressive French grammatical ability to provide a persuasive language sample and to ensure that low scores did not impact their ability to do so.

4.3.5 Social Responsiveness Scale, Second Edition (SRS-2)

The Social Responsiveness Scale, Second Edition (SRS-2; Constantino, 2012) provides a continuous measure of social functioning rather than a categorical indication of a presence or absence of autism. It can capture and identify autistic individuals with mild support needs in reciprocal social behaviour and non-autistic individuals who have social difficulties. While there is a teacher rating scale, only the caregiver rating scale was administered. Caregivers responded to 65 items on a 4-point Likert scale (1= not true, 4= almost always true) on Qualtrics. The questionnaire was translated to French in the Psychology of Pragmatics Laboratory with the help of native Quebec French speakers. The SRS-2 was normed with a sample of 1906 individuals in the United States. The raw scores from the SRS-2 were converted to gender-normed *T*-scores, where a *T*-score of < 59 is in the normal range, 60 to 75 is considered to have mild-to-moderate support needs in reciprocal social behaviour, and > 75 is considered to have high support needs in reciprocal social behaviour (Gergoudis et al., 2020). The gender-normed *T*-scores from the SRS-2 were used to assign participants to the autistic or non-autistic diagnostic group.

4.3.6 Social Communication Questionnaire (SCQ)

The Social Communication Questionnaire (SCQ; Rutter et al., 2003) is a 40-item caregiver-report questionnaire that asks yes/no questions about social, communication, and restricted interests or repetitive behaviors that are often found in autistic individuals. It takes 10 minutes to complete on Qualtrics and it was designed as a questionnaire adaptation of the Autism Diagnostic Interview- Revised (Rutter et al., 2003), which is a 90-to-150-minute standardized interview used to diagnose autism and to differentiate it from other developmental disorders. There are two versions of the SCQ, called the Lifetime version and the Current version. The French adaptation of the Current version was employed, which asked about the current

difficulties (within the last 3 months) that a participant may face. SCQ raw scores, which can range from 0 to 39, were used to confirm autism diagnosis and to assign participants to the autistic or non-autistic groups only when participants' SRS-2 *T*-scores were just below clinically significant (i.e., those with a score just below 60, such as those with scores of 58 or 59). According to the original assessment, a score of 15 or higher is consistent with an autism diagnosis. However, I used an adapted SCQ cut-off score of 11 or above to assign participants in the autistic group, and a cut-off score of 10 or below to assign participants in the non-autistic group, for the reasons specified in Section 4.2.

4.3.7 The persuasive argument elicitation task and the Persuasive Scoring Scheme (PSS)

A persuasive argument elicitation task, adapted from Heilmann et al. (2020), was used to collect a persuasive language sample (see Appendix A for the exact protocol that was administered). Participants picked one of three social scenarios presented to them and were told to persuade a peer (a similar-aged research assistant) to do something (e.g., switch shifts with them at a part-time job). They were given five minutes to prepare their persuasive argument and they were given a planning sheet (see Appendix B) to help them. The persuasive argument was told to a research assistant (RA), who acted as the peer that the participant tried to convince. The task was video recorded and audio recorded to allow subsequent transcription and to allow nonverbal communication to be coded, such as the listener's head nodding.

While the persuasive argument elicitation task generated a persuasive language sample and its transcript, the latter was used to analyze the content of the persuasive language sample. Specifically, the content was coded and analyzed by research assistants naïve to participants' diagnostic group using a scoring scheme developed by Heilmann et al. (2020), called the

Persuasive Scoring Scheme (PSS). The PSS evaluates the presence and complexity of 7 macrostructure elements, namely, the identification of an issue and a desired change; supporting reasons; other points of view (counterarguments); compromises; conclusion; cohesion; and effectiveness (see Appendix C). Each element receives a scaled score from 0 to 5, resulting in a PSS composite score that can range from 7 to 35. It takes approximately 30 minutes to code the content of the persuasive language sample using the Persuasive Scoring Scheme.

However, in my analyses, only six of the seven macrostructure elements of the Persuasive Scoring Scheme were used to produce the PSS composite score. The effectiveness element of the scoring scheme was removed, as it was a summary score that went beyond the content/ macrostructure of a persuasive language sample and included criteria that pertained to its manner of delivery as well. Consequently, the *content* variable was a PSS composite score that ranged from 6 to 30. It was the sum of the following Persuasive Scoring Scheme elements: the identification of an issue and a desired change; supporting reasons; other points of view (counterarguments); compromises; conclusion; and cohesion. This approximated to a better measure of content.

4.3.8 Listener ratings measure

A listener ratings measure was developed in the Psychology of Pragmatics Laboratory at the School of Communication Sciences and Disorders at McGill University, under the supervision of Dr. Aparna Nadig. The persuasive argument elicitation task generated a persuasive language sample from the participant, whereby its transcripts were analyzed to derive a measure of content using the Persuasive Scoring Scheme. In contrast, the listener ratings measure is an 8-item questionnaire that assessed the listener's perception (i.e., subjective gut feelings) of different aspects of the persuasive argument they heard. These items pertained to the

clarity of the argument, convincingness, confidence, body language, tone of voice, and register appropriateness. The measure was added to the end of the persuasive argument elicitation task protocol and was completed for the first time by the research assistant who acted as the peer that the participant tried to convince.

Two additional research assistants were recruited to watch video recordings of the persuasive argument elicitation task. Unlike the research assistant who acted as the peer that the participant tried to convince during the persuasive argument elicitation task, these two additional research assistants (each of which can also be referred to as the *listener*) were naïve to participants' diagnostic group and were not involved in testing any of the participants. They completed a subset of questions on this measure using a 5-point Likert scale (see Appendix D). One listener (Rater 1) completed items 4 to 6 pertaining to confidence, body language, and tone of voice. These items were summed to produce the *manner of delivery* variable, which can range from 3 to 15. A second listener (Rater 2) only completed item 2, which asked the listener how convinced they were to make the proposed change. The ratings on this item, which can range from 1 to 5, gave rise to the *convincingness* variable.

4.4 Procedure

For each visit in the larger study's protocol, two research assistants were involved in testing participants. One research assistant, referred to as RA1, was responsible for providing instructions and administering the tasks in the protocol. A second research assistant, referred to as RA2, was responsible for setting up the room in which data collection took place (e.g., setting up testing materials and stimuli, as well as setting up video and audio recording devices); greeting the adolescent participant and their accompanying caregiver, if any; and acting as the peer that the participant attempted to convince. The supervising graduate student oversaw the

entire visit and ensured that all procedures went smoothly and troubleshooted conflicts as they occurred. Some of their other responsibilities included confirming participants' demographic information and handling such confidential information; assigning the participant to a counterbalanced condition for a narrative retell task; and preparing the adolescent and caregiver's compensation (e.g., gift cards and public transportation passes or parking passes).

For each visit, thirty minutes before the participant was scheduled to arrive, RA1, RA2, and the graduate student prepared for the participant's visit by completing their respective tasks involved in set up. Ten minutes before the participant was scheduled to arrive, RA2 went to the building's lobby to greet the participant in case they arrived early. After meeting the participant and their accompanying caregiver, if any, RA2 accompanied them to the laboratory and identified where data collection would take place for the adolescent, and the waiting room in which the caregiver would wait. RA2 then introduced RA1 and the graduate student to the adolescent participant and their caregiver. RA1 and the adolescent participant entered the room in which data collection took place and began the visit's protocol. RA2 accompanied the caregiver to the waiting room where they could complete the questionnaires if they haven't completed them already. Upon completion, caregivers waited until their adolescent completed the entire visit.

In the first visit, the adolescent participant reviewed the consent form with RA1. Upon consenting to participating, the participant completed the Language and Social Background Questionnaire, followed by the ÉVIP. The participant then began the persuasive argument elicitation task. During this task, the participant was first given a list of three social scenarios (e.g., they must convince a co-worker at their part-time job to switch shifts with them) on a piece of paper and had to pick one. The participant was told that they will speak to the listener and

imagine that the listener is the peer that they need to convince. When a social scenario was picked, the participant was given a planning sheet to help them organize their thoughts. The planning sheet developed by Heilmann et al. (2020) was used, where the elements of a persuasive argument are listed on the left, and adjacent to each element, were prompting questions. Participants were given 5 minutes to plan their argument. After 3 minutes elapsed, participants were given a reminder. After another minute elapsed, a second reminder was given to let participants know they had one minute remaining to plan.

After a total of 5 minutes have elapsed, RA1 brought RA2 into the room, and RA2 sat down next to the participant. RA1 turned on both the video recorder and the audio recorder and told the participant that they are ready for their persuasive argument. RA1 stepped back to the corner of the room to allow the participant to attempt to convince RA2. The participant provided the persuasive language sample, and RA2 only provided generic backchannels such as *uh huh* and *yeah* or nodded their head. This is because, relative to specific backchannels (such as *oh wow*) that encouraged individuals to elaborate on their previous point, generic backchannels have been found to encourage individuals to provide new information (Tolins & Fox Tree, 2014). In adapting the task from Heilmann et al. (2020), we prioritized participants' provision of new information over clarifications (i.e., different ways of saying the same thing).

Listeners did not respond to the participant or engage them in a debate. The participant was the only one talking the entire time. If the participant did not discuss one or more points on the planning sheet, RA1 provided a general prompt and asked the participant: "Is there anything else you'd like to add?" and if the participant still hasn't addressed all the points on the planning sheet, RA1 prompted the participant to discuss one of the elements that they omitted. RA1 repeated this prompt for all elements that the participant omitted. When the participant finished

speaking, RA1 turned both the video and audio recorder off, and RA2 left the room to complete the listener's rating measure. RA1 resumed with the rest of the protocol in the first visit. This included a card sorting task that was completed on a computer, followed by a narrative retell task. The last task of the first visit was the Leiter-3.

In the second visit, the adolescent participant reviewed the consent form again with RA1. Upon consenting to participating, the participant completed a questionnaire about their subjective well-being, and then completed another persuasive argument elicitation task. Instead of acting as a peer that the participant tried to convince, RA2 acted as an authority figure that the participant tried to convince. The data from this persuasive argument elicitation task, however, were not reported in this thesis. After this second persuasive argument elicitation task, participants completed a verbal fluency task, where they had to name as many words as they could in 60 seconds, given specific criteria. Then, they completed the *Construction de phrases* subtest (Sentence Assembly), followed by an Executive Function Challenge Task. The last task of the second visit was an informal discussion between RA1 and the participant about the latter's strengths and interests.

At the end of each visit, after completing the last task in the protocol, the adolescent and caregiver participants selected their $25 and $15 gift card, respectively, of their choice. They were given their public transportation passes or parking passes, depending on their mode of transportation, and they signed a study compensation receipt to acknowledge and confirm that they received their compensation. After the adolescent and caregiver participants left the laboratory, RA1, RA2 and the graduate student cleaned and organized the room in which data collection took place; transferred the data from the video and audio recording devices to the laboratory's secure research server; and charged all electronic devices.

4.5 Coding

Some of the research assistants involved in the coding process were also involved in testing participants. While each participant was assigned a unique ID, to reduce the possibility that the research assistants were able to identify the participants, pseudo participant IDs were assigned to participants for coding purposes only.

4.5.1 Deriving orthographic transcripts using Microsoft Transcribe and the Codes for the Human Analysis of Transcripts (CHAT) transcription format

Prior to using the Persuasive Scoring Scheme (PSS; Heilmann et al., 2020) to analyze the content of the persuasive language samples, their transcripts needed to be developed. Rather than transcribing solely by hand, to facilitate the transcription process, multiple transcription software options were explored, such as Descript, Trint, and Cockatoo, among many others. Given that the video and audio recordings of participants' persuasive language samples were identifying, sensitive and confidential data, it was indispensable that no version of the video recordings, audio recordings, or transcripts were to be stored in the software's cloud storage. After consulting all transcription software's data and privacy descriptions, most of them would have uploaded and kept the video recordings, audio recordings, and transcripts on their cloud storage. The only exception was Microsoft (MS) Transcribe.

MS Transcribe can be accessed using the web version of Microsoft Word, which is provided by Microsoft 365. McGill University provides their students, faculty, and staff with access to the enterprise-level cloud service. When MS Transcribe processes the audio recordings to produce the transcript, they are both uploaded to OneDrive, which is an application included in Microsoft 365. Given that it is a McGill University-approved cloud service to store protected

and personal data, MS Transcribe was the transcription software that was selected and used to facilitate the transcription process.

After selecting the transcription software, a decision was made about the transcription format to apply to the transcripts to standardize the transcript files and to provide a standardized way to recognize and code linguistic information, such as code-switching, repetitions, retraces, and reformulations, as well as abandoned utterances. The Codes for the Human Analysis of Transcripts (CHAT; MacWhinney, 2000) transcription format was selected. CHAT is a standardized format used to produce computerized transcripts and it is recognized by the Computerized Language Analysis (CLAN) software, which can be used to conduct linguistic analyses across 49 languages, including French, the language of the persuasive language samples. In comparison to other transcription formats such as the Systematic Analysis of Language Transcripts (SALT; Miller & Iglesias, 2015), CHAT and CLAN offer a wider range of linguistic analyses that can be conducted; require less time to code; offer higher inter-rater reliability between transcripts; fewer utterances with coding disagreements (Pezold et al., 2020); and offer more flexibility to customize codes that are tailored to one's data or research questions.

Prior to developing transcripts with participants' files, I provided an in-person training about how to use MS Transcribe and CHAT. This training involved a step-by-step demonstration and explanation, and it was supplemented by a comprehensive manual to which transcribers could refer. After this training, transcribers were given a total of five files to practice. Four of these files came from the TalkBank repository. This open-source repository was developed by Brian MacWhinney at Carnegie Mellon University, and it contains transcripts and audio and video recordings in a variety of languages from corpora from all around the world. Each of the four files were audio recordings of French adolescents or young adults who retold a narrative.

The last practice file was an audio recording of another graduate student in the laboratory who piloted the persuasive argument elicitation task at the beginning of its development. This file was assigned so that transcribers had an opportunity to practice the use of MS Transcribe and the application of CHAT codes that would more accurately reflect the transcription work they would do with participants' files. For each practice file, transcribers practiced how to use MS Transcribe and how to apply the CHAT codes. Once completed, transcribers sent the transcript to me via email in a Microsoft Word document. Using the answer key that I developed, I provided in-line corrections and revisions directly within the body of the document, as well as provided comments as necessary. All in-line corrections and revisions ultimately matched the answer key for the corresponding practice file. I sent my revisions and comments back to the transcriber. Subsequently, they reviewed my corrections and feedback, and applied them to the next practice file. This meant that transcribers were not permitted to work on the next practice file until they received my feedback, but this was done to ensure that, as transcribers progressed from the first to fifth practice file, their transcripts would continue to improve. If, by the fifth practice file, transcribers had minimal errors and feedback, they were given permission to start working with the participants' files. Otherwise, transcribers were given an additional two files, for a total of seven files, to continue practicing.

A total of two different transcribers, both native Quebec French speakers, were involved in deriving the orthographic transcripts for participants' files. The following procedure was followed for every participant. First, the transcriber uploaded the audio recording of the participant's persuasive argument elicitation task (including the participant's expressive language sample, RA1's prompts, and the participant's responses to such prompts) to MS Transcribe to get a rough first draft of an orthographic transcript. Audio-transcript matches were

conducted, where the transcriber listened to the audio recording and corrected mistakes that the software made, including word choice, spelling, and grammatical agreement (subject-verb, in number, and in gender). These audio-transcript matches were conducted three times to catch the software's mistakes that were not previously noted. With the error-free orthographic transcript, the transcript was segmented into conversational units, also known as *c-unit*s, defined as a main clause and its dependent (subordinate or coordinate) clauses. The CHAT transcription format was subsequently applied. This procedure would facilitate future linguistic analyses that will be conducted in CLAN. Finally, the transcriber used the video recording of the persuasive argument elicitation task to identify the generic backchannels provided by the RA who acted as the peer that the participant tried to convince, such as instances where they said *mhm* and when they nodded their head. These backchannels were subsequently integrated into the transcript at the appropriate moments corresponding to the participant's discourse.

Once these steps were complete, a second transcriber used the audio recording of the persuasive argument elicitation task to conduct a final audio-transcript match. This involved listening to the audio recording and making sure that the transcribed content matched the audio recording, as well as correcting any mistakes that the first transcriber made that pertained to word choice, spelling, and grammatical agreement (subject-verb, in number, and in gender). They also checked that the first transcriber correctly applied the CHAT transcription format and correctly delineated the conversational units. Finally, using the video recording of the persuasive argument elicitation task, the second transcriber checked that backchannels were correctly documented. These steps produced the final orthographic transcript with which coders used to apply to Persuasive Scoring Scheme.

4.5.2 Coding persuasive language samples using the Persuasive Scoring Scheme

The two transcribers involved in deriving the orthographic transcripts were also the same research assistants who coded participants' persuasive language samples using the Persuasive Scoring Scheme. Consequently, they were already familiar with the content of participants' persuasive discourse. While it would have been preferable that the research assistants involved in transcribing were not also involved in coding the persuasive language samples, there were a limited number of research assistants available. The listeners who completed the listener's rating measure were prohibited from transcribing or coding the persuasive language samples to prevent their subjective gut judgements from being influenced by prior exposure to the content of participants' persuasive language samples.

Prior to coding participants' transcripts, I provided an in-person training about how to code persuasive language samples using the Persuasive Scoring Scheme. This training involved a step-by-step demonstration and explanation, and it was supplemented by a comprehensive manual to which coders could refer. After this training, coders were given a total of five files to practice. All five files came from a free self-paced online course offered by SALT. This course was created to teach attendees how to code persuasive language samples using the Persuasive Scoring Scheme. The transcripts of the persuasive language samples were available for download. While the persuasive language samples were in English rather than in French, the language of the persuasive language samples, the goal of the practice files were for the coders to learn how to use the scoring scheme. Once a practice file was completed, coders sent the transcript and the scoring scheme to me via email. Using an answer key that I developed, I provided in-line corrections and revisions directly within the body of the document and provided comments as necessary. All in-line corrections and revisions ultimately matched the answer key

for the corresponding practice file. I sent my revisions and comments back to the coder. Subsequently, they reviewed my corrections and feedback, and applied them to the next practice file. This meant that coders were not permitted to work on the next practice file until they received my feedback, but this was done to ensure that, as coders progressed from the first to fifth practice file, their coding would continue to improve. If, by the fifth practice file, coders had minimal errors and feedback, they were given permission to start working with participants' files. Otherwise, coders were given an additional two files, for a total of seven files, to continue practicing.

Two native Quebec French speakers, who also generated the orthographic transcripts, were involved in coding the content of participants' persuasive language samples using the Persuasive Scoring Scheme. As mentioned in Section 4.3.7, the scoring scheme evaluates the following 7 elements of a persuasive argument on a scaled score from 0 to 5: the identification of an issue and a desired change; supporting reasons; other points of view (counterarguments); compromises; conclusion; cohesion; and effectiveness. Due to the overlap between content and manner of delivery, the effectiveness element was removed from the scoring scheme. Therefore, six elements were coded using the Persuasive Scoring Scheme.

Two individuals, Coder 1 and Coder 2, both naïve to participants' diagnostic group, were involved in coding the persuasive language samples. The following steps were taken by each coder, independently, for each participant. The coder first reviewed the scoring scheme's performance criteria thoroughly and read the participant's transcript. Starting with the identification of an issue and a desired change element, they identified any part of the transcript that corresponded to that element. For example, all conversational units that pertained to identifying the issue and stating the desired change were highlighted in yellow. To the same

extent, all supporting reasons that the participant provided were highlighted in blue. The same procedure was followed until all conversational units that pertained to each of the six elements were highlighted. If a conversation unit appeared to be relevant for more than one element, the coder used their best judgement to determine to which element the conversation unit belonged. The coders confirmed this decision with a graduate student not involved in working with the data from the persuasive argument elicitation task.

For each element, having reviewed and considered the content in its corresponding colour, the coder identified the criteria that were and were not met on the scoring scheme. With this information, each element was assigned an overall score using the following anchor points: minimal/ immature (1 point), satisfactory/ adequate (3 points), and proficient/advanced (5 points). Scores of 2 and 4 were undefined and were up to the judgement of the coder (see Appendix C for the Scoring Scheme). For example, to receive a score of 5 in the supporting reasons element, the reasons had to be comprehensive and in detail, and the benefit(s) to others had to be clearly articulated. However, a score of 3 is awarded if one or more reasons were offered to support the desired change, but the benefit(s) to others were unclear or omitted. A participant received a score of 1 if the reason(s) were confusing or vague; if significant/ obvious reason(s) were not stated; and if the reason(s) were not plausible or do not support change.

Missing data or administrative errors were coded as follows. While Heilmann et al. (2020) assigned a code of 0 for participant errors, such as speech unintelligibility, a code of 98 was used. Instead of assigning a code of NA (non-applicable), as did Heilmann et al. (2020), for RA1 errors, such as issues with recording (e.g., cut-offs or interruptions) or RA1 not following the protocol, a code of 99 was used. As 0 or NA may be misconstrued with a poor performance on an element, codes of 98 and 99 were used instead. However, codes of 98 and 99 were not

included in the sum of the PSS elements to yield the PSS composite score. Instead, these codes were only used to identify participant errors or RA1 errors.

It is also important to note that some participants did not receive prompts from RA1, as specified in the persuasive argument elicitation task protocol. RA1 provided these prompts at the end of participants' persuasive argument if certain elements were missing. For example, if a participant did not provide a conclusion, RA1 prompted the participant by asking, 'is there anything else you'd like to add?'. If the participant still hasn't addressed the element, RA1 prompted the participant by asking 'what about a conclusion?'. As some participants were prompted and others were not, to ensure consistency in analyzing the persuasive language samples, analyses were conducted on the scores assigned to the content before any prompts were given.

For every element that the coder assigned a score, they also provided a rationale detailing the choices they made and considerations they took. Once a score was assigned to all six elements, its sum yielded the PSS composite score.

4.5.2.1 Inter-rater reliability the Persuasive Scoring Scheme (PSS)

Studies using observational scores from multiple coders require a procedure to ensure that different coders are transforming subjective events to quantitative scores in a similar fashion. This can be achieved by calculating inter-rater reliability, which measures the extent to which coders agree on a rating system. High inter-rater reliability values indicates strong agreement among coders, while low values indicate weak agreement (Lange, 2011).

For each participant, Coder 1 and Coder 2 independently coded the persuasive language sample using the Persuasive Scoring Scheme without discussing it with each other. There was a total of two Microsoft Excel spreadsheets, where one of them were assigned to Coder 1, and the

other was assigned to Coder 2. In their respective spreadsheets, they entered the scores of all 27 participants they scored. These means all participants' persuasive language samples were scored twice, once by Coder 1, and once by Coder 2. Two Microsoft Excel spreadsheets were used to reduce the possibility that one coder was able to see the scores assigned by the other coder. However, to facilitate analyses that would subsequently occur, a master Microsoft Excel spreadsheet contained all participants' pseudo IDs, a list of the PSS elements, and their corresponding scores assigned by both Coder 1 and Coder 2.

Krippendorf's alpha is a reliability coefficient that is used in content analyses where quantitative data are pulled out of textual data. Krippendorf's alpha coefficient can range from 0 (perfect disagreement) to 1 (perfect agreement). According to Krippendorf (2004), alpha values equal to or greater than .800 is the threshold that indicates a high level of agreement among coders and suggests that the coding is sufficiently reliable to draw conclusions from the data. However, alpha values less than .667 suggest that there is insufficient agreement among coders, and that the data may not be reliably coded to draw conclusions. Krippendorf's alpha coefficient can also handle small sample sizes and it can be applied to data of any measurement scale (e.g., nominal, ordinal, interval, or ratio scale). The original study conducted by Heilmann et al. (2020) calculated and reported Krippendorf's alpha coefficient for the composite score only, and the alpha coefficient for each PSS element was not reported. I calculated Krippendorf's alpha coefficient for each PSS element and for the composite score to provide a full and detailed assessment of inter-rater reliability, shown in Table 1.

Table 1

Krippendorf's alpha coefficient for each PSS element and for the composite score

PSS element	Krippendorf's alpha coefficient (α)
Issue identification and desired change	.26
Supporting reasons	.65
Other points of view (counterarguments)	.69
Compromises	.68
Conclusion	.68
Cohesion	.37
Composite	.63

Given that Krippendorf's alpha coefficients approximate $\alpha = .667$ for many of the PSS elements, the agreement among the two coders was relatively low. This means that the coding may not be sufficiently reliable to draw conclusions from the data. To increase the reliability of the coding of the persuasive language samples using the Persuasive Scoring Scheme, Coder 1 and Coder 2 coded the persuasive language samples to consensus. To do so, when the two coders' scores were not the same for any given PSS element, Coder 1 and Coder 2 both provided their rationale for assigning the scores that they did. They considered each other's perspectives to agree on a consensus score. The agreed upon scores for each element, after discussing them to consensus, were summed to yield the PSS composite score, which gave rise to the *content* variable, which ranged from 6 to 30.

4.5.3 Coding the listener ratings measure

Two variables were derived from the listener ratings measure, namely, manner of delivery, and convincingness, both as subjective gut feelings. Data was obtained from two different listeners, namely, Rater 1 and Rater 2, for the respective variables. This ensured that the observations in the dependent and independent variables were obtained consistently from one

rater and were independent of each other. They were both naïve to participants' diagnostic group; were not involved in testing any of the participants; and were not involved in deriving participants' orthographic transcripts or coding them using the Persuasive Scoring Scheme. The two listeners watched video recordings of the persuasive argument elicitation task. Of the 8 items on the measure, Rater 1 completed items 4 to 6 that pertained to confidence, body language, and tone of voice. Specifically, item 4 asked: 'how certain/ uncertain did the participant sound when making their argument?'. Item 5 asked: 'did the participant's body language help to convince you?'. Item 6 asked: 'did the way in which the participant used their voice help to convince you?'. Rater 1 responded to each item on a 5-point scale from 1 (very uncertain/ very unhelpful) to 5 (extremely certain/ extremely helpful). The sum of the ratings for all three items yielded the *manner of delivery* variable for each participant, which ranged from 3 to 15. Rater 1 also completed the other items on listener rating's measure that did not yield the manner of delivery variable, and the data is available, but not reported in this thesis.

Rater 2 only completed item 2, which asked: 'how convinced are you to make the proposed change?'. They responded to the item on a 5-point scale from 1 (not convinced at all) to 5 (extremely convinced). The rating for this item yielded the *convincingness* variable for each participant, which ranged from 1 to 5. Rater 2 did not complete the other items on the listener rating's measure that did not yield the convincingness variable.

We did not attempt to obtain inter-rater reliability on the manner of delivery and convincingness variables as our interest was to obtain subjective gut feelings, which are likely to vary between different individuals. An average of multiple raters' scores was considered, but this would have resulted in the rating measure no longer capturing a rater's subjective gut feeling. Although it was not possible in this study, it would be interesting to conduct a rating study with a

large number of participants, as has been done, for example, by Sasson et al. (2017). While these authors examined participants' social evaluation (e.g., likeability, awkwardness) of speakers via audiovisual clips, it would be interesting to extend this method to more specific judgments of manner of delivery and convincingness. Multiple individuals' ratings of these specific aspects of persuasive arguments could serve as a proxy for the argument's social acceptability.

4.6 Statistical analyses

Statistical analyses were conducted in in R/ RStudio, version: 2023.12.1+402 (2023.12.1+402). Following the recommendations of Kover and Atwood (2013) and the American Psychological Association Formatting and Style Guide, 7th Edition (Purdue University, n.d.), group differences were reported with the mean, standard deviation, *p* values, effect sizes (the size of the difference between groups), 95% confidence intervals of the effect sizes, and variance ratios (the variance or spread between groups, capturing group variability).

When the assumptions of a parametric test were not met (e.g., the data were not normally distributed, or comparison groups did not have equal variances), I used non-parametric tests. This involved Mann-Whitney U tests to perform group comparisons; Cramér's *V* or Cliff's delta (δ) value to report effect sizes[3]; Spearman's rank correlation coefficient to perform correlations; and ordinal logistic regression models to predict convincingness, given its ordinal scale. Descriptions of these non-parametric tests can be found in Appendix E.

[3] Cohen's *d* was still reported for informative purposes.

5.0 Results

5.1 Diagnostic group differences and similarities

The sample included 27 adolescent participants, comprised of 11 (41%) autistic and 16 (59%) non-autistic adolescents. For the demographic and background variables (e.g., age, percentage of French usage in the community, French receptive vocabulary scores, etc.), I calculated the mean and standard deviation for both the autistic and non-autistic group. To verify that the groups did not differ on the background variables, for each variable, I performed an independent samples t-test when the assumptions of the parametric test were met. Otherwise, a Mann-Whitney U test was performed. I reported the *p* value, as well as Cohen's *d* (and its 95% confidence interval), Cliff's δ (and its 95% confidence interval) and the variance ratio for the difference between the two groups. For the demographic variables pertaining to participants' current gender identity and visible minority status, I reported the proportion of autistic and non-autistic participants who identified their current gender identity to be male or masculine, as well as the proportion of autistic and non-autistic participants who identified as being a visible minority. A chi-square test of independence was performed for each of these two variables to determine whether the autistic and non-autistic groups differed. The *p* value of the chi-square test of independence was reported. The effect size estimate for the chi-square test of independence is Cramér's *V*. This, and its 95% confidence interval, were also reported. This information can be found in Table 2.

Table 2

Descriptive statistics of the demographic and background variables

Variable	Autistic group (n = 11)		Non-autistic group (n = 16)		p value for group difference	Effect size (Cohen's d or Cramér's V)	95% CI for Cohen's d or Cramér's V	Cliff's δ	95% CI for Cliff's δ	Variance ratio
	M	*SD*	*M*	*SD*						
Age (years)	16.73	1.68	15.75	1.29	.100	0.67 (medium)	[-0.16, 1.50]	0.43 (medium)	[-0.06, 0.76]	1.63
Current gender identity (proportion male or masculine)	0.73		0.88		.640	0.09 (negligible)	[0.00, 0.44]			
Visible minority (proportion)	0.46		0		.013*	0.48 (medium)	[0.13, 0.71]			
Percentage of French usage (LSBQ)	69.67	1.13	76.33	0.57	.241	-0.47 (small)	[-1.29, 0.35]	-0.11 (negligible)	[-0.57, 0.40]	-1.07
Receptive vocabulary scores (ÉVIP)	153.18	18.26	151.44	7.26	.732	0.14 (negligible)	[-0.67, 0.94]	0.29 (small)	[-0.21, 0.67]	0.30
NVIQ scores (Leiter-3)	124.80	13.55	121.13	10.80	.460	0.31 (small)	[-0.54, 1.16]	0.19 (small)	[-0.31, 0.60]	0.72
Expressive French grammatical scores (*Construction de phrases*)	15.78	2.49	16.08	1.26	.713	-0.16 (negligible)	[-1.07, 0.74]	-0.04 (negligible)	[-0.54, 0.48]	-0.33
SCQ total score	17.30	9.96	4.20	5.10	< .001***	1.77 (large)	[0.78, 2.76]	0.8 (large)	[0.45, 0.94]	3.84
SRS-2 *T*-score	71.10	10.80	45.73	6.66	< .001***	2.98 (large)	[1.76, 4.19]	0.97 (large)	[0.83, 0.99]	6.64

*p < .05. **p < .01. ***p < .001

As expected, the autistic and non-autistic groups differed significantly on their SCQ total scores and SRS-2 *T*-scores. The two groups also differed significantly on their visible minority status, with no visible minorities in the non-autistic group. According to the conventional levels of statistical significance, the two groups did not differ significantly on age, current gender identity, percentage of French usage, receptive vocabulary scores, nonverbal IQ scores, or expressive French grammatical scores ($p > .05$, between .100 and .732, and with negligible to medium effect sizes). Thus, the autistic and non-autistic groups were similar to each other on all the key variables, except for visible minority status and the two variables expected to differ by diagnostic group, namely, SCQ total scores and SRS-2 *T*-scores.

However, it should be mentioned that prior work has recommended that a criterion of $p > .5$ provides stronger evidence for non-differences between groups. This is because such a criterion indicates a high level of overlap between the two groups (Kover & Atwood, 2013; Mervis & Klein-Tasman, 2004). Using this stricter criterion, the autistic and non-autistic groups would not be matched on age, visible minority status, percentage of French usage, or nonverbal IQ scores, with the autistic group being approximately 1 year older, having a higher proportion of participants identifying as being a visible minority, a slightly lower percentage of French usage, and slightly higher nonverbal IQ scores.

It is possible that the social scenario chosen by autistic and non-autistic participants could influence the quality and convincingness of their persuasive discourse. This could be due to factors such as familiarity with the scenario. To investigate this, I examined whether the two groups selected scenarios in a similar manner, as shown in Table 3.

Table 3

Social scenarios chosen by the autistic and non-autistic participants

Social scenario	Autistic group $n = 11$		Non-autistic group $n = 16$	
	n	%	*n*	%
You need to switch work shifts with somebody at work.	2	18.18	7	43.75
You think the school cafeteria should stop serving junk food and only serve healthy food.	4	36.36	5	31.25
You are trying to get people to join you for a neighborhood trash clean-up for Earth Day.	5	45.45	4	25

It appears that the autistic and non-autistic groups showed preferences for different social scenarios. Specifically, the autistic group preferred persuading their peers to join them for a neighborhood trash clean-up for Earth Day, while the non-autistic group preferred persuading their peer to switch work shifts with them. Due to the small sample size, I did not conduct analyses on social scenario selection, but I will do so once the full sample is collected by Summer 2025.

5.2 Content, manner of delivery, and convincingness scores by group

I calculated the median, mean, and standard deviation for the content, manner of delivery, and convincingness scores for both the autistic and non-autistic group. To determine how the autistic and non-autistic groups compared on the content, manner of delivery, and convincingness scores, for each variable, I performed Mann-Whitney U tests. I reported the *U* statistic, the *p* value, as well as Cohen's *d* (and its 95% confidence interval), Cliff's δ (and its 95% confidence interval) and the variance ratio for the difference between the two groups (all reported in Table 4).

Table 4

Mann-Whitney U test results for the content, manner of delivery, and convincingness scores by group

Variable	Autistic group				Non-autistic group				*U* statistic	*p*	Cohen's *d*	95% CI for Cohen's *d*	Cliff's *δ*	95% CI for Cliff's *δ*	Variance ratio
	Mdn	*M*	*SD*	Range	*Mdn*	*M*	*SD*	Range							
Content scores	20	20	4.77	13-27	20	19.4	3.96	14-27	96.5	.692	0.15 (negligible)	[-0.66, 0.95]	0.10 (negligible)	[-0.37, 0.53]	0.80
Manner of delivery scores	13	12.5	2.81	6-15	12	11.6	2.85	7-15	105	.410	0.33 (small)	[-0.49, 1.14]	0.19 (small)	[-0.27, 0.58]	1.29
Convincingness scores	3	2.64	1.12	1-4	3	3.25	1.24	1-5	64	.233	-0.51 (medium)	[-1.33, 0.30]	-0.27 (small)	[-0.60, 0.14]	1.33

*$p < .05$. **$p < .01$. ***$p < .001$.

The autistic and non-autistic groups did not differ significantly on content, manner of delivery, or convincingness scores. For content scores, both groups had the same median, and a similar range of scores. For manner of delivery scores, however, there was a trend for autistic participants (*Mdn* = 13) to have higher scores relative to non-autistic participants (*Mdn* = 12), with a small effect size ($\delta = 0.33$). For convincingness scores, both groups had the same median score. There is a smaller range of scores for autistic participants compared to non-autistic participants.

While the two groups do not differ significantly on content scores, it is possible that autistic and non-autistic participants may perform differently upon closer examination of each PSS element. To investigate this, for each PSS element, I report the mean score for each group, as shown in Table 5.

Table 5

Mean score by group for each element on the Persuasive Scoring Scheme

PSS element	Mean score for the autistic group	Mean score for the non-autistic group
Identification of an issue and a desired change	4	3.88
Supporting reasons	3.91	4
Counterarguments	3.36	3
Compromises	2.09	3.06
Conclusion	3	1.62
Cohesion	3.64	3.88

Note. Participants' scores on each element can only range from 1 (a minimal/ immature production) to 5 (a proficient/ advanced production).

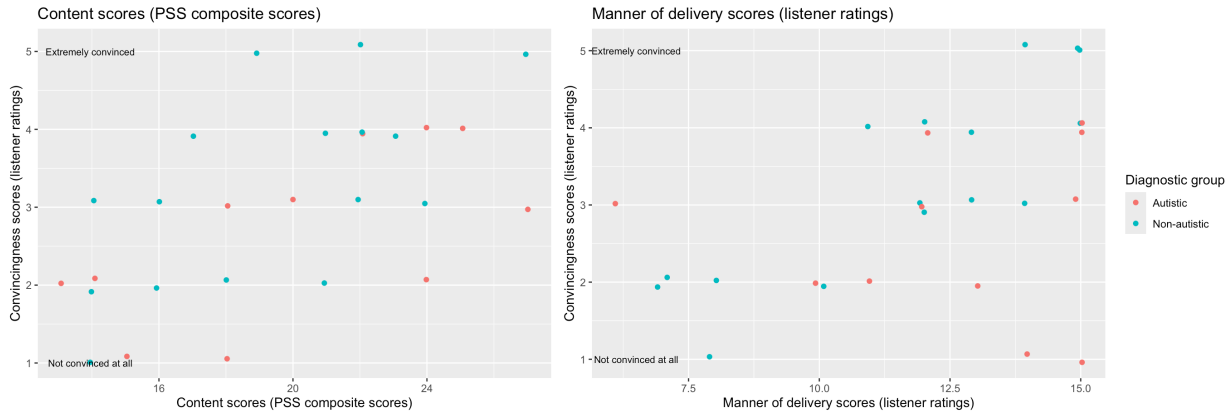
The autistic group had higher mean scores for the following PSS elements: identification of an issue and a desired change; counterarguments; and conclusion. The non-autistic group had higher mean scores for the remaining PSS elements, namely, supporting reasons; compromises; and cohesion.

5.3 The role of content and manner of delivery on convincingness

The scatterplots shown in Figure 1 depict the relationship between content (on the left) and manner of delivery (on the right) and convincingness for the autistic and non-autistic groups.

Figure 1

The relationship between content and manner of delivery and convincingness



For content scores predicting convincingness, the autistic group (ρ = 0.63) and non-autistic group (ρ = 0.59) both exhibited a strong positive correlation. On the other hand, for manner of delivery scores predicting convincingness, the autistic group exhibited a weak positive correlation (ρ = 0.12) relative to the non-autistic group, which exhibited a very strong positive correlation (ρ = 0.83).

To determine how content and manner of delivery compare in predicting convincingness, and whether this relationship differed for autistic and non-autistic adolescents, two ordinal logistic regression models were carried out. First, a null model was run with no predictors added. Second, a full model was run, where the fixed effects included content and manner of delivery scores, as well as diagnostic group. Two interaction terms were also added, namely, an interaction between content scores and diagnostic group, and an interaction between manner of

delivery scores and diagnostic group. The results of the null and full ordinal logistic regression models are reported in Table 6. For both the null model and the full model, both the coefficient estimates, and standard errors are reported. Unique to the full model, *p* values indicated which fixed effects had a statistically significant effect on convincingness. The coefficient estimates for each fixed effect were also converted into odds ratios by exponentiating the coefficient. The odds ratios' 95% confidence interval is also reported.

The model's two interaction terms are plotted in Figure 2, such that a line was fit to the data to capture the overall direction of the relationship illustrated in the interaction.

Table 6

The null and full ordinal logistic regression models predicting convincingness

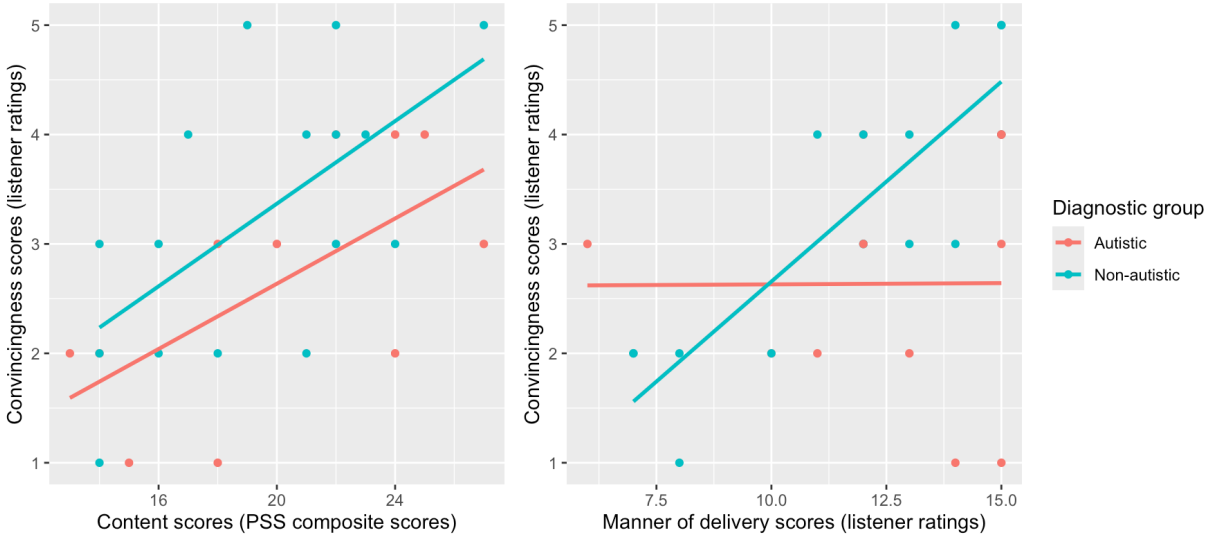
Effect	Null model		Full model				
	Estimate	*SE*	Estimate	*SE*	*p*	OR	95% CI for the OR
Fixed effects							
Content scores			0.21	0.15	.147	1.24	[0.93, 1.68]
Manner of delivery scores			0.80	0.25	.002 **	2.23	[1.42, 3.87]
Diagnostic group[a]			6.11	4.31	.156	450.17	[0.11, 3030212.48]
Interaction: content scores and diagnostic group			0.20	0.21	.336	1.22	[0.82, 1.90]
Interaction: manner of delivery scores and diagnostic group			-1.00	0.35	.005 *	0.37	[0.17, 0.70]
Threshold coefficients							
Not convinced at all|Somewhat convinced	-2.08	0.61	8.86	3.14			
Somewhat convinced|Convinced	-0.53	0.40	11.87	3.53			
Convinced|Very convinced	0.53	0.40	14.01	3.80			
Very convinced|Extremely convinced	2.08	0.61	16.62	4.19			

[a]The reference diagnostic group is the non-autistic group. This means that the null and full ordinal logistic regression models represent the pattern of relationships observed for autistic participants.

*$p < .05$. **$p < .01$. ***$p < .001$

Figure 2

Convincingness as a function of diagnostic group and content, as well as diagnostic group and manner of delivery



Across all participants, for content, as the coefficient estimate was positive, higher content scores were associated with convincingness. For every one-unit increase in participants' content scores, the odds of moving from a lower to higher category of convincingness increased by a factor of 1.24, holding all other variables constant, although this association was not statistically significant.

Across all participants, for manner of delivery, as the coefficient estimate was positive, higher manner of delivery scores were statistically significantly associated with convincingness. For every one-unit increase in participants' manner of delivery scores, the odds of moving from a lower to higher category of convincingness increased by a factor of 2.23, holding all other variables constant.

For diagnostic group, the coefficient was positive. However, the confidence interval was incredibly wide, and the effect was not statistically significant.

As seen in the left panel of Figure 3, the relationship between content scores and convincingness did not differ significantly between autistic and non-autistic participants. For non-autistic participants, as content scores increased, convincingness also increased. Specifically for autistic participants, for every one unit increase in autistic participants' content scores, the odds of moving from a lower to higher category of convincingness increased by a factor of 1.22.

As seen in the right panel of Figure 3, the relationship between manner of delivery and convincingness differed significantly between autistic and non-autistic participants. For non-autistic participants, there was a clear and strong positive relationship: as manner of delivery scores increased, convincingness also increased. However, for autistic participants, for every one-unit increase in manner of delivery scores, the odds of moving from a lower to higher category of convincingness decreased by a factor of 0.37.

The full model (including content scores, manner of delivery scores, diagnostic group, the interaction between content scores and diagnostic group, and the interaction between manner of delivery and diagnostic group; AIC = 74.12) fit better than the null model (without any of these predictors; AIC = 91.06, $\chi 2 = 26.95$, $df = 5$, $p < .001$), with a level of improvement of 0.32 (by McFadden's pseudo R^2). In conclusion[4], among all the fixed effects in the model, only manner of delivery and the interaction between manner of delivery and diagnostic group had a statistically significant effect on convincingness.

[4] Visual inspections using histograms, scatterplots, and boxplots of the dependent variables showed that one participant had an unusually low score on the manner of delivery variable. Ordinal regression models were run without this participant, and the results found the same effects to be significant. The results of the model can be found in Appendix F.

6.0 Discussion

To understand the role of content and manner of delivery in convincing peers, autistic and non-autistic adolescents provided a persuasive language sample through an elicitation task.

6.1 Do autistic and non-autistic participants differ in their persuasive arguments?

I found that there were no differences between the autistic and non-autistic groups with respect to their content, manner of delivery, and convincingness scores. Contrary to my initial hypothesis, both groups had the same median composite content score. However, a closer look at the elements of a persuasive argument revealed different trends: the non-autistic group in this study generated more supporting reasons than the autistic group, consistent with the study conducted by To et al. (2016), where neurotypical participants also generated more supporting reasons than autistic participants. In contrast, the autistic group in this study generated more counterarguments than the non-autistic group, differing from the study conducted by To et al. (2016), where autistic participants generated fewer counterarguments than neurotypical participants. This discrepancy may be due to differences in the comparison groups with respect to diagnosis and age group: To et al. (2016) compared neurotypical and autistic children, while I compared non-autistic and autistic adolescents. These findings suggest that while overall persuasive skills may be similar across groups, autistic and non-autistic adolescents may put emphasis on different elements of a persuasive argument, underscoring the complexity of the content of persuasive discourse.

Stepping away from group differences, my sample (consisting of both autistic and non-autistic adolescents) provided arguments that were as complex as, if not more so than, the

adolescents reported in the literature. For example, adolescent participants in the literature have been found to express both sides of the argument they provided (Nippold et al., 2005). The adolescent participants in this study, irrespective of diagnostic group, also expressed both sides of the argument (i.e., supporting reasons and counterarguments), but they outperformed the adolescent participants in the study conducted by Nippold et al. (2005) by also providing compromises. While these results may be explained by the planning sheet and prompting questions that were provided to the participants in my study during the persuasive argument elicitation task, Nippold et al. (2005) provided even more scaffolding by providing their participants with the exact arguments to use. This suggests that the participants in the current study, who were not given arguments, demonstrated a notable level of complexity in the content of their persuasive discourse and in their ability to generate their own ideas to convince another individual.

My thesis focused on expressive persuasive discourse. While other prior work (Brimo & Hall-Mills, 2019; Karasinski, 2023) focused on written persuasive discourse, written language tasks offer individuals more time to think about what they want to say and to organize their thoughts than during expressive language tasks, potentially allowing them to produce more complex and elaborated ideas, which may allow participants to generate more complex persuasive macrostructure. The Quebec Ministry of Education (n.d.) for secondary students emphasizes written, rather than expressive, persuasive discourse. The results observed in this study may have differed, in that adolescent participants may have performed better if they provided their persuasive argument in the written modality. This is because written discourse takes away pressures to convince another individual in the room, provides more time to organize and to elaborate on one's ideas, and draws on their persuasive writing skills that they were taught

in school. Nevertheless, as many of the skills in persuasive writing are transferrable to providing an expressive persuasive argument, it may also be the case that the participants in this study leveraged such transferrable skills.

With respect to manner of delivery scores, autistic participants had a higher median score than non-autistic participants, though this difference was not statistically significant, and the effect size was small. This finding did not align with my hypothesis. There is no prior work to my knowledge that examined manner of delivery as a summary score across three different items, namely, confidence, body language, and tone of voice. However, prior work has characterized autistic speech as having differences in inflection, stress, intonation, and rate of speech (McCann & Peppé, 2003; Paul, 2007). For example, there are reports of autistic individuals' speech being described as having an "exaggerated sing-song [manner] rather than a flat pattern" (Paul, 2007, p. 138). These characterizations often highlight perceived unfavorable differences in autistic individuals' speech compared to that of neurotypical individuals. In contrast, my results show that autistic participants' manner of delivery (consisting of confidence, body language, and tone of voice) were not worse than non-autistic adolescents. It may be the case that offering a choice for participants to select the social scenario that resonated with them most influenced their confidence, body language, and tone of voice.

Inconsistent with my hypothesis that autistic participants would be less convincing than non-autistic participants, both autistic and non-autistic participants were equally convincing to listeners. While previous research has examined social evaluations in autistic and non-autistic individuals, convincingness has not been previously studied in the literature on persuasive discourse. Given that social evaluation may be the closest outcome to convincingness, the findings of this study diverge from prior literature such as that of Sasson et al. (2017), which

reported more negative social evaluations for autistic speakers relative to neurotypical speakers. While the focus of my thesis was not on differences in language production abilities between autistic and non-autistic adolescents, understanding how convincingness compares between the two groups is an important extension of the prior work. Insights can be gained about how the communicated message, or, in the context of this thesis, the communicated persuasive argument, is received and perceived by listeners.

6.2 What is the role of content and manner of delivery in convincing peers?

My second question asked: how do content and manner of delivery compare in predicting convincingness? My hypothesis that manner of delivery would play a more important role than content, based on prior work on social evaluation (Sasson et al., 2017), was confirmed. Specifically, in the whole sample, manner of delivery, and not content, significantly predicted convincingness. Nonetheless, there was a trend for both groups, where, as content scores increased, so did convincingness.

My second research question also asked whether the relationship for content and manner of delivery in predicting convincingness differed for autistic and non-autistic adolescents. My hypothesis that manner of delivery would be particularly important for autistic adolescents was incorrect. The relationship between manner of delivery and convincingness differed significantly between the two groups. Specifically, for non-autistic participants, there was a strong positive relationship between manner of delivery and convincingness: higher manner of delivery scores resulted in the listener being more convinced. However, for the autistic group, manner of delivery scores were unrelated to how convinced the listener was. These results may be

explained by a consistent perception in how non-autistic participants were perceived. Perhaps, non-autistic participants' speech followed that of neurotypical or 'standard' patterns, which may have led manner of delivery to have a positive association with respect to convincingness.

Although manner of delivery scores were unrelated to convincingness for the autistic group, promoting mutual understanding between communication partners remain crucial. Communication styles vary widely among individuals, including autistic individuals, and understanding this diversity of communication preferences fosters empathy and acceptance. Encouraging open-mindedness and flexibility in communication, especially regarding the diverse ways in which discourse is delivered, can bridge gaps in mutual understanding. By fostering this understanding between communication partners, adolescents can better achieve their goals when interacting with peers.

6.3 Limitations and future directions

There are a few limitations to acknowledge. One limitation is that in the persuasive argument elicitation task, participants were asked to imagine that the research assistant was their peer that they had to try to convince. They were not with an actual peer of their age, which may have affected the content of the persuasive discourse they generated, or the manner in which the persuasive discourse was delivered. This suggests that the nature of the peer interaction may have limited the ecological validity of the findings, potentially affecting the authenticity of the persuasive arguments generated by participants. Future research should consider recruiting participants' peers to increase the authenticity of the task. In addition, the laboratory setting may not have accurately reflected the reality of social interactions. For example, listeners only provided generic backchannels and did not respond to the participant or engage them in a debate, which is not typical of real-life interactions. In everyday social exchanges, dialogue is involved,

where listeners respond, challenge, and/ or build on the speaker's ideas. This dynamic interaction allows for the observation of how participants handle the open exchange of ideas, elaborate on both communication partners' ideas, and collaborate to integrate opposing views (Felton et al., 2015), which I was not able to observe. Future research should aim to replicate these findings in more naturalistic settings, where participants can engage in authentic dialogue with their peers to better understand the complexities of persuasive discourse in real-world contexts.

A potential limitation is that the two raters who completed the listener's rating measure were both neurotypical adults. While the raters were naïve to participants' diagnostic group, implicit biases could still subtly influence their ratings. However, this study found no significant group differences in the variables that could have been influenced by these implicit biases, namely, manner of delivery or convincingness. Therefore, it does not appear that our measures were impacted by such implicit biases. Prior work has reported that autistic individuals tend to give themselves and their communication partner more freedom to express themselves in unique ways that may not fit the norm (Crompton et al., 2020, 2021; Heasman & Gillespie, 2019). In light of this, involving autistic individuals as raters in future studies could provide valuable insight on communication styles and preferences.

In the future, I would like to compare the ratings I analyzed, which were based on audiovisual information, with ratings based on transcripts alone. This would be another way to disentangle the effects of manner of delivery and content of a persuasive argument on convincingness. Additionally, I plan to analyze the persuasive discourse of autistic and non-autistic participants when they attempted to persuade an adult authority figure in the second persuasive argument elicitation task found in the larger study. This analysis of persuasive

microstructure and macrostructure will allow for the examination of potential register changes between convincing a peer and an authority figure.

7.0 Conclusion, contribution to the literature, and larger implications

Autistic and non-autistic adolescents provided a persuasive language sample through an elicitation task. Their persuasive discourse was analyzed to examine the role of content and manner of delivery in convincing peers. Across all participants, manner of delivery played a more important role than content in convincing a peer, and it was particularly relevant for non-autistic adolescents.

My research provides insight into the persuasive discourse and expressive language in not only the autistic population, but in the non-autistic/ neurotypical population as well. There has not been a study to my knowledge that has examined persuasive discourse in autistic and neurotypical individuals that also examined how convinced the listener was to make the proposed change (convincingness). Most of the prior literature has focused on the content, and not the manner of delivery, of persuasive arguments. Crucially, there has not been any work that examined how the content of the persuasive argument may play a different role than the manner in which the argument is given. My novel use of the listener's rating measure to evaluate manner of delivery and convincingness may add to the literature about persuasive discourse and its relevant pragmatic features with respect to the delivery of arguments. The results from this study contribute to the current body of literature about autistic and neurotypical individuals' social

communication skills in the different genres of spoken discourse and how these skills are used in daily interactions with others.

My thesis also contributes to the current literature with respect to understanding the ways that both autistic and non-autistic individuals communicate and how their communication is perceived by listeners. Specifically, I investigated the role of content in persuasive discourse and its manner of delivery in convincing a peer listener. The prior literature, which has focused on differences in language production abilities between autistic and non-autistic youth, can be viewed as following the medical model of disability. In contrast, I attempt to lay the basis for a different line of investigation that focuses on how autistic and non-autistic adolescents' persuasive arguments are perceived by the listener, highlighting the dyadic nature of social communication.

Autistic individuals in the literature reported that communication difficulties have arose due to internal and external factors. They recognized that while they needed personalized support, they emphasized that society needs to change as well (Cummins et al., 2020). This is in line with the social model of disability that stipulates that the environment, including the attitudes and behaviours of individuals within it, can and should adapt to accommodate diverse needs. Autistic individuals reported that communication was tiring and effortful, and as a result, they preferred to be alone (Cummins et al., 2020). Social communication differences have been reported by adolescents and adults to negatively impact the maintenance of relationships (Sturrock et al., 2022). Rather than placing the responsibility on the autistic individual to learn neurotypical communication methods, their communication partner can meet them halfway. This can entail, for example, neurotypical individuals adapting the conversational content to meet the needs of their autistic communication partner (Sturrock et al., 2023). To the same effect,

neurotypical communication partners require insight into the social world of autistic individuals. Neurotypical individuals may benefit from understanding the potential pitfalls of relying too heavily on implied meaning when communicating with autistic individuals, as doing so may lead to further confusion, misdirection, and frustration for the autistic individual (Sturrock et al., 2023).

My research also has clinical implications. Rather than developing intervention goals that seek to 'normalize' autistic behaviour or to 'remediate' from a deficit-model perspective (Milton et al., 2023), support strategies should target the social environment and the actions of those around the autistic individual. Possible support strategies include, for example, targeting rapport building and mutually fulfilling relationships (Milton et al., 2023).

The insights gained from my thesis about how content and manner of delivery contribute to convincing a listener can allow us to promote effective communication and mutual understanding between communication partners. Specifically, better communication could be promoted by educating individuals, such as neurotypical listeners, about differences in the content and manner of delivery in autistic discourse. By promoting better communication through such education, we can increase mutual understanding between individuals. Prior research on the impact of autism acceptance trainings have shown that they can improve neurotypical individuals' impressions of autistic individuals, such as rating them higher on attractiveness and likeability, as well as expressing a greater interest in hanging out with them (Scheerer et al., 2022). These promising results could potentially extend to promoting better communication between autistic and neurotypical communication partners through greater mutual understanding.

References

Agresti, A., & Tarantola, C. (2018). Simple ways to interpret effects in modeling ordinal categorical data. *Statistica Neerlandica*, *72*(3), 210–223. https://doi.org/10.1111/stan.12130

Allen, C. W., Silove, N., Williams, K., & Hutchins, P. (2007). Validity of the Social Communication Questionnaire in Assessing Risk of Autism in Preschool Children with Developmental Problems. *Journal of Autism and Developmental Disorders*, *37*(7), 1272–1278. https://doi.org/10.1007/s10803-006-0279-7

American Psychiatric Association. (2022). *Diagnostic And Statistical Manual Of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR)* (DSM-5-TR). American Psychiatric Association Publishing. https://doi.org/10.1176/appi.books.9780890425787

American Speech-Language-Hearing Association. (2023, April 25). *Social Communication*. https://www.asha.org/public/speech/development/social-communication/

Anderson, D. K., Lord, C., Risi, S., DiLavore, P. S., Shulman, C., Thurm, A., Welch, K., & Pickles, A. (2007). Patterns of growth in verbal abilities among children with autism spectrum disorder. *Journal of Consulting and Clinical Psychology*, *75*(4), Article 4. https://doi.org/10.1037/0022-006X.75.4.594

Anderson, J. A. E., Mak, L., Keyvani Chahi, A., & Bialystok, E. (2018). The language and social background questionnaire: Assessing degree of bilingualism in a diverse population. *Behavior Research Methods*, *50*(1), Article 1. https://doi.org/10.3758/s13428-017-0867-9

Baghdadli, A., Picot, M.-C., Michelon, C., Bodet, J., Pernon, E., Burstezjn, C., Hochmann, J., Lazartigues, A., Pry, R., & Aussilloux, C. (2007). What happens to children with PDD when they grow up? Prospective follow-up of 219 children from preschool age to mid-

childhood. *Acta Psychiatrica Scandinavica*, *115*(5), Article 5. https://doi.org/10.1111/j.1600-0447.2006.00898.x

Barnard-Brak, L., Brewer, A., Chesnut, S., Richman, D., & Schaeffer, A. M. (2016). The sensitivity and specificity of the social communication questionnaire for autism spectrum with respect to age. *Autism Research*, *9*(8), 838–845. https://doi.org/10.1002/aur.1584

Botha, M., Hanlon, J., & Williams, G. L. (2023). Does Language Matter? Identity-First Versus Person-First Language Use in Autism Research: A Response to Vivanti. *Journal of Autism and Developmental Disorders*, *53*(2), Article 2. https://doi.org/10.1007/s10803-020-04858-w

Bottema-Beutel, K., Kapp, S. K., Lester, J. N., Sasson, N. J., & Hand, B. N. (2021). Avoiding Ableist Language: Suggestions for Autism Researchers. *Autism in Adulthood*, *3*(1), Article 1. https://doi.org/10.1089/aut.2020.0014

Brimo, D., & Hall-Mills, S. (2019). Adolescents' production of complex syntax in spoken and written expository and persuasive genres. *Clinical Linguistics & Phonetics*, *33*(3), Article 3. https://doi.org/10.1080/02699206.2018.1504987

Bürkner, P.-C., & Vuorre, M. (2019). Ordinal Regression Models in Psychology: A Tutorial. *Advances in Methods and Practices in Psychological Science*, *2*(1), 77–101. https://doi.org/10.1177/2515245918823199

Caballero, J. A., & Pell, M. D. (2020). Implicit effects of speaker accents and vocally-expressed confidence on decisions to trust. *Decision*, *7*(4), Article 4. https://doi.org/10.1037/dec0000140

Cage, E., & Burton, H. (2019). Gender Differences in the First Impressions of Autistic Adults. *Autism Research*, *12*(10), Article 10. https://doi.org/10.1002/aur.2191

Canadian Autism Spectrum Disorder Alliance. (2020, June). *Language Guide*. https://www.autismalliance.ca/wp-content/uploads/2020/12/CASDA-Language-Guide.pdf

Christensen, R. H. B. (2019). *ordinal—Regression Models for Ordinal Data.* [R]. http://www.cran.r-project.org/package=ordinal/

Constantino, J. N. (2012). *Social Responsiveness Scale, Second Edition*. Western Psychological Services.

Corsello, C., Hus, V., Pickles, A., Risi, S., Cook, E. H., Leventhal, B. L., & Lord, C. (2007). Between a ROC and a hard place: Decision making and making decisions about using the SCQ. *Journal of Child Psychology and Psychiatry*, *48*(9), 932–940. https://doi.org/10.1111/j.1469-7610.2007.01762.x

Coutinho, A. T. D. Q., Vilela, M. B. R., Lima, M. L. L. T. D., & Silva, V. D. L. (2018). Social communication and functional independence of the elderly in a community assisted by the family health strategy. *Revista CEFAC*, *20*(3), Article 3. https://doi.org/10.1590/1982-0216201820313417

Crompton, C. J., DeBrabander, K., Heasman, B., Milton, D., & Sasson, N. J. (2021). Double Empathy: Why Autistic People Are Often Misunderstood. *Frontiers for Young Minds*, *9*, 554875. https://doi.org/10.3389/frym.2021.554875

Crompton, C. J., Hallett, S., Ropar, D., Flynn, E., & Fletcher-Watson, S. (2020). 'I never realised everybody felt as happy as I do when I am around autistic people': A thematic analysis of autistic adults' relationships with autistic and neurotypical friends and family. *Autism*, *24*(6), 1438–1448. https://doi.org/10.1177/1362361320908976

Cummins, C., Pellicano, E., & Crane, L. (2020). Autistic adults' views of their communication skills and needs. *International Journal of Language & Communication Disorders*, *55*(5), 678–689. https://doi.org/10.1111/1460-6984.12552

Dillon, E., Holingue, C., Herman, D., & Landa, R. J. (2021). Psychometrics of the Pragmatic Rating Scale for School-Age Children With a Range of Linguistic and Social Communication Skills. *Journal of Speech, Language, and Hearing Research : JSLHR*, *64*(9), Article 9. https://doi.org/10.1044/2021_JSLHR-20-00753

Dunn, L. M., Dunn, L. M., & Thériault-Whalen, C. M. (1993). *Échelle de vocabulaire en images Peabody: ÉVIP*. PSYCAN.

Dwyer, P. (2022). The Neurodiversity Approach(es): What Are They and What Do They Mean for Researchers? *Human Development*, *66*(2), 73–92. https://doi.org/10.1159/000523723

Elliott, S. N., Malecki, C. K., & Demaray, M. K. (2001). New Directions in Social Skills Assessment and Intervention for Elementary and Middle School Students. *Exceptionality*, *9*(1–2), Article 1–2. https://doi.org/10.1080/09362835.2001.9666989

Felton, M., Garcia-Mila, M., Villarroel, C., & Gilabert, S. (2015). Arguing collaboratively: Argumentative discourse types and their potential for knowledge building. *British Journal of Educational Psychology*, *85*(3), 372–386. https://doi.org/10.1111/bjep.12078

Fletcher-Watson, S. (2022). Transdiagnostic research and the neurodiversity paradigm: Commentary on the transdiagnostic revolution in neurodevelopmental disorders by Astle et al. *Journal of Child Psychology and Psychiatry*, *63*(4), Article 4. https://doi.org/10.1111/jcpp.13589

Fumero, A., Marrero, R. J., Pérez-Albéniz, A., & Fonseca-Pedrero, E. (2021). Adolescents' Bipolar Experiences and Suicide Risk: Well-being and Mental Health Difficulties as

Mediators. *International Journal of Environmental Research and Public Health*, *18*(6), 3024. https://doi.org/10.3390/ijerph18063024

Geelhand, P., Papastamou, F., Deliens, G., & Kissine, M. (2021). Judgments of spoken discourse and impression formation of neurotypical and autistic adults. *Research in Autism Spectrum Disorders*, *82*, 101742. https://doi.org/10.1016/j.rasd.2021.101742

Gergoudis, K., Weinberg, A., Templin, J., Farmer, C., Durkin, A., Weissman, J., Siper, P., Foss-Feig, J., Del Pilar Trelles, M., Bernstein, J. A., Buxbaum, J. D., Berry-Kravis, E., Powell, C. M., Sahin, M., Soorya, L., Thurm, A., Kolevzon, A., & Developmental Synaptopathies Consortium. (2020). Psychometric Study of the Social Responsiveness Scale in Phelan–McDermid Syndrome. *Autism Research*, *13*(8), Article 8. https://doi.org/10.1002/aur.2299

Gibson, C. M., Penn, D. L., Prinstein, M. J., Perkins, D. O., & Belger, A. (2010). Social skill and social cognition in adolescents at genetic risk for psychosis. *Schizophrenia Research*, *122*(1–3), 179–184. https://doi.org/10.1016/j.schres.2010.04.018

Goedhart, J. (2016). *Calculation of a distribution free estimate of effect size and confidence intervals using VBA/Excel*. https://doi.org/10.1101/073999

Gouvernement du Québec. (n.d.). *Secondary English Language Arts Program- Cycle Two*. https://www.education.gouv.qc.ca/fileadmin/site_web/documents/PFEQ/5b_QEP_SELA.pdf

Grossman, R. B., Mertens, J., & Zane, E. (2019). Perceptions of self and other: Social judgments and gaze patterns to videos of adolescents with and without autism spectrum disorder. *Autism*, *23*(4), Article 4. https://doi.org/10.1177/1362361318788071

Heasman, B., & Gillespie, A. (2019). Learning how to read autistic behavior from interactions between autistic people. *Behavioral and Brain Sciences*, *42*, e93. https://doi.org/10.1017/S0140525X18002364

Heilmann, J., Malone, T. O., & F Westerveld, M. (2020). Properties of Spoken Persuasive Language Samples From Typically Developing Adolescents. *Language, Speech, and Hearing Services in Schools*, *51*(2), Article 2. https://doi.org/10.1044/2019_LSHSS-19-00078

Higgins, L., Mannion, A., Chen, J. L., & Leader, G. (2023). Adaptation of Parents Raising a Child with ASD: The Role of Positive Perceptions, Coping, Self-efficacy, and Social Support. *Journal of Autism and Developmental Disorders*, *53*(3), 1224–1242. https://doi.org/10.1007/s10803-022-05537-8

Hill, E., Claessen, M., Whitworth, A., & Boyes, M. (2021). Profiling variability and development of spoken discourse in mainstream adolescents. *Clinical Linguistics & Phonetics*, *35*(2), Article 2. https://doi.org/10.1080/02699206.2020.1731607

Howlin, P., Magiati, I., & Charman, T. (2009). Systematic Review of Early Intensive Behavioral Interventions for Children With Autism. *American Journal on Intellectual and Developmental Disabilities*, *114*(1), Article 1. https://doi.org/10.1352/2009.114:23-41

Hudry, K., Leadbitter, K., Temple, K., Slonims, V., McConachie, H., Aldred, C., Howlin, P., Charman, T., & PACT Consortium. (2010). Preschoolers with autism show greater impairment in receptive compared with expressive language abilities. *International Journal of Language & Communication Disorders*, *45*(6), Article 6. https://doi.org/10.3109/13682820903461493

Jiang, X., Gossack-Keenan, K., & Pell, M. D. (2020). To believe or not to believe? How voice and accent information in speech alter listener impressions of trust. *Quarterly Journal of Experimental Psychology*, *73*(1), Article 1. https://doi.org/10.1177/1747021819865833

Justice, L. M., Bowles, R. P., Kaderavek, J. N., Ukrainetz, T. A., Eisenberg, S. L., & Gillam, R. B. (2006). The Index of Narrative Microstructure: A Clinical Tool for Analyzing School-Age Children's Narrative Performances. *American Journal of Speech-Language Pathology*, *15*(2), Article 2. https://doi.org/10.1044/1058-0360(2006/017)

Kapp, S. K. (2020). Introduction. In S. K. Kapp (Ed.), *Autistic Community and the Neurodiversity Movement* (pp. 1–19). Springer Singapore. https://doi.org/10.1007/978-981-13-8437-0_1

Karasinski, C. M. (2023). Microstructure and Macrostructure Measures of Written Narrative, Expository, and Persuasive Language Samples. *Communication Disorders Quarterly*, *44*(3), Article 3. https://doi.org/10.1177/15257401221111334

Kelly, R., O'Malley, M.-P., & Antonijevic, S. (2018). 'Just trying to talk to people … It's the hardest': Perspectives of adolescents with high-functioning autism spectrum disorder on their social communication skills. *Child Language Teaching and Therapy*, *34*(3), Article 3. https://doi.org/10.1177/0265659018806754

Kim, S. H., Paul, R., Tager-Flusberg, H., & Lord, C. (2014). Language and Communication in Autism. In F. R. Volkmar, R. Paul, S. J. Rogers, & K. A. Pelphrey, *Handbook of Autism and Pervasive Developmental Disorders, Fourth Edition* (1st ed.). Wiley. https://doi.org/10.1002/9781118911389.hautc10

Kjelgaard, M. M., & Tager-Flusberg, H. (2001). An investigation of language impairment in autism: Implications for genetic subgroups. *Language and Cognitive Processes*, *16*(2–3), Article 2–3. https://doi.org/10.1080/01690960042000058

Koegel, L. K., Bryan, K. M., Su, P. L., Vaidya, M., & Camarata, S. (2020). Definitions of Nonverbal and Minimally Verbal in Research for Autism: A Systematic Review of the Literature. *Journal of Autism and Developmental Disorders*, *50*(8), Article 8. https://doi.org/10.1007/s10803-020-04402-w

Kover, S. T., & Atwood, A. K. (2013). Establishing Equivalence: Methodological Progress in Group-matching Design and Analysis. *American Journal on Intellectual and Developmental Disabilities*, *118*(1), Article 1. https://doi.org/10.1352/1944-7558-118.1.3

Krippendorff, K. (2004). *Content analysis: An introduction to its methodology (2nd ed.)*. Sage Publications.

Laerd Statistics. (n.d.). *Ordinal Regression using SPSS Statistics*. Laerd Statistics. https://statistics.laerd.com/spss-tutorials/ordinal-regression-using-spss-statistics.php

Lange, R. T. (2011). Inter-rater Reliability. In J. S. Kreutzer, J. DeLuca, & B. Caplan (Eds.), *Encyclopedia of Clinical Neuropsychology* (pp. 1348–1348). Springer New York. https://doi.org/10.1007/978-0-387-79948-3_1203

Lu, J., Luo, J., Liang, L., & Jing, M. (2019). Measuring Adolescents' Social Media Behavior Outside and Inside of School: Development and Validation of Two Scales. *Journal of Educational Computing Research*, *57*(5), Article 5. https://doi.org/10.1177/0735633118786851

Macbeth, G., Razumiejczyk, E., & Ledesma, R. D. (2010). Cliff´s Delta Calculator: A non-parametric effect size program for two groups of observations. *Universitas Psychologica*, *10*(2), 545–555. https://doi.org/10.11144/Javeriana.upsy10-2.cdcp

MacWhinney, B. (2000). *The CHILDES Project: Tools for Analyzing Talk. 3rd Edition*. Lawrence Erlbaum Associates.

Mauchand, M., & Pell, M. D. (2021). Emotivity in the Voice: Prosodic, Lexical, and Cultural Appraisal of Complaining Speech. *Frontiers in Psychology*, *11*, 619222. https://doi.org/10.3389/fpsyg.2020.619222

McCann, J., & Peppé, S. (2003). Prosody in autism spectrum disorders: A critical review. *International Journal of Language & Communication Disorders*, *38*(4), 325–350. https://doi.org/10.1080/1368282031000154204

McGregor, K. K., Berns, A. J., Owen, A. J., Michels, S. A., Duff, D., Bahnsen, A. J., & Lloyd, M. (2012). Associations between syntax and the lexicon among children with or without ASD and language impairment. *Journal of Autism and Developmental Disorders*, *42*(1), 35–47. https://doi.org/10.1007/s10803-011-1210-4

McIntyre, N. S., Grimm, R. P., Solari, E. J., Zajic, M. C., & Mundy, P. C. (2020). Growth in narrative retelling and inference abilities and relations with reading comprehension in children and adolescents with autism spectrum disorder. *Autism & Developmental Language Impairments*, *5*, 239694152096802. https://doi.org/10.1177/2396941520968028

Meissel, K., & Yao, E. (2024). *Using Cliff's Delta as a Non-Parametric Effect Size Measure: An Accessible Web App and R Tutorial*. https://doi.org/10.7275/PARE.1977

Mervis, C. B., & Klein-Tasman, B. P. (2004). Methodological Issues in Group-Matching Designs: Levels for Control Variable Comparisons and Measurement Characteristics of Control and Target Variables. *Journal of Autism and Developmental Disorders*, *34*(1), Article 1. https://doi.org/10.1023/B:JADD.0000018069.69562.b8

Miller, J. F., & Iglesias, A. (2015). *Systematic Analysis of Language Transcripts* [Computer software]. Salt Software, LLC.

Milton, D. E. M., Waldock, K. E., & Keates, N. (2023). Autism and the 'double empathy problem.' In F. Mezzenzana & D. Peluso, *Conversations on Empathy* (1st ed., pp. 78–97). Routledge. https://doi.org/10.4324/9781003189978-6

Milton, D., Ridout, S., Martin, N., Mills, R., & Murray, D. (Eds.). (2020). *The neurodiversity reader exploring concepts, lived experience and implications for practice*. Pavilion Publishing and Media.

Mok, P. L. H., Pickles, A., Durkin, K., & Conti-Ramsden, G. (2014). Longitudinal trajectories of peer relations in children with specific language impairment. *Journal of Child Psychology and Psychiatry*, *55*(5), Article 5. https://doi.org/10.1111/jcpp.12190

Montoya, R. M., Horton, R. S., Vevea, J. L., Citkowicz, M., & Lauber, E. A. (2017). A re-examination of the mere exposure effect: The influence of repeated exposure on recognition, familiarity, and liking. *Psychological Bulletin*, *143*(5), 459–498. https://doi.org/10.1037/bul0000085

Moody, E. J., Reyes, N., Ledbetter, C., Wiggins, L., DiGuiseppi, C., Alexander, A., Jackson, S., Lee, L.-C., Levy, S. E., & Rosenberg, S. A. (2017). Screening for Autism with the SRS and SCQ: Variations across Demographic, Developmental and Behavioral Factors in

Preschool Children. *Journal of Autism and Developmental Disorders*, *47*(11), Article 11. https://doi.org/10.1007/s10803-017-3255-5

Mottron, L., & Bzdok, D. (2020). Autism spectrum heterogeneity: Fact or artifact? *Molecular Psychiatry*, *25*(12), Article 12. https://doi.org/10.1038/s41380-020-0748-y

Nippold, M. A. (2007). *Later language development: School-age children, adolescents, and young adults (3rd Ed.)*. PRO-ED.

Nippold, M. A., Ward-Lonergan, J. M., & Fanning, J. L. (2005). Persuasive Writing in Children, Adolescents, and Adults: A Study of Syntactic, Semantic, and Pragmatic Development. *Language, Speech, and Hearing Services in Schools*, *36*(2), Article 2. https://doi.org/10.1044/0161-1461(2005/012)

Norrelgen, F., Fernell, E., Eriksson, M., Hedvall, Å., Persson, C., Sjölin, M., Gillberg, C., & Kjellmer, L. (2015). Children with autism spectrum disorders who do not develop phrase speech in the preschool years. *Autism*, *19*(8), Article 8. https://doi.org/10.1177/1362361314556782

Orben, A., Tomova, L., & Blakemore, S.-J. (2020). The effects of social deprivation on adolescent development and mental health. *The Lancet Child & Adolescent Health*, *4*(8), Article 8. https://doi.org/10.1016/S2352-4642(20)30186-3

Paul, R. (2007). Communication and its development in autism spectrum disorders. In F. R. Volkmar (Ed.), *Autism and Pervasive Developmental Disorders* (2nd ed., pp. 129–156). Cambridge University Press. https://doi.org/10.1017/CBO9780511544446.005

Peristeri, E., Andreou, M., & Tsimpli, I. M. (2017). Syntactic and Story Structure Complexity in the Narratives of High- and Low-Language Ability Children with Autism Spectrum Disorder. *Frontiers in Psychology*, *8*, 2027. https://doi.org/10.3389/fpsyg.2017.02027

Perry, R. (2022, August). *Differences in Autistic v. Allistic Communication*. https://accessate.net/features/2791/differences-in-autistic-v-allistic-communication

Pezold, M. J., Imgrund, C. M., & Storkel, H. L. (2020). Using Computer Programs for Language Sample Analysis. *Language, Speech, and Hearing Services in Schools*, *51*(1), Article 1. https://doi.org/10.1044/2019_LSHSS-18-0148

Place, K. S., & Becker, J. A. (1991). The influence of pragmatic competence on the likeability of grade-school children. *Discourse Processes*, *14*(2), Article 2. https://doi.org/10.1080/01638539109544783

Prislin, R. (2010). Persuasion as social interaction. In J. P. Forgas, J. Cooper, & W. D. Crano (Eds.), *The psychology of attitudes and attitude change* (pp. 215–227). Psychology Press.

Purdue University. (n.d.). *Numbers & Statistics*. Numbers and Statistics - Purdue OWL® - Purdue University. https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/apa_numbers_statistics.html

Rideout, V., & Robb, M. B. (2019). *The Common Sense census: Media use by tweens and teens*. Common Sense Media.

Rocklage, M. D., Rucker, D. D., & Nordgren, L. F. (2018). Persuasion, Emotion, and Language: The Intent to Persuade Transforms Language via Emotionality. *Psychological Science*, *29*(5), Article 5. https://doi.org/10.1177/0956797617744797

Roid, G. H., Miller, L. J., Pomplun, M., & Koch, C. (2013). *Leiter International Performance Scale- Third Edition*. Stoelting Co.

Rose, V., Trembath, D., Keen, D., & Paynter, J. (2016). The proportion of minimally verbal children with autism spectrum disorder in a community-based early intervention

programme: Proportion of minimally verbal children with ASD. *Journal of Intellectual Disability Research*, *60*(5), Article 5. https://doi.org/10.1111/jir.12284

Rubin, K. H., Bukowski, W. M., Parker, J. G., & Bowker, J. C. (2008). Peer interactions, relationships, and groups. In *Child and adolescent development: An advanced course* (pp. 141–180).

Rutter, M., Bailey, A., & Lord, C. (2003). *Social Communication Questionnaire*. Western Psychological Services.

Rutter, M., LeCouteur, A., & Lord, C. (2003). *Autism Diagnostic Interview–Revised*. Western Psychological Services.

Sasson, N. J., Faso, D. J., Nugent, J., Lovell, S., Kennedy, D. P., & Grossman, R. B. (2017). Neurotypical Peers are Less Willing to Interact with Those with Autism based on Thin Slice Judgments. *Scientific Reports*, *7*(1), Article 1. https://doi.org/10.1038/srep40700

Scheerer, N. E., Boucher, T. Q., Sasson, N. J., & Iarocci, G. (2022). Effects of an Educational Presentation About Autism on High School Students' Perceptions of Autistic Adults. *Autism in Adulthood*, *4*(3), Article 3. https://doi.org/10.1089/aut.2021.0046

Schendel, D. E., DiGuiseppi, C., Croen, L. A., Fallin, M. D., Reed, P. L., Schieve, L. A., Wiggins, L. D., Daniels, J., Grether, J., Levy, S. E., Miller, L., Newschaffer, C., Pinto-Martin, J., Robinson, C., Windham, G. C., Alexander, A., Aylsworth, A. S., Bernal, P., Bonner, J. D., … Yeargin-Allsopp, M. (2012). The Study to Explore Early Development (SEED): A Multisite Epidemiologic Study of Autism by the Centers for Autism and Developmental Disabilities Research and Epidemiology (CADDRE) Network. *Journal of Autism and Developmental Disorders*, *42*(10), Article 10. https://doi.org/10.1007/s10803-012-1461-8

Shenouda, J., Barrett, E., Davidow, A. L., Sidwell, K., Lescott, C., Halperin, W., Silenzio, V. M. B., & Zahorodny, W. (2023). Prevalence and Disparities in the Detection of Autism Without Intellectual Disability. *Pediatrics*, *151*(2), Article 2. https://doi.org/10.1542/peds.2022-056594

Simms, M. D., & Jin, X. M. (2015). Autism, Language Disorder, and Social (Pragmatic) Communication Disorder: DSM-V and Differential Diagnoses. *Pediatrics In Review*, *36*(8), Article 8. https://doi.org/10.1542/pir.36.8.355

Sonderegger, M. (2023). *Regression modeling for linguistic data*. The MIT Press.

Sturrock, A., Chilton, H., Foy, K., Freed, J., & Adams, C. (2022). In their own words: The impact of subtle language and communication difficulties as described by autistic girls and boys without intellectual disability. *Autism*, *26*(2), 332–345. https://doi.org/10.1177/13623613211002047

Sturrock, A., Foy, K., Freed, J., Adams, C., & Leadbitter, K. (2023). The impact of subtle language and communication difficulties on the daily lives of autistic children without intellectual disability: Parent perspectives. *International Journal of Language & Communication Disorders*, *58*(4), 1232–1250. https://doi.org/10.1111/1460-6984.12859

Tager-Flusberg, H., & Anderson, M. (1991). The Development of Contingent Discourse Ability in Autistic Children. *Journal of Child Psychology and Psychiatry*, *32*(7), 1123–1134. https://doi.org/10.1111/j.1469-7610.1991.tb00353.x

To, C. K. S., Yim, S. F. Y., Lam, G. Y. H., & Iao, L.-S. (2016). Persuasion in Chinese School-Age Children With and Without Autism Spectrum Disorders. *Focus on Autism and Other Developmental Disabilities*, *31*(3), Article 3. https://doi.org/10.1177/1088357614547888

Tolins, J., & Fox Tree, J. E. (2014). Addressee backchannels steer narrative development. *Journal of Pragmatics*, *70*, 152–164. https://doi.org/10.1016/j.pragma.2014.06.006

UCLA: Statistical Consulting Group. (2011). *FAQ: What are pseudo R-squareds?* https://stats.oarc.ucla.edu/other/mult-pkg/faq/general/faq-what-are-pseudo-r-squareds/

Van Zant, A. B., & Berger, J. (2020). How the voice persuades. *Journal of Personality and Social Psychology*, *118*(4), Article 4. https://doi.org/10.1037/pspi0000193

Volkmar, F. R., Rogers, S. J., Paul, R., & Pelphrey, K. A. (Eds.). (2014). *Handbook of autism and pervasive developmental disorders* (Fourth edition). John Wiley & Sons, Inc.

Walker, N. (2014). Neurodiversity: Some basic terms and definitions. *Neuroqueer*. https://neuroqueer.com/neurodiversity-terms-and-definitions/

Western Psychological Services. (n.d.). *(Leiter-3) Leiter International Performance Scale, Third Edition*. Educational & Psychological Assessments for Clinicians & Educators. https://www.wpspublish.com/leiter-3-leiter-international-performance-scale-third-edition

Wiggins, L. D., Reynolds, A., Rice, C. E., Moody, E. J., Bernal, P., Blaskey, L., Rosenberg, S. A., Lee, L.-C., & Levy, S. E. (2015). Using Standardized Diagnostic Instruments to Classify Children with Autism in the Study to Explore Early Development. *Journal of Autism and Developmental Disorders*, *45*(5), Article 5. https://doi.org/10.1007/s10803-014-2287-3

Wiig, E. H., Semel, E., & Secord, W. A. (2019). *Évaluation clinique des notions langagières fondamentales: Version pour francophones du Canada (Clinical evaluation of language fundamentals: French Canadian version)*. Pearson Canada Assessment.

Williams, R. (2020, January 12). *Scalar Measures of Fit: Pseudo R2 and Information Measures (AIC & BIC)*. https://www3.nd.edu/~rwilliam/stats3/L05.pdf

Wolff, N., Stroth, S., Kamp-Becker, I., Roepke, S., & Roessner, V. (2022). Autism Spectrum Disorder and IQ – A Complex Interplay. *Frontiers in Psychiatry*, *13*, 856084. https://doi.org/10.3389/fpsyt.2022.856084

World Health Organization. (n.d.). *Adolescent health*. World Health Organization. https://www.who.int/health-topics/adolescent-health#tab=tab_1

Zamzow, R. (2021). Double empathy, explained. *Spectrum*. https://doi.org/10.53053/MMNL2849

Appendices

These materials are also available in French, as it is the language in which the participants are tested.

Appendix A

Persuasive Argument Elicitation Task Protocol

Today, we're going to find out how well you can persuade others. Persuading others means talking people into, or convincing them, to do something you want.

I'm going to show you three issues. I would like you to pick the issue that interests you most. Here are the three issues: [hand list to participant].

1. You need to switch work shifts with somebody at work.

   Person: a friend you work with

2. You think the school cafeteria should stop serving junk food and only serve healthy food.

   Person: your friend who is the president of the student council

3. You are trying to get people to join you for a neighborhood trash clean-up for Earth Day.

   Person: a friend your age

Allow the participant time to review the suggested issues before asking: *What issue have you picked?* If the participant has difficulty choosing an issue, offer assistance *[Do you need help choosing a topic?]*. Review the list together.

Here's a list of points you'll need to cover to make a complete argument [give the participant a copy of the planning sheet]. *Please take the next few minutes to plan your argument by taking notes in these blank spaces* [point to the empty boxes in the right-hand column]. *Don't waste time writing out complete sentences. Just jot down a few key words to help you remember*

what you want to say. If you prefer, you can use the reverse side of the sheet to draw a diagram or make a graphic organizer. Do you have any questions? Go ahead and start planning.

REMINDER: Give the participant 5 minutes to plan. Remind the participant when there is 2 minutes left and 1 minute left.

If the participant seems to be having any difficulty understanding the planning sheet, read it aloud.

Allow enough time for the participant to write a few ideas down for each point on the planning sheet, or to create a diagram. Check that the participant has done some planning for each point. If they haven't, prompt with: *Don't forget to write down a few ideas for (name[s] of points omitted).*

Let me introduce you to (RA'S NAME). Imagine that (RA) is your (name the role chosen for this scenario), in other words, is the friend that you're trying to convince. Talk to (RA) as if they were your (NAME RA'S ROLE).

Before turning the video and audio recorders on, say: *When you're ready to speak, I'll start recording. Remember, you're the one who has to do the talking. (RA) will just listen. Tell them everything you can think of to convince them. You can check your planning sheet to help you remember what you want to say. You can also add to the information you've written down. Remember, I expect you to talk for as long as possible.*

Turn on both the video and audio recorders and ask the participant to start speaking. Do not engage the participant in a debate. Instead, (RA) should limit their encouragements to affirmations such as: *uh huh*, and *yeah*.

If the participant has finished speaking before several minutes have elapsed, or if they have not discussed one or more points on the planning sheet, prompt: *Is there anything else you'd like to add?*

If the participant still hasn't addressed all the points on the planning sheet, the experimenter should prompt with: *What about (name[s] of omitted point[s])?*

When the participant has finished speaking, turn off both the video and audio recorders. Check the quality of the recordings before proceeding with the rest of the protocol.

REMINDER: Give the RA the listener's subjective ratings of persuasive effectiveness.

Appendix B

Planning Sheet for the Persuasive Argument Elicitation Task

Participant ID: _____

Characteristic	What's covered	Notes
Issue identification	What rule or situation would you like to change? What would you change it to?	
Supporting reasons	What facts, values or evidence support your position? Be sure to include how the change you propose would benefit or help the people who are important to your listener.	
Other points of view (counterarguments)	What are some reasons to support an opposing position?	
Response to counterarguments	What can you say to reduce the effectiveness of the counterarguments? Which counterarguments do you agree with, either partially or completely?	
Compromises	If you can't get exactly what you want, what compromises might be acceptable?	
Conclusion	Briefly summarize your position: What do you want? Why do you want it? What are the first steps to achieving the desired change?	

Use the reverse of this page for an optional diagram or graphic organizer, or for additional notes.

Appendix C

The Persuasive Scoring Scheme (PSS) developed by Heilmann et al. (2020)

Participant ID: _____

Characteristic	Proficient/Advanced (5)	Satisfactory/Adequate (3)	Minimal/Immature (1)
Issue identification and desired change	• Existing rule or situation is clearly understood before supporting reasons are stated. • Desired change is clearly stated.	• Existing rule or situation can be discerned; may require shared knowledge. • Desired change can be discerned.	• Speaker launches into persuasion with no mention of existing rule or situation. • Desired change is difficult to determine.
Supporting reasons	• Reason(s) are comprehensive; include detail. • Benefit(s) to others are clearly understood.	• One or more reasons are offered to support desired change. • Benefit(s) to others are unclear or omitted.	• Reason(s) are confusing or vague. • Significant/obvious reason(s) are not stated. • Reason(s) are not plausible; do not support change.
Other point of view (counter arguments)	• Other point(s) of view are clearly explained; include detail. • Includes language to support or refute other point of view.	• Other point(s) of view are acknowledged. OR • Dismissive of other point(s) of view.	• Other point(s) of view are unclear or omitted.
Compromises	• Includes language, with some detail, to support or refute compromising.	• Compromise(s) are acknowledged. OR • Dismissive of compromising.	• Compromises are unclear or omitted.
Conclusion	• Desired change is clearly restated/summarized. • Arguments are clearly restated/summarized. • Concludes using language such as, “to conclude”, “therefore”, “and so”, “in sum”, etc. • First step(s) for change are mentioned.	• Desired change is restated. • One or more supporting reasons are restated. • Ending is inferred and/or lacks transition to conclusion, e.g., “and that’s all”, “that’s it”, “I’m done”.	• Summary statement(s) are omitted. • Unclear to listener that the persuasion task is completed.
Cohesion	• Points are fully covered before moving on to another. • Transitions between points are smooth/clear using mature language. • Referents are clear. • Listener can easily follow the argument.	• Points are covered, but lack organization. • Transitions between points are acceptable. • Referencing is adequate. • Listener can follow the argument with some effort.	• Points are not fully covered before moving onto another. • Abrupt transitions between points. • Referents are unclear, hard to follow. • Argument is difficult to follow.
Effectiveness	• Argument is extremely compelling.	• Argument is compelling. • Argument is plausible.	• Argument is minimally or not compelling. • Argument is not plausible.

	• Argument is entirely plausible. • Argument is well stated. • Mature language is used. • Minimal errors of syntax/form. • Supported points well. • Speaker's delivery is passionate. • Speaker engages listener.	• Argument requires little or no clarification. • Acceptable syntax/form. • Speaker's delivery is clear; not necessarily passionate. • Effort to persuade is evident. • Speaker makes some attempt to engage listener.	• Language is unclear. • Errors of syntax/form may be prevalent. • Speaker's delivery lacks effort; not passionate. • Speaker makes no attempt to engage listener. • Speaker uses inappropriate/immature tone.
Scoring: Each characteristic receives a scaled score 0-5. Proficient/Advanced characteristics=5, Satisfactory/Adequate=3, Minimal/Immature=1. Scores in between, 2 and 4, are undefined, use judgment. Significant factual errors reduce the score for that topic. Scores of 0, NA are defined below. A composite is scored by adding the total of the characteristic scores. Highest score=35. **A score of 0 is given for student errors,** e.g., not covering topic, not completing/refusing task, student unintelligibility, abandoned utterances. **A score of NA (non-applicable) is given for mechanical/examiner/operator errors**, e.g., interference from background noise, issues with recording (cut-offs, interruptions), examiner not following protocol, examiner asking overly specific or leading questions rather than open-ended questions or prompts.			

Appendix D

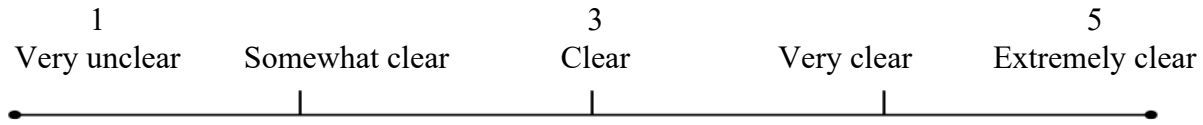
Listener's subjective ratings of persuasive effectiveness

Participant ID: _____ Listener/ RA name: _____

Condition (Peer or Adult): _____ Subject and person: _____

Please rate and answer the following questions based on the participant's persuasive argument.

1. Was the argument clear? Were you able to follow the participant's train of thought and logical flow from one point to another?

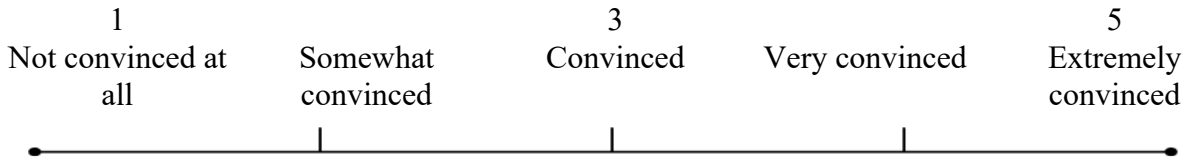


Please share any comments as to why you think this is the case:

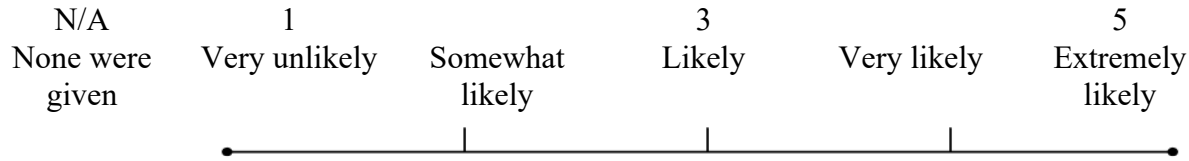
_____

_____

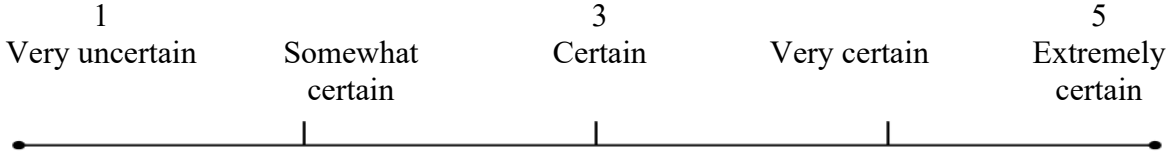
2. As the (PERSON), how convinced are you to make the proposed change?



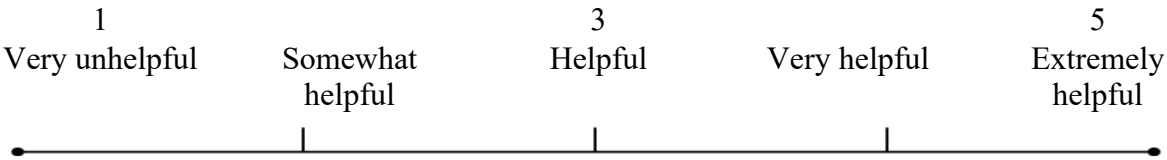
3. How likely are you to use the same supporting arguments, counterarguments or compromises when convincing another person yourself?



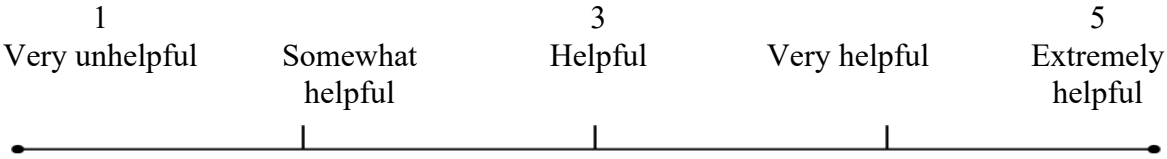
4. How certain/ uncertain did the participant sound when making their argument?



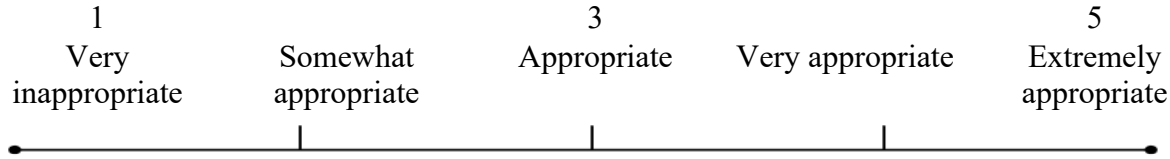
5. Did the participant's body language help to convince you?



6. Was the participant's use of voice helpful to convince you?



7. FOR **PEER** CONDITION ONLY: Did the participant use language that was appropriate for a peer of their age?

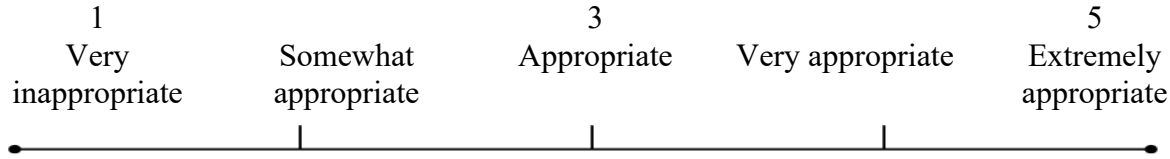


Please share any comments as to why you think this is the case:

_____

_____

8. FOR **ADULT** CONDITION ONLY: Did the participant use language that was appropriate for an adult authority figure?



Please share any comments as to why you think this is the case:

_____

_____

Appendix E

Descriptions of non-parametric tests

I used and reported non-parametric effect size estimates called Cramér's *V* and Cliff's delta (δ) value. Cramér's *V* is the effect size estimate for the chi-square test of independence, measuring the strength of association between two categorical variables (Sonderegger, 2023). The estimate ranges from 0 to 1, where 0 indicates an absence of an association, and 1 indicates a perfect association (Sonderegger, 2023). A 2 x 2 contingency table ($df = 1$) was generated for the sample in this thesis. The interpretation of Cramér's *V* when the degrees of freedom are equal to 1, and how it compares with Cohen's *d*, are reported below.

Cliff's delta (δ) value estimates the "probability that a value selected from one of the groups is greater than a value selected from the other group, minus the reverse probability" (Macbeth et al., 2010, p. 547). In other words, Cliff's delta value is used to compare two groups and is calculated based on the ranks of the observations in each group. It measures the difference between the probability that a randomly chosen observation from one group is higher than a randomly chosen observation from another group, and the probability of the opposite happening. The statistic ranges from -1 to +1, where the extremes indicate that there is no overlap between the two groups' distributions, and 0 indicates a complete overlap (Meissel & Yao, 2024). It can measure the effect size on both continuous and ordinal data, and is robust with small to moderate sample sizes ($n = 10$ to 50) and with non-normal distributions (Goedhart, 2016). Cliff's delta value was appropriate for my data given the small sample size of $n = 27$ and given the non-normal distributions in many of the variables. The interpretation of Cliff's δ, and how it compares with Cohen's *d and* Cramér's *V*, are reported below.

Interpretations of Cohen's d, Cramér's *V,* and *Cliff's δ value*

Cohen's *d*	Cramér's *V*	Cliff's δ value	Interpretation
< 0.2	0 < 0.10	$\lvert\delta\rvert < 0.147$	Negligible
0.2	0.10 < 0.30	$0.147 \leq \lvert\delta\rvert < 0.330$	Small
0.5	0.30 < 0.50	$0.330 \leq \lvert\delta\rvert < 0.474$	Medium
≥ 0.8	< 0.50	$\lvert\delta\rvert \geq 0.474$	Large

Spearman's rank correlation coefficient was used to examine the relationship between content and manner of delivery and convincingness. The coefficient was calculated for both the autistic and non-autistic groups. Spearman's rank correlation coefficient is a monotonic measure of the strength and direction of association between two ranked variables. Therefore, Spearman's coefficient is not restricted to continuous variables and can be used for ordinal data as well. It performs wells for non-normal distributions, and is robust against outliers (Schober et al., 2018). Spearman's rank correlation coefficient was selected as my data contains both continuous and ordinal variables and has non-normal distributions.

Finally, to answer my second question, namely, how do content and manner of delivery compare in predicting convincingness, and whether this relationship differs for autistic and non-autistic adolescents, ordinal logistic regression models (which can also be referred to as *ordinal regression*) were run. I chose to run ordinal regression models because the dependent variable, convincingness, was an ordinal variable with categories that have a natural order. Analyzing ordinal data as metric responses (i.e., interval or ratio scales) can lead to errors in inference, such as "distorted effect-size estimates, inflated false alarm (Type I error) rates, and even inversions of differences between groups" (Bürkner & Vuorre, 2019, p. 77). Ordinal regression models predict probabilities of an ordinal dependent variable, given one or more independent variables (Laerd Statistics, n.d.). They can determine which independent variable(s), if any, have a significant effect on the dependent variable. Ordinal regressions make four assumptions about

the underlying data: the dependent variable is measured on an ordinal scale; one or more of the independent variables are either continuous, categorical, or ordinal; there is no multi-collinearity (i.e., two or more independent variables must not be highly correlated with each other); and the odds are proportional (i.e., each independent variable has an identical effect at each cumulative split of the ordinal dependent variable, or in other words, the relationship between any two adjacent categories on the ordinal scale is the same, regardless of which pair of categories are being examined). All four assumptions were met for the data reported in this thesis.

Cumulative link models, one of the most popular ordinal regression models, were fit using the 'ordinal' package (Christensen, 2019) in R/ RStudio. It is a model for ordinal-scale observations (i.e., observations that fall in an ordered finite set of categories) where the thresholds (i.e., the cut-off points between the variable's response options or categories) are strictly ordered. These models provide coefficient estimates, standard errors, and *p* values. An additional parameter are the threshold values between the variable's response options or categories. In addition, the estimates of the model can be converted to odds ratios (OR), defined as a "multiplicative effect of each 1-unit increase in the [dependent variable] on the cumulative odds" of the outcome variable (Agresti & Tarantola, 2018, p. 2). In the context of my thesis, the continuous independent variables such as content and manner of delivery scores can be interpreted as how a single unit increase or decrease in that variable was associated with the likelihood of the dependent variable having a higher or lower value (Laerd Statistics, n.d.).

Pseudo R^2 is a goodness-of-fit measure appropriate for ordinal regression models, where higher values indicate which model better fits the observed data. McFadden's pseudo R^2 is the most commonly reported goodness-of-fit measure (Williams, 2020). The log likelihood of the null model (with no independent variables or *predictors* added to the model) is the total sum of

squares, and the log likelihood of the full model (with all independent variables and any interaction terms included in the model) is the sum of squared errors. The ratio of the likelihoods, which falls between 0 and 1, suggests the level of improvement over the null model offered by the full model (UCLA: Statistical Consulting Group, 2011). The Akaike information criteria (AIC) can also provide information about the fit of the model, such that smaller AIC values imply a better fitting model.

I ran two cumulative link models: a null model was run with no predictors added, and a full model was also run, where, in addition to content and manner of delivery scores being fixed effects in the model, diagnostic group and two interaction terms were also added. The first interaction was between content scores and diagnostic group, and the second interaction was between manner of delivery scores and diagnostic group. Adding content, manner of delivery, and diagnostic group as fixed effects allowed the model to capture the average effect of each independent variable on convincingness, holding all other variables constant. The interaction terms allowed the model to capture how the relationship between one independent variable (e.g., content or manner of delivery) changes depending on diagnostic group, thereby enabling me to understand how the effects of the independent variables vary based on diagnostic group.

The reported threshold coefficients depict the cut-offs between the categories of the ordinal scale (i.e., not convinced at all, somewhat convinced, convinced, very convinced, extremely convinced). The coefficient is the log odds of being in the higher level versus the lower level and all cut-off points below it. For example, the coefficient at the “Convinced|Very convinced” threshold corresponds to the log odds of being in the Very convinced level versus the Convinced, Somewhat convinced, and Not convinced at all levels. The coefficients allow us to understand the relative ease or difficulty for participants to achieve higher levels of

convincingness. For example, a large positive threshold coefficient indicates that a substantial increase in the predictor variables is required for participants to be classified into a higher convincingness category. Conversely, smaller coefficient suggests that less change is needed.

Appendix F

The null and full ordinal logistic regression models predicting convincingness, excluding a participant with an unusually low manner of delivery score

Effect	Null model		Full model				
	Estimate	*SE*	Estimate	*SE*	*p*	OR	95% CI for the OR
Fixed effects							
Content scores			0.21	0.15	.151	1.23	[0.93, 1.67]
Manner of delivery scores			0.78	0.25	.002 **	2.19	[1.39, 3.83]
Diagnostic group[a]			7.95	5.91	.178	2827.40	[0.04, 795368461.91]
Interaction: content scores and diagnostic group			0.24	0.23	.306	1.27	[0.82, 2.05]
Interaction: manner of delivery scores and diagnostic group			-1.18	0.57	.038 *	0.31	[0.09, 0.84]
Threshold coefficients							
Not convinced at all|Somewhat convinced	-2.04	0.61	8.63	3.14			
Somewhat convinced|Convinced	-0.47	0.40	11.75	3.57			
Convinced|Very convinced	0.47	0.40	13.64	3.80			
Very convinced|Extremely convinced	2.04	0.61	16.27	4.21			

[a]The reference diagnostic group is the non-autistic group. This means that the null and full ordinal logistic regression models represent the pattern of relationships observed for autistic participants.

*$p < .05$. **$p < .01$. ***$p < .001$