Self-awareness and Metacognition in a Young Adult Student Population: An Autistic Trait Approach

by

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Abstract

Autism is characterised by social and communication difficulties and restricted and repetitive patterns of behaviour, interests or activities; traits that are evident across clinical and non-clinical populations. Historically, autistic individuals were seen as egocentric, but more contemporary views suggest that challenges might stem from difficulties in distinguishing the self from others. There are many ways the self can be understood. The thesis explores private and public self-awareness as well as metacognition. Existing literature has often treated autistic traits as a general construct with the more nuanced contributions of the subdomains less explored. Furthermore, despite the idea that metacognition may play an important role in self-awareness, these constructs are rarely studied together.

After identifying an appropriate Autism Quotient model to assess autistic traits in a non-clinical sample of young adults (Chapter 4), the thesis investigates the relationship between autistic traits, self-awareness and metacognition (Chapter 5). Two key findings emerged. First, autistic traits were related to self-awareness and metacognition, but only when broken down into their subdomains. Secondly, the nature of these relationships manifested differently in social (involving others) and non-social (referring only to the self) domains. The difference underscores the essential role of context in self-awareness. Focusing on the social context, the statistical mediation effect of trait anxiety within the relationship between social skills and public self-awareness was significant (Chapter 6). Further analysis then investigated how these constructs relate to the perceived benefits and costs of help-seeking (Chapter 7). Results indicated that heightened public self-awareness was associated with an increased perception of the costs associated with help-seeking, suggesting that greater self-awareness might inadvertently pose challenges for individuals. Identifying the relationship led to a theoretical model for future research to explore autistic traits in non-clinical populations to better tailor support strategies aimed at overcoming barriers to educational success.

Table of Contents

List of Tables

List of Figures

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Declaration

I declare that:

- The work presented in this thesis is my own and embodies the results of my research during my period of registration.
- I have read and followed the University's Academic Integrity Policy and that the thesis does not breach copyright or other intellectual property rights of a third party. Where necessary I have gained permission to reproduce copyright materials.
- Any material which has been previously presented and accepted for the award of an aca-demic qualification at this University or elsewhere is clearly identified in the thesis.
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Signature …  ..... Date 27.02.24

Chapter 1: Introduction

The overarching theme of the thesis is to explore the possible relationship between autistic traits and the self in relation to an educational outcome. To explore this, a range of theoretical constructs are investigated. To understand autistic traits there will be a review of autistic traits in a non-clinical population compared to clinical. Following this, the self, which in the thesis is conceptualised as self-awareness and metacognition, will be reviewed. Specifically, the literature will assess how autistic traits relate to both of these constructs and investigate the novel idea that metacognition may be an important process for self-awareness. Exploring the possible relationships also allows for the context (social or non-social) to be assessed to identify whether relationships between autistic traits in a non-clinical population and the self are context-dependent. Finally, the constructs outlined will be explored in relation to the educational outcome of attitudes and beliefs towards help-seeking. This outcome measure has a metacognitive component and is arguably from a social context, as there is a focus on the self and others. After the key theoretical constructs are outlined, there will be a review of the overarching aims, the thesis structure, including the focus of each empirical chapter, and finally the possible contributions of the thesis.

1.1 Autism

Autism is a neurodevelopmental condition with a diagnosis based on behavioural criteria (Lai et al., 2013; Stewart & Austin, 2009), currently including persistent difficulties in social communication and social interaction and restricted or repetitive patterns of behaviour, interests, or activities (American Psychiatric Association (APA), 2013). It is estimated that 1.1% of adults in the UK general population meet the criteria for a diagnosis (Brugha et al., 2016). Compared to previous criteria, Asperger Syndrome has been removed and the umbrella term "Autism Spectrum Disorder" (ASD) has been included. The development in definition recognises autism as a spectrum and is consistent with a continuum approach, whereby traits are believed to be present in both clinical and non-clinical populations (Lai et al., 2013; Stewart et al., 2018). However, high scores on autistic trait measures do not always accurately predict receipt of a future diagnosis (Ashwood et al., 2016) and does not mean everyone is a "little bit autistic" (Sasson & Bottema-Beutel, 2022), as is sometimes a lay interpretation of a spectrum condition. The perception may be in part due to differences in how autistic traits are measured in both populations, with autism

requiring more than the self-completion of a questionnaire. As well as the use of different measures, Sasson and Bottema-Beutel (2022) also suggest autistic individuals may not always meet the cut-off criteria on autistic trait measures despite having a diagnosis. Thus, suggesting that the measures used for autistic traits in the general population differ from those used in the clinical population. Whilst characteristics can be found within the general population, from a clinical perspective, individuals are autistic only if they hold an autism diagnosis (Reed et al., 2016). Autistic traits in clinical and non-clinical populations are discussed further in the next section alongside the first aim of the thesis.

1.1.1 Autistic traits in non-clinical populations

The first aim of the thesis is to explore autistic traits in a non-clinical population and to assess the psychometric properties of the Autism Quotient (AQ). The AQ, a self-report questionnaire, is a dominant way of measuring autistic traits in non-clinical populations (English et al., 2020; Ruzich et al., 2015; Stevenson & Hart, 2017). However, a key issue is the debate as to the psychometric properties of the measure in terms of the factor structure and the scoring approaches taken with it. Assessing the psychometric properties will identify a suitable model to use within the empirical chapters of the thesis.

When studying autistic traits in a non-clinical population caution is needed. Whilst autistic traits appear to be on a continuum and therefore can be explored in a non-clinical population, the diagnostic criteria states that for individuals to receive a diagnosis they must display clinically significant "impairments" in functioning (APA, 2013). Thus, caution is needed in how studies are developed and then interpreted. The research aims should be carefully considered so that studies are not investigating whether "deficits" found in autistic individuals extend to individuals with traits in non-clinical populations because it can reinforce the deficit framework of autism (Sasson & Bottema-Beutel, 2022). Reinforcing the view could be contributing to society focusing on difficulties rather than strengths which can also be associated with the condition and therefore not considering the range of behaviours demonstrated. The autistic community has also raised the concern that focusing on autistic traits in the general population can trivialise their difficulties, making it harder for society to understand and recognise them (Kenny et al., 2016). Thus, researchers need to carefully consider how autistic traits are presented in literature and avoid over-generalisations from non-clinical to clinical populations (Sasson & Bottema-Beutel, 2022). However, exploring

autistic traits across the continuum and therefore assessing populations without a diagnosis can be beneficial from both public health and academic perspectives.

From a societal perspective, autistic traits are associated with depression, anxiety, and even schizophrenia, which suggests that being aware of and understanding the traits can benefit individuals with a range of conditions (Sasson & Bottema-Beutel, 2022). A level of understanding from employers can also be advantageous for both the employer and the employee. For instance, if attributes such as attention to detail are accepted and valued, rather than seen negatively, individuals will be able to use their unique skills effectively and contribute positively to the workforce (Brownlow & O'Dell, 2009).

Focusing on autistic traits in non-clinical populations has advantages from an academic perspective too. The population is believed to be more tolerant to testing environments, compared to individuals with a clinical diagnosis, which supports the use of a broader range of methodologies to potentially provide unique and valuable insights into autistic traits (Christ et al., 2010; Gökçen et al., 2016). For example, in cognitive studies, the testing sessions can be prolonged with multiple experiments and require participants to experience uncomfortable sensory experiences, which can be challenging for autistic individuals (Landry & Chouinard, 2016). Focusing on autistic traits in non-clinical populations allows for these studies to be completed, which extends our knowledge about autistic traits without the potential distress that autistic participants could feel.

Taking a trait approach also provides an opportunity to include women in research and study the distinct female presentation of autism. In doing so, researchers understanding of the female phenotype can strengthen (Belcher et al., 2022) and challenge the view that autism is a "male" condition (Russell et al., 2022). Challenging the historical view is an example of how the findings from non-clinical populations have the potential to increase our knowledge and awareness, which could reduce the gender imbalance of diagnosis rates, with it commonly reported that males are more likely to have a diagnosis than females (Lai et al., 2016; Russell et al., 2022).

Understanding autistic traits can be beneficial in general, not only to females, as there are many barriers to seeking and receiving a diagnosis, such as knowledge surrounding autism and access to services, and many individuals with autistic traits could meet the clinical criteria for a diagnosis but remain undiagnosed (Cassidy et al., 2022). Thus, a greater understanding of traits in non-clinical populations could provide essential information to those who need it.

While there is support for the thesis taking an autistic traits approach in a non-clinical population, to address the potentially sensitive nature of doing so, throughout it will be clear that the aim is not to assume these findings generalise to a clinical population. The AQ will be used to assess autistic traits on a continuum in the general population. The first overarching aim, which is to assess the psychometric properties of the AQ, will be addressed in Chapter 4 which is a preliminary investigation to identify an appropriate model for the data set.

The following sections will review the main constructs to be assessed within the thesis, self-awareness and metacognition. Both constructs relate to the self, which has historical importance when defining autism and contributed to the stereotypical view of autistic individuals being confined to the self (Duff & Flattery, 2014). One suggestion is that the increased attention toward the self may be a result of difficulties distinguishing between the self and others (Lombardo et al., 2010). However, this perspective does not consider social skill difficulties, a key trait associated with autism, which could be limiting opportunities to successfully interact with others (Lind, 2010). The thesis will extend the idea by exploring the self through the construct of self-awareness which can be considered in terms of being social or non-social through its subdomains. As well as self-awareness, the self will also be examined through the construct of metacognition. There is some evidence to suggest that the relationship between autistic traits and self-awareness may be explained by metacognition, however, to our knowledge no study has explored both constructs together. This therefore supports the second overarching aim which is to understand the relationship between autistic traits and the self, which is conceptualised by self-awareness and metacognition.

1.2 Self-awareness and metacognition

Self-awareness as an overall construct refers to a state of self-directed attention, with Fenigstein et al. (1975) suggesting there are two subdomains. These are private self-awareness, which relates to cognitive awareness and attending to one's inner thoughts and feelings, and public self-awareness which relates to an awareness and concern over the self as a social entity that can influence others. Both subdomains can result in individuals becoming reflective observers as well as having the ability to process information about the self (Morin, 2006).

Metacognition on the other hand refers to the cognitive processes involved in thinking about thinking (Frith, 2012; Grainger et al., 2014) and is a tool for monitoring and self-regulating behaviour and beliefs (Lou, 2015). It is a broad construct (Flavell, 1979; Veenman et al., 2006) that can be assessed via a self-report questionnaire, but also lends itself to more objective measures, such as metacognitive monitoring which explains how we represent the occurrence of cognitive activity (Carpenter & Williams, 2023). One way to assess the component is by discriminating between correct and incorrect responses based on confidence (Carpenter & Williams, 2023; Grainger et al., 2016; Sawyer et al., 2014).

With the constructs of self-awareness and metacognition defined, the following section will explore them in relation to one another to identify possible relationships and key distinctions.

1.2.1 Exploring the constructs of self-awareness and metacognition

When exploring self-awareness there is a tendency for research to focus on the subdomains, however, it can also be explored as an overall construct. In doing so, self-awareness is seen as a metacognitive process with the dynamic relationship between knowledge, beliefs, task demands and the context of the situation all accounted for (Zlotnik & Toglia, 2018). Focusing on the overarching construct contributes to awareness of performance, which can in turn influence future behaviour, thus highlighting the role of cognitive processes in self-awareness. Identifying the role of cognitive processes provides support for the suggestion that metacognition could be an important process for self-awareness, with self-awareness being a result of metacognition (Lou, 2015; Zlotnik & Toglia, 2018).

Whilst there is a potential relationship between these constructs, a key distinction is that metacognition refers to cognitive processes (Frith, 2012; Grainger et al., 2014), whereas self-awareness focuses on where attention is directed, and if this is observable or not. For instance, private consists of unobservable events, whereas public self-awareness refers to visible attributes (Morin, 2006). Therefore, when comparing these definitions, a key difference is that metacognition does not have the distinction regarding where attention is directed and specifically requires individuals to think about their thinking.

Although the distinction suggests the constructs can be measured independently, the fact that there may be a relationship leads to the novel idea that metacognition might be an important process for self-awareness and therefore provides a unique framework for the

thesis. Investigating these constructs collectively has the potential to identify the relationships between autistic traits, self-awareness, and metacognition. When exploring these relationships, the context (social or non-social) will be considered to assess whether relationships are context-dependent. The role of the context stems from the idea that social difficulties may be contributing to difficulties with the self as there may be fewer opportunities for autistic individuals to internalise views others have of themselves (Schriber et al., 2014). In the thesis, a social context involves the self and others (e.g., public self-awareness), whilst a non-social context refers only to the self (e.g., private self-awareness). Distinguishing between social and non-social is also consistent with how autism is characterised, with the non-social traits typically grouped together focusing on attention to personal interests and detail-focused attributes (Conson et al., 2022; Palmer et al., 2015). Thus, the focus is on the individual, specifically their processing style. Despite this, when reviewing existing literature, self-awareness has only been explored with total overall autistic trait scores. Exploring the subdomains addresses a gap within the literature and allows for more nuanced relationships to be assessed in a non-clinical sample. It is important to stress that the context is considered for all the main constructs being assessed, which include autistic traits, self-awareness, and metacognition. Exploring the context will extend our understanding of the self in terms of whether autistic traits are related to self-referential difficulties in different contexts.

As well as considering the context for the direct relationship between autistic traits and the self, it will also be accounted for when exploring the statistical mediation between autistic traits and self-awareness through two mediation models, a non-social and social model. The non-social model will focus on the details/patterns subdomain and private self-awareness, whilst the social model will focus on the social skills subdomain and public self-awareness. The mediating variable will be identified by the correlations identified in the thesis ensuring they are consistent with the context of the models. The individual relationships from the social model will then be explored with a social educational outcome, namely attitudes and beliefs toward help-seeking. There will be a focus on the social model which includes the autistic trait subdomain of social skills difficulties, whereas the non-social model includes the details/patterns subdomain which can be seen as a strength or more broadly as a processing bias within the weak central coherence theory of autism (Happé and Frith, 2006). Thus, focusing on the social model allows for exploration into the possible effect of a difficulty and therefore potentially influences support offered at university. To address the third overarching aim, which is to explore the relationship between self-

awareness and an educational outcome, the outcome of perceived benefits and costs of help-seeking will be explored. Consistent with the other constructs, the perceived benefits and costs of help-seeking are also from a social context referring to both the self and others, with a specific view on lecturers and peers. Focusing on this outcome also extends existing literature which tends to focus on grades, even though help-seeking, and subsequently attitudes and beliefs toward seeking help, can be key to success (Chu et al., 2018). Thus, focusing on the identified gap in the literature has the potential to explore whether attitudes and beliefs around seeking help from others are a barrier to student success.

1.3 The perceived benefits and costs of help-seeking

Help-seeking as a broad construct is metacognitive due to the learner evaluating how well they have learnt or performed a task, while attitudes and beliefs toward help-seeking can be a form of metacognitive control as it can guide one's behaviour (Chu et al., 2018). This is possible due to attitudes and beliefs toward help-seeking typically involving a cost-benefit analysis (Dueñas et al., 2021) to identify whether they decide to seek help, therefore shaping behaviour. Due to the metacognitive component in the construct, it is important to understand the relationship between self-awareness and metacognition to identify whether one contributes to the other and how they relate to the attitudes and beliefs toward help-seeking. Exploring the relationship is a unique contribution, as whilst there is theoretical support for the outcome to be related to public self-awareness, with a possible consequence of help-seeking being shame (Rosas & Pérez, 2015) due to negative ideas about how individuals believe they will be perceived by others, to our knowledge exploring both constructs is a novel development of the thesis.

The perceived benefits of help-seeking are the positive ramifications of seeking help (Pajares et al., 2004), whilst the perceived costs commonly focus on negative aspects such as emotional costs (Rosas & Pérez, 2015). Throughout the thesis, these will also be referred to more generally as attitudes and beliefs toward help-seeking. This will be the outcome in the last empirical chapter (Chapter 7) as it is an under-researched area, with research often focusing on academic achievement. Whilst it is widely reported that there is a negative association between autistic traits and academic achievement in university students (McLeod & Anderson, 2022; Trevisan & Birmingham, 2015; Zukerman et al., 2019), there is less known about factors that may be affecting success, such as attitudes and beliefs toward help-

seeking. Understanding attitudes and beliefs in relation to seeking help from lecturers could lead to university-wide changes in terms of the type of support and how support is offered.

With the constructs discussed, the overarching aims of the thesis will be recapped before the thesis structure is outlined.

1.4 The overarching aims

Three overarching aims are being addressed in the thesis. First, is to investigate the psychometric properties of the Autism Quotient (AQ), a dominant instrument to measure traits in research. Chapter 4 explores the factor structure and scoring approach to identify the best-fitting model. The second aim is to understand the relationship between autistic traits and the self, which is conceptualised by self-awareness and metacognition. This will identify whether autistic traits differentially relate to the different aspects of self-awareness and metacognition, thus assessing the specific associations of trait profiles alongside the broad autistic trait approach. Chapter 5 addresses this by exploring the direct associations between autistic traits, self-awareness, and metacognition. Chapter 6 will use these findings to explore whether the pathway between autistic traits and self-awareness subdomains is statistically mediated by a third variable. One model will assess whether a variable mediates the non-social constructs of the details/patterns autistic trait subdomain and private self-awareness and another model will assess whether a variable mediates the social constructs of social skills autistic trait subdomain and public self-awareness. Discussing the constructs in terms of being social or non-social allows for the context to be assessed which is an extension of the idea that social skill difficulties may make it harder to differentiate between the self and other. If a construct is described as a social context it means there is reference to both self and other, while a non-social context means there is only reference to the self. The distinction is a novel approach within the thesis to investigate nuanced relationships. Throughout the thesis, the autistic trait subdomains will simply be referred to as either the details/patterns subdomain or the social skills subdomain. Finally, using the self-awareness model from Chapter 6, the third overarching aim which is to be addressed in Chapter 7, is to explore the relationship between self-awareness and an educational outcome of the perceived benefits and costs of help-seeking. The specific aims of each study are included in the empirical chapters.

1.5 Thesis structure

Chapter 2 presents a review of the literature and begins with an overview of autism from a clinical perspective. The shift from a categorical view of autism to a continuum approach is outlined to understand how autistic traits can be studied and the potential importance of this from clinical and non-clinical perspectives. The focus then shifts to one of the most widely used measures of quantifying autistic traits, the AQ, and its existing use in research. Following this, attention shifts to the key focus of the thesis, the self, specifically understanding the relationship between autistic traits, self-awareness, and metacognition. Finally, there will be a review of help-seeking, focusing on the perceived benefits and costs in relation to autistic traits and the constructs of self-awareness and metacognition.

Chapter 3 presents the overarching methodology of the thesis, including a description of the research design, procedures for data collection, participant recruitment, ethical considerations, and details of the measures that were used across multiple studies. The chapter ends with an outline of the data analysis strategy for the empirical studies.

Chapters 4, 5, 6, and 7 present a series of empirical studies. Chapter 4 focuses on the psychometric properties of the AQ, which is the key measure of autistic traits used throughout the thesis. It details a preliminary investigation to identify an appropriate factor structure and scoring approach for the data set that will then be used in all subsequent analyses within the thesis. The study in Chapter 5 explores whether there is a direct relationship between autistic traits, self-awareness, and metacognition, with analysis in Chapter 6 building on this, and addressing a gap in the literature by exploring the extent to which there are indirect associations between autistic traits and self-awareness. Two mediation models are assessed with one focusing on non-social constructs and the other social, with these supported by the data in the thesis and theoretically from existing literature. Bringing the empirical chapters together, Chapter 7 focuses on an outcome that involves metacognition, specifically the perceived benefits and costs of help-seeking, in relation to the social model.

To conclude, Chapter 8 brings all the elements of the thesis together in a general discussion. There is a summary of findings across all the studies as well as considering the limitations of the work as a whole. The chapter finishes with possible directions for future research, including a proposed theoretical model that draws together the key findings from the thesis.

1.6 Contributions of the thesis

The purpose of the thesis is to develop our understanding of the self, through the constructs of self-awareness and metacognition, in relation to autistic traits in a non-clinical population. Focusing on both constructs will contribute to our knowledge in terms of the relationship between these and autistic traits and further our understanding of whether metacognition is an important construct for self-awareness.

Furthermore, the thesis aims to contribute to a greater understanding of autistic traits in a non-clinical population. This will be achieved by assessing the social model in relation to attitudes and beliefs toward help-seeking, which has a crucial metacognitive component. An established view is that metacognition relates to educational success, with students able to monitor mistakes and modify these accordingly (Grainger et al., 2014; Maras et al., 2017), however, attitudes and beliefs have not been investigated with autistic traits. Exploring the social measure is new in terms of its links to autistic traits, but also in relation to self-awareness and will add to our knowledge about whether self-awareness acts as a barrier to seeking help in a non-clinical university student population.

Chapter 2: Literature review

This chapter begins with a clinical overview of autism and a discussion of the broader shift from a categorical view of autism to a continuum approach, which focuses on autistic traits. This is followed by a brief review of the literature for the measurement of autistic traits, the Autism Quotient (AQ), and the psychometric properties of the measure. A full discussion surrounding the AQ is in the first empirical chapter (Chapter 4).

The focus of this chapter is the construct of the self, which is conceptualised by self-awareness and metacognition. Before exploring these constructs, there is a brief overview of the physical and psychological self and a discussion surrounding why these are an inadequate explanation for self-referential difficulties, which relates to the processing of information in relation to the self (Ford & McLean, 2023) that are associated with autism. Following a review of autistic traits in relation to self-awareness and metacognition the chapter finishes by assessing these constructs with the perceived benefits and costs of help-seeking in university students. Throughout this chapter, due to the gap in current research for autistic traits in non-clinical populations, the literature will primarily focus on clinical research and autism to provide theoretical support.

2.1 Overview of autism

Autism is a neurodevelopmental condition that is present throughout an individual's life (Arslan et al., 2020; Lai et al., 2016; Trevisan et al., 2017). In the early work, "classic" autism was described by Kanner (1943) as individuals experiencing learning disabilities and language delay (Crane et al., 2009; Klin et al., 2007), and Asperger Syndrome was independently described by Asperger (1944) after identifying a group of young males who demonstrated a range of behavioural features including a lack of empathy, trouble forming friendships, and one-sided conversations (Lawson et al., 2004). These terms were separate categories, and whilst still referred to, they are now included under the umbrella term of "Autism Spectrum Disorder" (ASD), with the next section providing a more up-to-date clinical perspective.

2.1.1 A clinical perspective of autism

The Diagnostic and Statistical Manual-Fifth Edition (DSM-5) states that autism is characterised by persistent difficulties in social communication and social interaction and

restricted or repetitive patterns of behaviour, interests, or activities (American Psychiatric Association (APA), 2013). The DSM-5 uses the umbrella term ASD which includes: autistic disorder, Asperger's syndrome, childhood disintegrative disorder, and Pervasive Developmental Disorder - Not Otherwise Specified (PDD-NOS) (APA, 2013). As well as autism referred to as a spectrum, the DSM-5 also recognises late diagnoses by acknowledging that whilst traits appear in early childhood, they might not have a significant impact until social demands exceed one's capacity (Lai et al., 2013).

In terms of autism diagnosis rates, approximately 1.1% of adults in the UK general population meet the criteria for a diagnosis (Brugha et al., 2016). It is commonly reported that males are more likely to have an autism diagnosis than females (Baron-Cohen, Scott et al., 2009; Lai et al., 2016; Russell et al., 2022). A relatively recent estimate is around three males for every one female, although in clinical samples, where individuals have already received a diagnosis, it is higher with four males for every female (Loomes et al., 2017). However, Russell et al. (2022) suggest that prevalence rates can be misleading and therefore focus on comparative trends instead. A time trend review over the past 20 years identifies an increase in diagnosis rates in adults, specifically females, with Russell et al. (2022) suggesting that growth in knowledge about autism and how it presents could explain why diagnosis is higher for adult females compared to adult males and children.

When exploring the possible reasons for the gender difference, although contested, one suggestion relates to the Empathising-Systemising model (E-S model). The first dimension in the model is Empathising (E), which is a component of social cognition (Wheelwright et al., 2006) and is the ability to identify and respond to another person's thoughts (Baron-Cohen, 2002) and therefore make sense of the behaviour in others (Lawson et al., 2004). The second dimension is Systemising (S), which is the drive to analyse and construct systems, and identify rules that direct the behaviour of a system (Baron-Cohen, 2002). The male brain is characterised by Type S (where S>E), the female brain by Type E (where E>S), and the autistic brain is an extreme male brain where systemising is hyper-developed and empathising is hypo-developed (S>>E) (Baron-Cohen, 2002; Lawson et al., 2004). While the theory is still referred to in more recent autism literature such as that by Hull et al. (2020), the model is challenged and alternative explanations have been proposed. The difference in the gender ratio could symbolise an under-diagnosis in females. Gender stereotypes and the characterisation of autism being predominately male-based can contribute to the diagnosis rates (Lai et al., 2016). However, females can remain undiagnosed for longer because of increased motivation to camouflage their behaviour; when difficulties are masked

the signs of autism are less evident to others and thus reduce the likelihood of an assessment or a diagnosis from an assessment (Lai et al., 2016; Hull et al., 2017). Overall, despite there being a lack of agreement in explaining the reasons for the gender difference, there is a general acceptance that autism can present differently in males and females (Belcher et al., 2022; Russell et al., 2022). The potential effect of gender will be assessed to determine whether results can be analysed collectively with the thesis. The analysis of gender occurs in existing metacognitive literature (e.g., Williams et al., 2016) and existing factor analytic studies of the AQ (e.g., Hurst, Mitchell, et al., 2007).

Before considering a trait approach, the terminology that will be used throughout the thesis will be reviewed, including autism itself and how individuals with a diagnosis are referred to.

2.1.2 Autism terminology

The DSM-5 refers to autism as "Autism Spectrum Disorder" (ASD), however, referring to autism as a disorder can be seen as stigmatising (Baron-Cohen, 2017; Uzefovsky et al., 2016) as there are negative connotations of being "broken" (Lai et al., 2013). Furthermore, when describing autism, autistic adults have identified autism as being a difference rather than a disorder (Botha et al., 2022). Autism can also be referred to as a condition that is believed to be less stigmatising and acknowledges that whilst individuals may require a medical diagnosis due to difficulties, they can still have areas of cognitive strength (Baron-Cohen, Scott et al., 2009; Lai et al., 2013). Thus, considering autism as a condition supports the inclusion of positive traits (Wright et al., 2020) and therefore considers the spectrum of traits. As the thesis explored the autistic traits subdomains, the term condition will be referred to throughout.

Preference in the terminology used to refer to autistic individuals differs between academics and the autistic community. When considering the views of both, Kenny et al. (2016) report that whilst some professionals prefer person-first language (e.g., a person with autism) as it puts the individual first, not the condition, autistic adults and parents do not strongly endorse it. Instead, autistic individuals often indicate a preference for disability/identity-first terms, (e.g., autistic person) (Kapp et al., 2012; Kenny et al., 2016). Qualitative analysis identified that autistic adults tend to prefer the identity-first terms as autism is viewed as intrinsic to the person and cannot be separated from them (Kenny et al., 2016). The studies by Kapp et al. (2012) and Kenny et al. (2016) have been commonly cited

in autism literature to explain terminology choice within more recent studies (e.g., Botha et al., 2022; Hull et al., 2020). The preference is consistent with the neurodiversity approach which does not seek to cure autism but instead values diversity (Baron-Cohen, 2017; Kapp et al., 2012). To account for the viewpoint of the autistic community, the use of identity-first terms will be used throughout the thesis. When comparing individuals with and without a diagnosis there will also be reference to clinical and non-clinical populations. As well as terminology, the approach to studying autistic traits also needs consideration.

2.1.3 A continuum approach to studying autistic traits

Traditionally, autism was conceptualised as a categorically distinct condition, whereby individuals were characterised as either autistic or non-autistic (Baron-Cohen, Scott et al., 2009; Murray et al., 2016). While this is still believed to be the case by some within the autistic community (Botha et al., 2022), the DSM-5 refers to autism as a spectrum which suggests that individuals display varying levels of behaviours (De Groot & Van Strien, 2017; Donati et al., 2019). The concept of a spectrum allows for the full range of traits in the population to be considered and is therefore more representative of how autistic traits present (McLeod & Anderson, 2022). There is also a shared view that autistic traits are continuously distributed across the general population (Hoekstra et al., 2007; Lai et al., 2013; Reed, et al., 2016; Whitehouse et al., 2011), with autism conceptualised on the extreme end of a normal distribution of autistic traits (Moseley et al., 2022). The continuous nature of traits suggests characteristics are found within the general population who do not hold a diagnosis (Murray et al., 2016; Ratner & Burrow, 2018; Reed et al., 2016).

Whilst there is support to assess autistic traits in both clinical and non-clinical populations, having autistic traits does not necessarily mean that an individual is autistic (Baron-Cohen et al., 2001; Reed et al., 2016), from a clinical perspective, individuals are autistic only if they have an autism diagnosis (Reed et al., 2016). As discussed in section 1.1.1 academics must therefore be careful with framing and interpreting results from studies taking a trait approach (Sasson & Bottema-Beutel, 2022). A proposed way to study autistic traits is through the Autism Quotient (AQ) (Baron-Cohen et al., 2001), a self-report questionnaire. Whilst the AQ can be analysed into subgroups (low and high) (Stevenson & Hart, 2017), the classification can result in a loss of information at the extreme ends of the distribution of autistic traits (Mason et al., 2020; Stevenson & Hart, 2017). To avoid this, a continuum approach typically uses AQ scores as a predictor or outcome within correlational

analysis (Mason et al., 2020). The use of the AQ in non-clinical populations is reviewed next with this directly relating to the first aim of the thesis, which is to explore the psychometric properties of the AQ.

2.1.4 Using the Autism Quotient to measure autistic traits

The AQ was developed by Baron-Cohen et al. (2001) to measure the extent to which an individual with average intelligence demonstrates autistic traits. It is one of the most widely used self-report measures to quantify autistic traits (English et al., 2020; Ruzich et al., 2015; Stevenson & Hart, 2017) and can be used in both clinical and non-clinical populations (Kunihira et al., 2006). Whilst it can be used for both populations there is a greater tendency to use it with non-clinical populations (English et al., 2020; Murray et al., 2016). A common view is that traits are not restricted to those with a diagnosis and high levels can be used as a proxy for autism (English et al., 2020), thus the AQ can be a useful screening measure (Fusar-Poli et al., 2020; Woodbury-Smith et al., 2005). The AQ is believed to be best at capturing the moderately low to moderately high range of traits, with limited precision for the very high and very low levels (Murray et al., 2016). The lack of accuracy for the extreme scores might be due to the statements referring to a situation or task which includes mild language such as "hard" or "difficult", but not words such as "impossible" that would record higher levels of autistic traits (Murray et al., 2016). For example: "I find it *hard* to make new friends". There is also limited precision for the very high range of traits because restrictive repetitive behaviours which are representative of clinical levels of autism are not represented in the measure.

The AQ has been used extensively to study autistic traits in the general population (Wheelwright et al., 2010). For instance, psychological aspects, such as anorexia nervosa (Calderoni et al., 2015), proneness to psychosis (Abu-Akel et al., 2015), and purpose in life (Ratner & Burrow, 2018). There is also research exploring cognitive aspects, including perceptual style and processing of sensory input (Chouinard et al., 2016), and visual perception (Jackson et al., 2013). In terms of university students, which are the focus of the thesis, there is research exploring the AQ and anorexia nervosa (Vuillier et al., 2020), body satisfaction (Krumm et al., 2017), depression / anxiety in relation to self-compassion (Galvin et al., 2021), ADHD (Nankoo et al., 2019), and Schizotypal Personality Disorder (Hurst, Nelson-Gray et al., 2007). Thus, reviewing existing literature that measures autistic traits using the AQ highlights that whilst there has been consideration of psychological aspects,

there is a gap in existing literature in terms of how autistic traits relate to the self (Galvin et al., 2021).

Despite the AQ being widely used to quantify autistic traits and identified as the appropriate measure for the thesis, psychometric evaluations have led to the proposal of a range of factor structures (English et al., 2020) and scoring approaches (Barros et al., 2022). The developments have been a result of subsequent studies reporting low reliability for some of the subdomains from the original five-factor model. However, to our knowledge, no studies consider both of these psychometric properties. Thus, Chapter 4 aims to address this gap in the literature by considering both properties and then establishing the best model structure to measure autistic traits in university students. The identified model will then be used in the subsequent empirical chapters. Alternative measures to assess autistic traits are presented in Chapter 3 (section 3.6.1.1) alongside the rationale for why they were not deemed appropriate for the thesis. The research aims of Chapter 4 are presented in the following section with the supportive literature discussed in the empirical chapter itself because it is a preliminary investigation and therefore not the focus of the thesis.

2.1.5 Psychometric properties of the Autism Quotient - Research aims

Altogether there are three aims in Chapter 4, all relating to the psychometric properties of the AQ. The first aim is to explore the factor structure of the AQ to identify if there is support for the original five-factor model (Baron-Cohen et al., 2001) or the alternative four-factor (Stewart and Austin, 2009) or three-factor (Austin, 2005) model. The second aim is to explore if the scoring approach used, binary or 4-point likert, affects the model fit. Although Baron-Cohen et al. (2001) initially reported no difference based on the scoring approach, there is a precedent for existing factor analytic studies to use the 4-point likert approach. The third aim is to explore how the known correlates of autism (anxiety, alexithymia, Theory of Mind (ToM), and self-esteem) relate to the AQ. This will allow the validity of an identified model to be assessed. The correlates have been included across many studies and support the AQ measuring autistic traits (Murray et al., 2016). For a more nuanced understanding of the relationship with the correlates, specific subdomains of autistic traits will be assessed alongside the aggregated overall score. Focusing on the psychometric properties of the AQ is a preliminary investigation to identify a reliable model to use for analysing data in subsequent empirical chapters.

The following section makes the main focus of the thesis clearer by addressing the second overarching aim, to understand the relationship between autistic traits and the self. When exploring the relationships, the discussion will be based on the potential effect of social difficulties, and a novel approach will be to consider the context of the constructs in terms of whether they are social or non-social. In the thesis, a social construct involves the self and others, whilst a non-social construct is specific to the self. Before exploring the constructs of self-awareness and metacognition, there will be a historical overview of autism to understand why the self may be important and then a review of why the traditional way of assessing the self in terms of the physical and psychological self does not fully account for difficulties in the self in autistic individuals.

2.2 The self through the constructs of self-awareness and metacognition

The self is a complex construct that is used to discuss multiple cognitive phenomena (Huang et al., 2017; Lombardo et al., 2010; Uddin, 2011), hence there is a range of definitions. Broadly the self refers to physical and psychological aspects, with the physical self referring to body parts and the psychological referring to knowledge of the self, such as episodic memory knowledge (specific events) and semantic memory knowledge (facts about oneself) (Gillihan & Farah, 2005). However, these aspects may not be an adequate explanation of the self as they do not explain subtle difficulties with the physical self, such as embarrassment; an alternative explanation refers to a more abstract representational process that relates to mental states or emotions (Lombardo & Baron-Cohen, 2010). Thus, a more detailed suggestion is that becoming aware of one's own states might depend on the same process as being aware of others' states (Williams, 2010). One way to investigate this is by exploring the understanding of emotions in oneself and others (Huggins et al., 2021). Alternatively, another way to explore both the self and other is through self-awareness, including the private and public subdomains. Before reviewing self-awareness, alongside a related construct of metacognition, the relationship between the self and autism will be outlined.

Although the self is not included in the characterisation of autism, historically it was an important concept to understand. Autism is derived from the Greek word "autos", meaning self (Duff & Flattery, 2014; Lombardo & Baron-Cohen, 2010) and when defined from its root syntax, it is a form of "self-ism" (Duff & Flattery, 2014). The early classification of autism therefore suggests egocentrism and individuals being confined to the self due to social

difficulties (Duff & Flattery, 2014; Ford & McLean, 2023; Uddin, 2011). However, Lombardo et al. (2010) acknowledge that since the early work, an alternative suggestion is that egocentrism may be because autistic individuals have a reduced ability to distinguish the self from other and difficulties in self-referential cognitive processing which encompasses: reflecting on one's own false beliefs, emotion regulation and autobiographical and episodic memory. Both ideas are consistent with the absent-self theory which proposes that self-processing differs in autistic individuals (Gillespie-Smith et al., 2018). Developing the theory, Ford and McLean (2023) suggest that these difficulties are largely a result of social difficulties associated with autism. As well as supporting the earlier literature, the latter study also highlights the role of social difficulties. As outlined in section 1.2.1, an extension of this is to distinguish between constructs that are from a social and non-social context throughout the thesis. This will be explored when investigating the relationship between autistic traits and the self as all of the constructs can be assessed this way. Importantly this is also consistent with how autistic traits are typically grouped into factors. Items relating to attention to personal interests and detail-focused attributes (Conson et al., 2022; Palmer et al., 2015) are often grouped together as non-social traits and therefore support this novel approach. The following section will begin by exploring the physical and psychological self in relation to self-referential difficulties in autistic individuals and then review the construct of self-awareness.

2.2.1 Examining physical and psychological self in autism

When exploring the construct of the self, Gillihan and Farah (2005) propose two aspects of the self, the physical and the psychological. A widely held view is that the two aspects mean the self is not a unitary construct (e.g., Lind, 2010; Uddin, 2011; Northoff et al., 2006; Williams, 2010); the different components of the self mean it can be conceptualised as the awareness of these components (Lage et al., 2022). When distinguishing between these paradigms, Gillihan and Farah (2005) suggest the physical aspect refers to awareness of specific body parts or the body as a whole, whilst the psychological aspect includes knowledge of the self. One of the most common ways to assess the physical self is through self-recognition studies (Perrykkad & Hohwy, 2019), whilst the psychological self has been measured in numerous ways within psychological research. Overall, Williams (2010) suggest that these two aspects appear to be quite separable, focusing on either the body or knowledge

of one's mind. Typically, it is suggested autistic individuals do not have difficulties with their physical self, yet do with their psychological self (Lind, 2010; Uddin, 2011).

Beginning with the physical self, research often focuses on self-recognition by studying mirror self-recognition ability. Results commonly indicate that autistic children recognise themselves using a mirror test (Lind, 2010; Lombardo & Baron-Cohen, 2010; Perrykkad & Hohwy, 2019), therefore demonstrating a physical self as they recognise that the image in the mirror relates to their own body (Perrykkad & Hohwy, 2019). Soon after passing the mirror test difficulties relating to the psychological self begin to emerge. For instance, difficulty in orienting to one's name, which is seen as an early marker for autism, can suggest a lack of understanding that the name refers to the self (Lombardo & Baron-Cohen, 2010). In terms of understanding the difficulty, Arslan et al. (2020) suggest it may relate to social skills difficulties as the name is a salient stimulus and is used by others to initiate social interaction.

An alternative explanation for difficulties with the psychological self is a more abstract representational process that relates to mental states or emotions. A frequently reported difficulty is in the monitoring of one's intentions (Lombardo & Baron-Cohen, 2010), which can be assessed through false belief tasks (Li et al., 2023; Lombardo & Baron-Cohen, 2010; Williams & Happé, 2009; Williams, 2010). However, Yuk et al. (2020) suggest the use of false belief tasks is not always appropriate as autistic adults can successfully complete them. However, the latter study demonstrates differences in neural processing of false belief in autistic adults compared to a control group which suggests that they may have difficulties integrating the cognitive functions. This is supported by an objective measure that identifies reduced connectivity between two regions for a task that requires self- versus other-related judgements (Lombardo et al., 2010). The reduction suggests cognitive difficulties could be an explanation for the commonly reported difficulty in decoding the mental states of self and others.

Difficulties in decoding the mental states of self and others are evident in studies that use alternative methodologies. Mitchell and O'Keefe (2008) asked participants to identify a comparison individual who they believed was closest to them or helped them the most. Participants rated out of 10 how much they thought they and the comparison person knew about specific topics e.g., feeling ill, tired, sad, happy, and daydreaming, and what kind of person. It was identified that adults in a control group assign more knowledge to themselves compared to autistic individuals, although there is no difference in how much knowledge they assign to others. The findings suggest autistic adults assign a similar level of knowledge to others as they do to themselves, indicating they do not appreciate or understand their first-

person access to their own subjective states. However, when focusing on autistic children the findings do not appear to be replicated as although autistic children were more likely to cite another person to know more about their behaviours than themselves, this was not true for their mental states, suggesting a difference in the representation of internal and external personality traits (Robinson et al., 2017). In terms of the contrasting results, Robinson et al. (2017) suggest their findings may differ from the findings reported by Mitchell and O'Keefe (2008) because, in the earlier study, autistic adults only differed for the "happy" cue where more signs were available compared to the other mental states, suggesting there may be nuanced differences.

Whilst difficulties decoding the mental states of self and others is a possible explanation for the difficulties in the self, it does not account for social difficulties which may be having an effect. Lombardo et al. (2010) support the potential influence of social skills on the self. They used functional magnetic resonance imaging to monitor brain activity when participants reflected on mental and physical judgements of both themselves and a familiar other. As well as identifying disruptions in the coding for self-information, Lombardo et al. (2010) also identified that the magnitude of self-other distinction was strongly related to early social difficulties. Those who made the biggest distinction between self and other experienced fewer social difficulties in early childhood which supports the idea that social skills may have an impact on the ability to decode the mental states of self and others. Lind (2010) also suggest that psychological difficulties, including awareness of emotions and mental states, which are typically associated with autism are likely to be a consequence of social difficulties. One suggestion is that the difficulties may be a result of autistic individuals having limited opportunities for effective engagement with others and therefore reduced opportunities to acquire self-knowledge. Social skills are less likely to impact the physical self because the paradigm does not rely on social engagement. Supporting this, Schriber et al. (2014) refer to a main characteristic of autism, social and communication difficulties, and how the trait could mean autistic individuals have fewer opportunities to internalise the views that others have of them and therefore may gain less knowledge about themselves through others. As well as less knowledge through others, it is also suggested that due to awareness of social difficulties and challenges with understanding their own mental states, autistic children believe others know more about their internal states (such as sadness, happiness, etc.) than they do (Dritschel et al., 2010). These findings indicate possible difficulties decoding the mental states of self and others could be attributed to social and communication difficulties associated with autism.

Following on from the idea that social skills difficulties need to be accounted for to explain why autistic individuals may have difficulty decoding the mental states of others, an alternative construct that can be explored to understand the self is self-awareness, and the two subdomains of private and public. Alongside self-awareness, the construct of metacognition will also be considered due to the suggestion that these constructs may be related. Thus, to understand the self, both constructs are explored in the thesis.

2.2.2 The construct of self-awareness

A well-established definition of self-awareness is that it refers to a state of self-directed attention (Fenigstein et al., 1975). Morin (2011) suggest that self-directed attention requires individuals to actively identify, process, and store information about the self. Self-awareness is rarely studied as an overarching construct as it would result in a broad definition (Sutton, 2016) and it is not an all-or-nothing construct (Zahavi, 2010), with it consisting of private and public subdomains. When distinguishing between these, Fenigstein et al. (1975) suggest that private self-awareness relates to cognitive self-awareness and attending to one's inner thoughts and feelings, whereas public self-awareness relates to an awareness and concern over the self as a social stimulus that influences others. Thus, when comparing these subdomains there are two key distinctions. First, the type of behaviour assessed differs as private self-awareness typically refers to more unobservable events whilst public self-awareness refers to more visible behaviours (Morin, 2006). Second, relates to where attention is directed. Private self-awareness refers to attention which is focused inward whilst public self-awareness refers to an outward focus (DaSilveira et al., 2015). Extending the distinction, private focuses on thinking about the self, whereas public focuses on the self in relation to others and how one might appear (Burns et al., 2019; Carden et al., 2022). Thus, public self-awareness focuses on the self as a social stimulus (Burns et al., 2019) and as such considers a social context. Alongside private and public self-awareness there is another subdomain of self-awareness, social anxiety, which is seen as a reaction to the process of private and public self-awareness (Fenigstein et al., 1975). The subdomain will not be included within the thesis as it is not self-awareness per se, but occurs as a by-product of self-awareness (Falewicz & Bak, 2016; Fenigstein et al., 1975).

Exploring the construct of self-awareness rather than focusing on the physical and psychological self allows for the role of the self to be explored in terms of one's thoughts (private), but also as a social entity in relation to others (public). This extends the idea that

social skills difficulties may have an impact on the self by considering the context of the constructs; reference to the self and others (public) is classed as social and only reference to the self (therefore private) is classed as non-social. To develop this idea further, the subdomains of autistic traits will also be assessed to identify whether autistic traits differentially relate to different aspects of the self. Within the thesis, the self will also be examined through the construct of metacognition, which is discussed in relation to self-awareness in the following section.

2.2.3 The construct of metacognition and the possible relationship with self-awareness

In most metacognitive literature, including that which focuses on autistic traits in either clinical or non-clinical populations (e.g., Carpenter & Williams, 2023; Grainger et al., 2014; Grainger et al., 2016; Nicholson et al., 2019) the standard definition of metacognition refers to cognitions about own mental states. Simply, metacognition refers to the cognitive processes involved in thinking about thinking (Flavell, 1979; Frith, 2012).

Metacognition is a tool for monitoring and self-regulating behaviour (Lou, 2015), allowing us to make sense of, predict, and control actions (Carpenter & Williams, 2023). This is achieved through one of three components, metacognitive knowledge, metacognitive monitoring, and metacognitive control (Flavell, 1979). Metacognitive knowledge refers to acquired beliefs (e.g., I am better at arithmetic than at spelling) (Flavell, 1979), with the beliefs and knowledge about cognition relating to both self and others (Grainger et al., 2016). Metacognitive monitoring and metacognitive control, are sometimes referred to collectively as metacognitive skill (Grainger et al., 2016). Metacognitive monitoring is the ability to discriminate between accurate and inaccurate responses based on confidence (Sawyer et al., 2014), whilst metacognitive control refers to an individual's ability to regulate cognition (Grainger et al., 2016). When distinguishing between these components, metacognitive monitoring is an objective measure that explains how we represent the occurrence of cognitive activity (Carpenter & Williams, 2023), for example, the ability to discriminate between correct and incorrect responses based on confidence (Grainger et al., 2016; Maras et al., 2020; Sawyer et al., 2014). Thus, metacognitive monitoring will be the focus of the thesis as it accounts for the reliance on self-report throughout the rest of the thesis, with section 2.2.5 identifying a suitable measure. Additionally, as an overall construct, metacognition can be assessed through a self-report measure, Metacognitions Questionnaire

(MCQ). Although there has been limited exploration into this measure to ensure consistency in the methods of the measures used, this will also be used in the thesis.

When comparing the constructs of metacognitive and self-awareness, whilst metacognition refers to a cognitive process that is often referred to as an ability (Carpenter & Williams, 2023; Frith, 2012; Grainger et al., 2014) self-awareness is more broadly defined as a state of self-directed attention, with private and public subdomains (Fenigstein et al., 1975). Thus, a difference in these constructs is the lack of reference to cognitive processes in the self-awareness definition. To explore the relationship, the first aim of Chapter 5 is to explore the direct association between self-awareness and metacognition.

Despite the constructs having separate definitions, self-awareness may be a result of metacognition (Lou, 2015; Zlotnik & Toglia, 2018). Supporting the possible relationship, DeMink-Carthew et al. (2020) suggest metacognition involves a process where individuals reflect on their thought processes, an ability that can be extended to self-awareness. If true, then it can be hypothesised that any link between autistic traits and self-awareness may be explained (or mediated) by metacognitive ability. To our knowledge, there have been no studies testing this in either clinical or non-clinical populations. To address the gap, the aim of Chapter 6 is to test the relationship between autistic trait subdomains and self-awareness subdomains through mediating factors.

Whilst Chapter 6 extends Chapter 5 in terms of the relationship between self-awareness and metacognition, Chapter 5 also considers the relationship between autistic traits and the constructs of self-awareness and metacognition. This addresses the second and third aims which are to explore the relationships by considering both the overall levels and subdomains. In doing so, it supports the investigation into whether autistic traits differentially relate to different aspects of the self. Importantly, considering the subdomains allows the context of the variables (social or non-social) to be assessed which sheds light on whether for a non-clinical sample, the relationships are nuanced and context-dependent. Beginning with self-awareness, the following section will focus on, although is not exclusive to, existing self-awareness which has used the original self-report measure by Fenigstein et al. (1975). Whilst there are methodological limitations with self-report, see methodology chapter (section 3.2), it allows one's views of the self to be assessed with a range of constructs that can also be assessed through self-report. Thus, ensuring consistency within the methodology.

2.2.4 Autistic traits in relation to private and public self-awareness

Beginning with private self-awareness in autistic adults, when using self-report measures a robust finding is no difference in private self-awareness between autistic adults and a control group (Burns et al., 2019; Grisdale et al., 2014; Lombardo et al., 2007). Despite being widely reported, the finding is not consistent with one of the early studies by Blackshaw et al. (2001) where it was identified that autistic adults self-report significantly more private self-awareness, compared to adults in the control group. The difference in results cannot be attributed to the approach used to classify autism because Blackshaw et al. (2001) and Grisdale et al. (2014) used a diagnostic categorical approach, whilst Burns et al. (2019) and Lombardo et al. (2007) took a continuum approach. Therefore, categorising as autistic / control group or assessing traits as a continuous construct did not explain the difference in results. There was a difference between the two studies which took a continuum approach, as Burns et al. (2019) only recruited adults with a diagnosis, whereas Lombardo et al. (2007) analysed adults with and without a diagnosis collectively. Although caution is needed due to the limited literature, the recruitment difference did not appear to affect the results. Assessing autistic traits will contribute further, much needed, data to address the question of whether there is a relationship between autistic traits and self-awareness from a continuum approach.

For existing public self-awareness literature, alongside studies using the original self-report measure, self-awareness is inferred from studies that did not directly refer to the construct. This is in response to there being limited existing literature using the original measure. Through the analysis of a range of communications, including web pages and magazines, the qualitative analysis identified that autistic adults recognised that eye contact difficulties have created barriers and were motivated to either think of ways of improving it or to compensate for it (Trevisan et al., 2017). Within the literature, there has also been a shift in attention toward understanding the role of camouflaging in autism which suggests individuals learn strategies to conceal social difficulties and mask underlying difficulties associated with autism (Hull et al., 2020; Lai et al., 2016). It is widely reported that camouflaging may occur due to stigma and not feeling accepted by others (Cook et al., 2021) or as a concern about what others think (Cage et al., 2016), therefore closely aligned with public self-awareness in terms of referring to others. Overall, it seems that irrespective of the approach there is a lack of association between autism and public self-awareness, thus implying that autistic traits are independent of the self-awareness subdomain. The evidence

suggests no difficulties with public self-awareness, but there is limited research so exploring the self-awareness subdomain with autistic traits in a non-clinical population will contribute further evidence.

Overall, the findings from the limited literature do not support the historical view of egocentrism or self-referential difficulties in autistic individuals. However, it is plausible that the lack of support may be due to autistic traits only being assessed at an overall level, without the subdomains being accounted for. Autism is associated with a range of characteristics, including persistent difficulties in social communication and social interaction and restricted or repetitive patterns of behaviour, interests, or activities (APA, 2013), it is therefore possible that the relationship might be context-specific, specifically social or non-social. Within both autistic traits and self-awareness some elements are social and some are non-social. For instance, when considering the original five-factor AQ measure, some subdomains are social, such as social skills, whereas others are non-social, such as attention to detail (Conson et al., 2022; Palmer et al., 2015). For self-awareness, private self-awareness refers to one's thoughts not within a social context, whilst public refers to one as a social entity in relation to others and therefore can be classified as social. As both traits and self-awareness have aspects referring to a social or non-social context the novel approach will be taken within the thesis to address a clear gap in knowledge. In doing so, the thesis seeks to explore whether studying particular subdomains of autistic traits offers a more nuanced understanding of relationships.

There is some existing autism literature that suggests the context might be important when assessing self-awareness through self-report. When focusing on a social context, specifically social skills and competence, responses from a structured questionnaire identified that parents rated difficulties higher than the children themselves (Knott et al., 2006). Thus, supporting the idea that autistic children may have self-awareness difficulties in a social context. More recently, a systematic review highlights that a reoccurring finding within the literature is that whilst autistic children report their emotional self-awareness does not differ from their peers, parent-report outcomes are associated with emotional self-awareness difficulties (Huggins et al., 2021). The difference strengthens the notion that self- and parent-report may not be consistent in a social context. To our knowledge, only one study has directly compared self- and other-report for a social and non-social context. Scores on an autistic traits measure and empathy measure differed significantly between child and parent, but for a systemising measure, which is arguably non-social, there was no difference

(Johnson et al., 2009). Although limited and specific to children, the findings support the idea that the relationship between autistic traits and self-awareness might be context-dependent.

Further support for a possible difference between a social and non-social context comes from assessing how individuals express concepts and opinions about themselves. When using the Self-Understanding Interview, which was originally designed by Damon and Hart (1988), Lee and Hobson (1998) report that autistic children were able to describe themselves in physical, active, and psychological terms, but produced fewer statements in the social category compared to children in the control group. For instance, attributes relating to social interactions and relationships. Across all these categories, level three descriptors, which involve some reference to social aspects of the self-as-subject, were less frequent. Less reference to social descriptors indicates a specific social difficulty in autistic individuals that might impact how one presents their views of the self. Supporting this, when using the Self-Understanding Interview adults were asked to verbally articulate a self-characteristic. Jackson et al. (2012) report autistic adults were significantly more likely to describe their characteristics in terms of simple physical and psychological descriptors, whereas non-autistic adults described themselves in a broad social context. A physical descriptor refers to an individual's body and material possessions, a psychological descriptor refers to emotions and thoughts, and a social descriptor typically refers to attributes relating to social interactions and relationships (Jackson et al., 2012). With non-autistic adults showing a greater tendency to use social descriptors, although autistic adults do not, there is support for the idea that self-knowledge may differ between a social and non-social context. In terms of understanding why there might be a difference, Lin et al. (2020) suggest it could be due to autistic individuals paying insufficient attention to social information during their early development. Alternatively, Lombardo and Baron-Cohen (2010) suggest autistic individuals may struggle to view themselves as being embedded within social contexts. Identifying a potential effect of the context supports the second aim of Chapter 5, which is to explore the relationship between the autistic traits (aggregated score and subdomains), which will be identified in Chapter 4, and the subdomains of self-awareness. Focusing on the subdomains allows for the exploration into whether autistic traits differentially relate to aspects of self-awareness whilst also accounting for the context of both variables, in terms of social or non-social. The exploration into context extends the idea that difficulties differentiating between the self and other may in part be due to social difficulties.

Having identified that a gap within existing literature is the exploration of autistic traits and whether the relationship with self-awareness is context-dependent, whereby the

constructs are either social or non-social, subsequent constructs will also be discussed in relation to the context. The next construct to be explored is metacognition.

2.2.5 Autistic traits in relation to metacognition

The third aim of Chapter 5 is to explore the relationship between autistic traits (overall levels and subdomains) and metacognition (subdomains). By definition, metacognition refers to thinking about thinking (Flavell, 1979; Frith, 2012). It can be assessed via a validated self-report questionnaire, the MCQ, which assesses beliefs about own metacognitive ability (Wells & Cartwright-Hatton, 2004). Within the questionnaire, there are five subdomains (lack of cognitive confidence, positive beliefs about worry, cognitive self-consciousness, negative beliefs about uncontrollability and need to control thoughts). Of these subdomains, only cognitive confidence and cognitive self-consciousness address participants' awareness of their cognitions (Grainger et al., 2014). Therefore, similar to Grainger et al., these two subdomains will be the focus of the thesis. Lower scores on the cognitive confidence subdomain mean greater confidence in cognitions and higher scores on cognitive self-consciousness demonstrate higher awareness of one's thought processes. Whilst the two subdomains can assess cognitive processes, there are issues with relying on self-report in terms of accuracy and response bias (Christ et al., 2010). In a recent psychometric investigation, Williams and Gotham (2021) report that for a self-report measure assessing the quality of life in autistic adults response bias was demonstrated for some of the items. The bias can result in under- or over-reporting behaviours.

Metacognition does lend itself to more objective measures as well. Focusing on metacognitive monitoring, the component explains how we represent the occurrence of cognitive activity (Carpenter & Williams, 2023). The component can be measured in a variety of ways, although to be methodologically consistent with the use of self-report measures which are used throughout the thesis, and to address the main limitation of accuracy with self-report, Judgement of Confidence (JoC) tasks will be used. The task enables an objective measure (item correctness) to be compared with self-report (confidence in performance), thus referring to the ability to discriminate between correct and incorrect responses by making a judgement about performance on a task (Carpenter & Williams, 2023; Grainger et al., 2016; Sawyer et al., 2014). Within the thesis, JoC tasks will be used to assess metacognitive monitoring ability for both social and non-social tasks. The completion of both tasks is consistent with self-awareness also being explored from both contexts, to identify

whether relationships are context-dependent and to account for the social difficulties commonly associated with autism.

A JoC task is an objective measure of metacognitive monitoring with gamma scores (Goodman & Kruskal, 1954) typically calculated to provide an index of JoC for each participant. Gamma scores are a measure of association (Nicholson et al., 2019), with a large positive gamma indicating a high correspondence between confidence in the correctness of one's answer and the actual correctness and a large negative value indicating confidence judgement was inversely related to performance (Maras et al., 2020; Grainger et al., 2016). A full discussion of the scoring is in the methodology chapter (section 3.6.8). There are alternative ways of assessing metacognitive monitoring ability. First, there are Feeling of Knowing (FoK) tasks which require individuals to monitor their current internal memory states (Grainger et al., 2014). Second, there is the provision of feedback, where for example after completing a task participants received a summary of the number of correctly answered questions and the number of points they won and were provided strategy reminders, such as choosing to go down a level would result in easier questions (Maras et al., 2017). Third, is metacognitive questioning which refers to whether they thought the answer was correct and if they intended to get the answer correct or not (Brosnan et al., 2016). The latter approach is the only other measure that assesses item correctness with one's own view, therefore addressing issues with relying on self-report, but the JoC has been used in both clinical and non-clinical populations (e.g., Williams et al., 2016) and will be used in the thesis. Existing literature will now be reviewed with a focus on the context to identify whether any findings are context-dependent. This will shed light on whether the relationship with autistic traits is context-dependent, whilst also indicating which autistic traits subdomains are expected to relate. Before exploring existing literature for metacognitive monitoring, literature exploring the metacognitive self-report questionnaire will be assessed.

Grainger et al. (2014) were the first researchers, and to our knowledge, the only ones to use the MCQ with an autistic sample. They focused on two of the subdomains: cognitive confidence (lack of) which refers to assessing confidence in memory and cognitive self-consciousness which is the tendency to focus attention on thoughts (Wells & Cartwright-Hatton, 2004). The results by Grainger et al. (2014) indicate no difference between the groups for lack of cognitive confidence, although a significant difference in cognitive self-consciousness scores between autistic adults and a control group, with autistic adults believing they are superior at monitoring their thoughts. However, Grainger et al. (2014) acknowledge that whilst autistic adults report greater awareness of their own mental states,

this is not consistent with an objective FOK measure that they used. As part of the FOK task participants monitored their internal states and were asked to judge whether they thought they would recognise the missing target word later; autistic adults scored significantly lower compared to the control group suggesting a lack of awareness of existing knowledge. When exploring the difference between the measures, autistic adults may demonstrate Positive Illusory Bias (PIB), which is reporting higher self-perceptions than warranted (Hoza et al., 2002). Taking a metacognitive monitoring approach in the thesis will indicate whether over-reporting is also evident in a non-clinical sample from an autistic traits approach. The use of an objective measure of metacognition (via metacognitive monitoring) allows the self-reported confidence to be assessed with item correctness.

Beginning with autism literature which has investigated metacognitive monitoring ability in a social context, Wilkinson et al. (2010) report that between autistic adults and a control group, there are subtle difficulties in metacognition for autistic adults. The performance of autistic adults was comparable to a control group on a facial recognition task, but a lack of sensitive awareness of memory was demonstrated because a high degree of certainty is not associated with increased accuracy compared to a moderate degree of certainty. In other words, there is some evidence that autistic adults appear to have subtle metacognitive difficulties in social contexts. The social context has been under-researched, but there has been a larger focus on a non-social context within existing literature.

An explicit non-social task by Nicholson et al. (2019) suggests metacognitive monitoring difficulties in autistic adults. Participants took part in a perceptual discrimination task where they identified the longest line or the patch with the greatest number of dates. Following this, participants rate their confidence judgement. Nicholson et al. (2019) reported gamma scores were significantly smaller among autistic adults compared to the control group, suggesting there is less association between the judgement of performance and actual performance in autistic adults and therefore difficulties in metacognitive monitoring. However, a study by Carpenter et al. (2019), which also consists of a perceptual judgement phase to identify the most dots, reports no difference in metacognitive monitoring ability between autistic adults and adults in the control group. The result was not consistent with their hypothesis or with their other findings in relation to autistic traits, where a negative association is reported, as autistic traits increase, metacognitive monitoring ability decreases.

There is one known study to have assessed a clinical population for both a social and non-social context in autistic adults. Sawyer et al. (2014) used an emotion recognition (which requires social skills which are typically developed through interactions with others) and

general knowledge task. They report no difference in metacognitive scores between autistic adults and the control group for either task. In other words, irrespective of autism, all adults use confidence to discriminate between correct and incorrect responses for both tasks.

When focusing on autistic traits in a non-clinical sample, only two metacognitive studies are identified and neither consider both contexts. On a non-social general knowledge task, adults answered a general knowledge question and then provided a confidence score in their answer. Metacognitive ability was assessed in terms of a JoC score to identify whether individuals correctly monitored their knowledge e.g., higher confidence when correct. Williams et al. (2016) report that autistic traits did not relate to metacognitive ability. However, when exploring perceptual judgement through a post-decision wagering task, which requires participants to place a non-verbal bet on their accuracy of judgement, Carpenter et al. (2019) report that as autistic traits increase, metacognitive monitoring accuracy decreases. The researchers acknowledge that the sample might have been underpowered for the non-social study. Overall, there has been little investigation into the relationship between autistic traits and metacognitive ability in a non-clinical sample, and the area can also be extended by exploring the constructs in terms of a social and non-social context.

To account for the limited literature, findings from autistic children can also contribute. Limited research has considered a social context, with only Wilkinson et al. (2010) exploring memory awareness for a facial recognition task and reporting metacognitive monitoring difficulties. However, there has been a larger focus on a non-social context, with metacognitive monitoring difficulties for autistic children identified for example when using educational video clips (Grainger et al., 2016) and general knowledge stimuli (Williams et al., 2016). Both studies report JoC accuracy was reduced in the clinical sample suggesting confidence judgements were less accurate. However, Maras et al. (2017) report that when presenting a mathematics challenge via a computer programme autistic children demonstrate a general bias towards higher confidence, yet they were still able to distinguish between correct and incorrect answers demonstrating metacognitive monitoring ability. Although this differs from the other findings reported for autistic children, it is consistent with the results of a study by Elmose and Happé (2014) who investigated memory performance of two stimulus types: faces (social) and buildings (non-social) in autistic children. They report metacognitive monitoring is similar across all participants and there is no effect of the stimulus being social or non-social.

Overall, there are mixed findings on whether autistic children experience metacognitive monitoring difficulties, and when compared to the limited autistic adult literature, difficulties appear to be more evident in autistic children. Therefore, focusing on emerging adults in the thesis could provide a bridge in terms of understanding a potential developmental difference. Arnett (2000) identifies emerging adulthood between the ages of 18-25 years as marked by an extended transition from adolescence into adulthood. Additionally, reviewing the literature highlights limited research has considered the effect of the context, in terms of whether it is social or non-social. The one study (Sawyer et al., 2014) to assess both contexts in autistic adults relied on static images which are not representative of a real-world context. Having identified this as a gap in the literature a new JoC task will be developed for the thesis to enable self-awareness of own behaviour, therefore exploring a social context that can be assessed objectively. The development is necessary due to there being no existing standardised measure. As outlined in section 1.1.1, focusing on a non-clinical population, rather than a clinical, allows a broader range of methodologies to be used to provide unique insights (Christ et al., 2010; Gökçen et al., 2016). For the thesis it allows both contexts to be assessed in the same study with an unstandardised measure.

Having explored autistic traits, self-awareness, and metacognition, these constructs will now be discussed in relation to an outcome that has a crucial metacognitive component, attitudes and beliefs toward help-seeking. Focusing on the outcome extends existing literature which typically assesses success at university in terms of grades and overlooks factors that may be having an impact, such as attitudes and beliefs toward help-seeking (Chu et al., 2018; Micari & Calkins, 2021). In terms of whether the construct is social or non-social, due to directly referring to the self and others (lecturers and peers) it is viewed as a social construct. Focusing on this outcome has the potential to shape the direction of future help-seeking research in terms of the type of support and how the support is offered to university students. Importantly, this means society adapting to the needs of individuals. The final section of this chapter relates to the third overarching aim of the thesis, which is the primary aim of Chapter 7, to explore the relationship between autistic traits, the self, and an educational outcome of the perceived benefits and costs of help-seeking. Before reviewing the attitudes and beliefs, there is a general overview of help-seeking.

2.3 Help-seeking

Help-seeking requires metacognitive skills (Chu et al., 2018; Dueñas et al., 2021; Fan & Lin, 2023) as individuals evaluate how well one has either learnt material or performed a task (Chu et al., 2018). By identifying difficulties (Dueñas et al., 2021) individuals can seek help to prevent failure, maintain engagement, and increase the likelihood of mastery and autonomous learning (Newman, 2002). Focusing on the prevention of failure, a widely reported finding is a positive association between help-seeking and academic performance (Horowitz et al., 2013; Martín-Arbós et al., 2021; Payakachat et al., 2013), as one increases, so does the other. Whilst it is agreed that for help-seeking to be activated individuals need to have the necessary metacognitive skills, Dueñas et al. (2021) acknowledge the early work by Ryan and Pintrich (1997) which suggests that following the awareness that one needs help, individuals need to decide to seek help, and therefore have the motivation to do so. Thus, whether to seek help is based on an individual's assessment of the situation, both cognitive and motivational components (Martín-Arbós et al., 2021). One way to assess the implication of these components is by focusing on attitudes and beliefs toward help-seeking, specifically the perceived benefits and costs (Dueñas et al., 2021). When reviewing the perceived benefits and costs of help-seeking in relation to autistic traits, self-awareness, and metacognition there will be reference to autism literature for theoretical support. First, there will be an overview of the perceived benefits and costs of help-seeking.

2.3.1 A general overview of the perceived benefits and costs of help-seeking

Broadly, the perceived benefits of help-seeking refer to the positive ramifications of seeking help, from the individual's perspective (Pajares et al., 2004). A key benefit is an improvement in performance (Martín-Arbós et al., 2021; Payakachat et al., 2013). Specifically, higher instrumental help-seeking, whereby individuals gain the minimum amount of help to still achieve, such as a hint or explanation (Karabenic & Knapp, 1991), correlates with increased perceived benefits of help-seeking (Pajares et al., 2004; Roussel et al., 2011). Thus, supporting the idea that benefits are associated with help-seeking. When comparing the perceived benefits to perceived costs, a key difference is that the perceived benefits represent an understanding that help-seeking will be useful, whereas the perceived costs reflect a threat to one's self-worth (Roussel et al., 2011). The perceived costs can include fears of being regarded as less competent and feelings of embarrassment (Martín-Arbós et al., 2021). Although emotional costs, such as feeling uncomfortable asking

questions (Rosas & Pérez, 2015), are identified as a cost of asking for help, these have rarely been explored in student populations (Dueñas et al., 2021). Furthermore, despite help-seeking seen as a cost-benefit analysis by university students (Dueñas et al., 2021) exploring the perceived benefits and costs in a student population is under-researched.

Focusing on autistic traits in a non-clinical population is a unique contribution to the research area and therefore the study will be exploratory. Within this chapter attitudes and beliefs toward help-seeking will be explored with autistic traits first and then with self-awareness and metacognition.

2.3.2 Exploring the relationship between the perceived benefits and costs of help-seeking and autistic traits

To our knowledge, existing literature has not explored the perceived benefits and costs of help-seeking with autistic traits in either clinical or non-clinical populations. Thus, help-seeking literature will be used as theoretical support for exploring the potential relationship between attitudes and beliefs toward help-seeking and autistic traits in a non-clinical population.

Upon reviewing help-seeking literature it seems that autistic traits may result in increased perceived costs toward help-seeking, suggesting a possible negative relationship. Help-seeking involves a level of vulnerability as it requires one to admit they do not have the knowledge or skills to successfully complete academic challenges by themselves (Dueñas et al., 2021; Shim et al., 2013). Therefore, irrespective of whether help is sought from teachers or peers, it is a social activity (Ryan & Shin, 2011; Schenke et al., 2015) requiring engagement in social interactions with others (Dueñas et al., 2021; Newman, 2002). From a non-clinical sample, children who were unsure of themselves cognitively and socially were identified as being more likely to feel threatened when seeking help and more likely to avoid it (Ryan & Pintrich, 1997). Although the literature is not specific to autistic traits, it showcases how individuals perceive their social skills as a key aspect that may affect help-seeking. As autism is characterised by persistent difficulties in social communication and social interaction (APA, 2013) it seems reasonable to hypothesise that there may be a positive relationship between autistic traits and perceived costs toward seeking help. Although under-researched, there is support from clinical literature. Social skill difficulties can negatively affect communication and participation in group discussions with autistic university students identifying these difficulties as contributing factors to not seeking academic help from peers

(Sefotho & Onyishi, 2021). As well as difficulty seeking help from peers, there can also be challenges with academic staff because of difficulties communicating (Ward & Webster, 2018). This is echoed in non-clinical literature, Payakachat et al. (2013) identify that respect, accessibility, approachability, and friendly demeanour are all key elements for successful staff-student relationships to make help-seeking appear less threatening. It is therefore possible that student-teacher interaction could influence academic help-seeking behaviour, specifically the perceived costs. Therefore, existing literature suggests social skill difficulties could contribute to the perceived costs of seeking help, supporting a possible relationship between these constructs.

However, this interpretation is speculative and it is important to acknowledge that a common reason autistic university students give for not seeking help is a lack of awareness that help is needed (Anderson et al., 2020; Gurbuz et al., 2019), suggesting potential difficulties with the knowledge of the self. The next section explores the relationship between attitudes and beliefs towards help-seeking and self-awareness.

2.3.3 Exploring the relationship between the perceived benefits and costs of help-seeking and self-awareness

Due to limited literature exploring the perceived benefits and costs in relation to the subdomains of self-awareness, the general concept of help-seeking will be investigated. Help-seeking may be related to public self-awareness. Ryan and Shin (2011) report that children who are conscious of being popular are rated, by their teachers, are less likely to engage in appropriate help when needed. It therefore seems that how concerned one is about the views of others could influence behaviour due to the potential cost of a negative view. Similarly, the concern about how one is perceived is also shown when considering the influence of peers. Through self-report measures, a positive peer climate was found to encourage students to seek help from their peers as they may be less concerned about being perceived negatively (Shim et al., 2013). Taken together, these studies imply that public self-awareness could influence help-seeking, particularly the perceived costs. Although limited, there is some theoretical support for the perceived costs, especially emotional ones, being related to public self-awareness in university students who completed a battery of self-report measures. Rosas and Pérez (2015) identify that the emotional costs associated with help-seeking positively predict shame in university students and with shame referring to the supposed negative thoughts of others it is reasonable to predict a relationship with the subdomain of self-

awareness which also focuses on others. Findings by Won et al. (2021) provide further theoretical support for a relationship between attitudes and beliefs towards help-seeking and public self-awareness. They report that students' sense of belonging to the university, which can be marked by a sense of feeling accepted and supported by others, predicts the use of help-seeking strategies. It is theoretically possible that the reference to others is contributing to the relationship, which if true supports a relationship between perceived benefits and costs of help-seeking and public self-awareness as both constructs refer to others.

There is also support for the relationship between help-seeking and public self-awareness from a clinical approach by assessing the views and lived experiences of individuals. Some autistic university students report not seeking help because they do not want to draw attention to themselves or appear different from their peers (Cai & Richdale, 2016). Not seeking help for these reasons suggests that seeking help could be perceived as a cost. As well as the perception of peers having an impact, the same could apply to members of staff. In one study, three out of four autistic university students describe not seeking help because of fears of what others will think of them, with specific concerns around disturbing a member of staff and being perceived as lacking the skills necessary to achieve on the programme (Ward & Webster, 2018). Together, these studies suggest how one thinks they might be perceived, by peers or teachers, could be a potential cost of help-seeking for autistic university students. As the perceived costs were not directly investigated, inferences were made. Focusing on the relationship between autistic traits and attitudes and beliefs toward help-seeking, rather than help-seeking itself is a unique contribution of the thesis. This chapter will finish by exploring metacognition, which is a further construct relating to the self that has been under-researched in relation to attitudes and beliefs toward help-seeking.

2.3.4 Exploring the relationship between the perceived benefits and costs of help-seeking and metacognition

Learners need to use metacognitive monitoring to be aware of and understand their thought processes (Chu et al., 2018). Otherwise, individuals can struggle to monitor what they have learnt and what still needs to be studied (Chu et al., 2018) which can result in early termination of studying and lower levels of retention (Dunlosky & Rawson, 2012). Thus, metacognitive monitoring is needed for help-seeking so that individuals become aware that they need help.

Metacognition as a general ability can explore participants' beliefs about their thoughts and efficacy. Beginning with the self-report measure and the two subdomains identified in section 2.2.5 Grainger et al. (2014) explored the subdomains in autistic adults and a control group, however to our knowledge, they have not been explored in relation to attitudes and beliefs toward help-seeking. Thus, there is reliance on theoretical rationale in terms of whether a relationship is expected. Literature suggests that help-seeking is seen as less threatening if individuals are sure of themselves cognitively (Ryan & Pintrich, 1997); if seeking help is seen as less threatening it is reasonable to predict that confidence in cognitions may be associated with less perceived costs of help-seeking. However, it is also possible that a lack of cognitive confidence might be related to less perceived costs. In a non-clinical sample, a lack of cognitive confidence and cognitive self-consciousness positively correlated in a student population (Ryum et al., 2017). This means reduced confidence is associated with less attention paid to thoughts. As help-seeking is seen as a cost-benefit analysis by university students (Dueñas et al., 2021) paying less attention to thoughts means it is theoretically possible that fewer benefits and costs are perceived. Although the direction of a potential relationship is not clear, the existing literature suggests there may be a relationship between attitudes and beliefs toward help-seeking and metacognition. A novel aspect of the thesis is exploring this from an autistic trait perspective.

The relationship between the perceived benefits and costs of help-seeking and the objective metacognitive monitoring tasks will also be assessed. These are included alongside the self-report metacognitive measure as the questionnaire does not allow for the context to be assessed, whereas the objective metacognitive monitoring tasks are designed as either social (referring to the self and other) or non-social (only referring to the self). Thus, potentially contributing to our understanding of whether relationships are context-dependent.

To recap, the aim of Chapter 7 is to explore the relationship between autistic traits, self-awareness, and metacognition with an educational outcome of the perceived benefits and costs of help-seeking. Due to the limited autistic traits literature investigating attitudes and beliefs toward help-seeking it is an exploratory study. From the study, a theoretical model will be developed for future research.

Chapter 3: Methodology

This chapter begins by reviewing the impact of COVID-19 on the research design and fieldwork phase of the thesis. This is followed by an overview of the final research design, data collection process, participant recruitment, inclusion criteria, and ethical considerations. The chapter will then move on to describe the measures that were used across multiple studies in the thesis. When measures were only used in a single study, their description can be found in the relevant empirical chapters, and only those in multiple chapters are described here. Finally, the chapter ends with a review of the data analysis plan for the empirical chapters.

3.1 Impact of COVID-19 on data collection and design

COVID-19 had a significant impact on data collection processes, and consequently on the overall research design of the thesis. At the start of the pandemic, only half of the data for the thesis had been collected. During the first lockdown in March 2020, all in-person data collection had to be stopped. The constraint meant that participant recruitment for the main laboratory study of the thesis was stopped before the study had concluded as students were no longer able to attend campus due to social distancing measures. The early termination of the data collection resulted in a limited sample size for stage two of the data collection (n = 100). Due to ongoing and varying social distancing measures on campus for the remaining academic year, no further laboratory work was possible. The restriction meant re-designing the remaining planned studies and moving solely to online questionnaire-based measures. To account for the change, stage three of the data collection is a follow-up study and a new cohort not being recruited, see section 3.3 for a more detailed overview. As well as COVID-19 affecting the design and measures that were possible, it also had an impact on the sample size of the planned longitudinal aspect of the work (presented in Chapter 7). The subsequent design and follow-up questionnaire that is presented in Chapter 7 was developed in response to COVID-19 and the restrictions that were in place that prohibited laboratory testing. Without these restrictions, the design could have included further behavioural measures.

3.2 Design

A quantitative methodological approach was used throughout the thesis. Data was collected at three stages (see Table 1), with stage one focusing on self-report questionnaires

for measures of autistic traits and correlates of autism, with stage two focusing on objective metacognitive monitoring tasks, and the third stage of the data collection including a self-report measure for the perceived benefits and costs of help-seeking. There are limitations associated with relying on self-report, but the approach was opted for as the autistic traits self-report measure is identified as the most appropriate for assessing traits in the general population, see section 3.6.1.1 for a review. Literature exploring self-awareness in autistic adults also favours self-report measures, including the studies by Blackshaw et al. (2001) and Burns et al. (2019) which assessed both the private and public self-awareness subdomains. The tendency to rely on self-report when measuring autistic traits and self-awareness supported the approach also being used when measuring metacognition to ensure consistency in the measurement approach. A metacognitive monitoring approach was opted for which allows for discrimination between correct and incorrect responses, based on the confidence reported by the individual (Grainger et al., 2016; Sawyer et al., 2014), thus providing an objective measure and further insight into the views individuals have of the self. Additionally, a self-report measure is also used to ensure methodological consistency across measures used within the thesis.

Despite its popularity, the reliability of self-report has been questioned due to concerns and uncertainty regarding how aware autistic individuals are of their own behaviour (Johnson et al., 2009; Morsanyi et al., 2011). Furthermore, a lack of consistency between self- and other-report raises further questions around the validity of using self-report (Sandercock et al., 2020). Irrespective of autism, there is also a greater risk of response bias when measures rely on self- or other-report compared to more objective measures (Christ et al., 2010). Whilst there are concerns associated with using self-report, it is important to remember that the methodology allows the perspectives of the individual to be shared (Sandercock et al., 2020). This is key to the thesis in terms of understanding the individual's view of the self. However, the limitations of the methodology are acknowledged and objective metacognitive monitoring tasks were developed and piloted in the thesis so that the self-report methodology could be compared and assessed.

3.3 Data collection

The final research involved three stages of data collection: 1) a measure of autistic traits and correlates, 2) objective metacognitive monitoring tasks, and 3) a follow-up outcome that has a metacognitive component (self-report).

Stage one consisted of an online questionnaire via Qualtrics (n = 152). The questionnaire assessed whether the autistic traits identified for the factor structure of the Autism Quotient (AQ) have a similar relationship with the established correlates of autism.

For the second stage of data collection, stage one was repeated with a new cohort (n = 139) and participants were then invited into the psychology laboratory for the second part of the testing, which consisted of the remaining self-report questionnaires and the objective metacognitive monitoring tasks (n = 100). Due to the COVID-19 pandemic, rather than recruiting a further cohort, the decision was made for stage three of the data collection process to follow-up the cohort from stage two, with a further questionnaire measure (n = 25). No participants spanned across stages one and two of the data collection process.

Table 1 shows the stages of data collection and a list of all the measures used throughout the thesis. The number represents the chapter the measure was used. As the table demonstrates, some of the measures contributed to multiple chapters. The measures used are also included in the procedure section of each empirical chapter.

Table 1

Data Collection and use in Empirical Chapters.

	Measure	Stage 1	Stage 2	Stage 3
Self-report				
	Autism Quotient (AQ)	4, 5, 6	4, 5, 6, 7	
	State-Trait Anxiety Inventory (STAI)	4, 6	4, 6, 7	
	Toronto Alexithymia Scale (TAS)	4	4	
	Empathy Quotient (EQ)	4	4	
	Rosenberg Self-Esteem Scale (RSES)	4	4	
	Self-Consciousness Scale Revised (SCS-R)	5, 6	5, 6, 7	
	Metacognitions Questionnaire (MCQ)	5, 6	5, 6, 7	
	Mathematics Learning in the Classroom Questionnaire (MLCQ)			7
Objective				
	Social metacognitive task		5, 7	
	Non-social metacognitive task		5, 7	

3.4 Participant recruitment and inclusion criteria

All participants were recruited from Canterbury Christ Church University (CCCU), United Kingdom, as a matter of convenience. Participants were recruited through the psychology Research Participation Scheme (RPS), whereby they could be rewarded for

participation. The incentive of RPS credits contributed towards a course requirement; the value of these incentives depended on the stage of data collection due to different methodologies and therefore time commitments. Participants received three credits for stage one. For stage two, if participants only completed the first online measure they received one credit, and if they participated in the second part of testing in the psychology laboratory they received a further six credits. Finally, for the follow-up study, stage three, participants received one further credit. There were attempts to recruit from outside of psychology through advertising on a range of Degree programmes, unfortunately, students did not opt to take part.

The inclusion criteria to participate was for participants to be undergraduate students and to be aged between 18 - 25 years of age (emerging adulthood). With the sample only consisting of university students, and therefore not representative of the general population, IQ was not controlled for at any data collection stage. The potential implication of not accounting for intelligence is discussed further as a potential limitation in Chapter 8 (section 8.4). Participants needed to be fluent in English to access and respond to the research materials. There was also an inclusion criterion that participants had to be native speakers of English. Specific to the AQ, it is suggested that the language of a questionnaire may influence non-native English speakers' answering tendency, with language proficiency appearing to relate to response style on the AQ (Chee & de Vries, 2022). Data collection at stage one had no requirements for the year of enrolment, although stage two required participants to be enrolled as a first-year student to ensure a new pool of participants. Participants who self-reported an autism diagnosis were excluded as the thesis was focusing on a non-clinical population.

3.4.1 Participant Summary

Across the data collection stages, 291 undergraduate students participated. Whilst there was no formal testing for an autism diagnosis, participants were asked to self-report any autism-related diagnoses. In total, nine participants self-reported an autism diagnosis and were excluded from the data. Although there was no clinical cut-off, which is in line with the continuum approach, boxplots identified four outliers with scores greater than or equal to 40 which were excluded from the data. While these were excluded for being outliers, there was no clinical cut-off which White, Ollendick and Bray (2011) suggest is important. They report that out of 667 students from an American university, 13 were identified as scoring above the

recommended AQ cut-off >32; eight of these were formally assessed and five met the diagnostic criteria. Importantly, these students had not previously received a diagnosis. The statistics suggest that if a cut-off was used then it would not consider the range of traits within the general population, including those who may go on to receive a diagnosis.

The final sample was 291 (236 females); which is the maximum sample size for any study within the thesis, although some studies report a smaller sample size because of participants opting not to complete all tasks either within or across each stage of data collection. In the method section of each empirical chapter, there is a reference to the number of participants that completed each measure relevant to that chapter. For stage two data collection there was not a complete data set for two of the participants including the key metacognitive variables and so they were excluded.

The average age of participants across the whole sample was 19.68 years (*SD* = 1.59; range = 18-25). Ethnicity was categorised into five ethnic groups, with White British accounting for 90.4% of the whole sample. This is followed by the remaining groups, Black British (3.4%), Black African (2.4%), Asian (1.7%), and Caribbean (1.4%). With an unequal gender distribution (236 female v 55 male), a possible gender difference in AQ score is investigated in Chapter 4, a preliminary investigation, with section 4.3.1 reporting the results based on the original five-factor model for both scoring approaches. Additionally, section 4.3.4.1 reports whether there is a gender difference for the model identified as an appropriate fit for the data set.

3.5 Ethical considerations

Ethical approval was obtained from the Faculty of Sciences, Engineering, and Social Sciences Ethics Panel at CCCU. Areas considered included consent, withdrawal, confidentiality, and risk. For the stages of data collection, the purpose of the study was always clearly indicated before informed consent was obtained. The right to withdraw was stated in the participant information sheet, which was provided before consent was obtained. Additionally, for stage two data collection it was clearly stated that participants did not have to participate in all aspects; informed consent was obtained and the right to withdraw was reiterated for the first online measure, then the laboratory part.

In terms of confidentiality and anonymity, participants created unique codes to be recorded on the data instead of names. The codes were memorable to each participant (the first two digits of the date of birth, the last letter of their surname, and the last letter from the

month they were born). Participants were informed that if they wanted to withdraw at any point, they would need to reference their code. In case of participants misreporting, a password-protected document with codes and contact email addresses was created, which was only accessible to the researcher. Additionally, participants from stage two data collection were asked to leave their email addresses if they wanted to be contacted for any follow-up studies. In other words, email addresses were stored so that these participants could be contacted, with these destroyed alongside other records after the 10-year retention period.

Due to the researcher also being a member of staff, additional mitigations were put in place to ensure students did not feel that choosing to participate or not would affect their university grades. The concern was addressed by ensuring that if the researcher was involved in marking, then it was only for modules with anonymous marking.

Participants were debriefed at the end of each stage of data collection.

See Appendix 1 for an example of an information sheet, Appendix 2 for an example of a consent form, and Appendix 3 for an example of a debrief. These were adapted for each study. The next section details the measures used across multiple studies.

3.6 Measures used within multiple studies

The measures reviewed in this section are from the preliminary investigation (Chapter 4) and / or used within multiple studies and therefore reported here in full and only briefly mentioned in the appropriate empirical chapter. The unique measures used in each study are discussed in the appropriate chapter.

For the first measure reported in the following section, the AQ, the internal consistency will not be reported. The model being used throughout the thesis is investigated in Chapter 4 and therefore the reliability is reported in the empirical chapter. For the remaining measures, the internal consistency scores are reported from stage one data collection (n = 152).

3.6.1 The Autism Quotient

The Autism Quotient (AQ; Baron-Cohen et al., 2001) is a 50-item self-report scale measuring the extent to which individuals express autistic characteristics. The AQ has five subdomains: social skills, attention switching, attention to detail, communication, and imagination. Participants are required to indicate their level of agreement with the statements on a 4-point likert scale (definitely agree, slightly agree, slightly disagree, and definitely

disagree). Approximately half the items are designed to elicit a “disagree” response and half an “agree” response for a high scoring person with autistic traits. To protect against false negatives and due to the risk of under-reporting social difficulties, the AQ focuses on preferences and not behavioural judgements (Baron-Cohen et al., 2001; Hoekstra et al., 2007).

Chapter 4 will explore the psychometric properties of the AQ, focusing on the factor structure and scoring approach. The original five-factor model (Baron-Cohen et al., 2001) and subsequent alternative models are fully discussed in Chapter 4 (section 4.1.2). The two scoring approaches are the original binary approach and the 4-point likert method, both of which are fully reviewed in Chapter 4 (section 4.1.3). The identified model from Chapter 4 will be used in subsequent studies within the thesis to assess autistic traits in a non-clinical sample.

3.6.1.1 Alternative Measures to the Autism Quotient

There are a range of alternative measures for assessing autistic traits in non-clinical populations. For instance, when focusing on family history, there is the Family History Interview (FHI) (Rutter & Folstein, 1995) which measures autistic traits in family members by interviewing one member of the family (Wheelwright et al., 2010). There is also the Broader Phenotype Autism Symptom Scale (BPASS) (Dawson et al; 2007) which assesses traits in autistic individuals and their families. Dawson et al. (2007) aimed for this to be the one measure that could explore traits within all family members by using interviews and direct observations via a clinician. Due to the need for a trained clinician and the focus on family, these measures were not selected for the thesis.

Another measure is the Broad Autism Phenotype Questionnaire (BAPQ) (Hurley et al., 2007). This was developed after 20 years of observing characteristics of Broad Autism Phenotype (BAP) which reflects the phenotypic expression of the genetic liability for autism in relatives of autistic individuals. It was designed to screen for BAP traits in parents of autistic children (Hurley et al., 2007) and therefore is not appropriate for university students, the sample within the thesis.

Moving away from measures focusing on the family, Allison et al. (2012) developed the AQ-10 which is considered the first step towards developing a short autism instrument. However, in a study by Ashwood et al. (2016), it was identified that two thirds of adults scoring below the AQ10 cut-off were false negatives, meaning other measures identified

them as autistic and therefore raising concerns over the validity of the measure. It is also suggested that the most appropriate use of the AQ-10 is for professionals, who have time constraints, to identify those who should be referred for a full assessment (Booth et al., 2013). With the thesis not aiming to assess individuals for referral it is not deemed an appropriate measure.

Finally, there is the Social Responsiveness Scale (SRS) questionnaire (Constantino 2002) which was primarily designed to measure reciprocal social behaviour, although does also include items relating to communication/language and stereotyped behaviours and interests (Hurley et al., 2007). Initially designed for children and completed by an adult informant it is not normally distributed (Wheelwright et al., 2010) and has inappropriate wording for adults (Chan et al., 2017). The measure has since been adapted for adults, the SRS-2 (Constantino & Gruber, 2012), and has been used when measuring autistic traits in patients with anorexia nervosa (Kerr-Gaffney et al., 2020). However, there is a lack of research into the effectiveness of the measure for non-clinical populations and therefore also was not deemed as an appropriate measure.

To summarise, the alternative measures either refer to family members, are not intended as a screening tool for non-clinical populations (e.g., AQ-10), or have not been researched fully within the general population (e.g., SRS-2). Subsequently, the AQ was identified as the most appropriate measure for assessing autistic traits in a non-clinical sample.

3.6.2 The State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970) is a 40-item self-report measure for anxiety. The inventory is divided into state and trait anxiety, with 20 items in each domain. State anxiety items relate to how the participants feel at that moment, their current state, with participants answering on a 4-point likert scale (not at all, somewhat, moderately so, and very much so) (Garfinkel et al., 2016). Whilst trait anxiety items relate to how participants generally feel, a more stable dispositional tendency, with a 4-point likert scale also used (almost never, sometimes, often and, almost always) (Garfinkel et al., 2016). Scoring should be reversed for the anxiety-absent items, approximately half (19) of the total items (Julian, 2011). Each questionnaire is scored between 20-80.

When considering the test-retest reliability for state and trait items separately, Julian (2011) acknowledges that the state anxiety scale often has a lower level of stability as it

detects transitory states. However, there is good internal consistency for the domain when exploring autistic traits in a non-clinical university student sample (α = .94) (Krumm et al., 2017). The STAI demonstrated good internal consistency in the present sample for both the state (α = .93) and trait (α = .93) subdomains. The measure was used in Chapter 4 as a known correlate of autism to enable the validity of a proposed AQ model to be assessed. It was also used in Chapter 6 to assess whether there may be an indirect relationship between social skills and public self-awareness with anxiety as the mediating factor. The variables from the model, including anxiety, were also explored in Chapter 7 to explore a possible relationship with the outcome of attitudes and beliefs toward help-seeking to identify whether further research is justified.

3.6.3 The twenty-item Toronto Alexithymia Scale

The Toronto Alexithymia Scale (TAS-20; Bagby et al., 1994) is a 20-item self-report scale measuring alexithymia. As an overall measure, it assesses difficulties in understanding and describing one's emotions, with the three subdomains measuring: difficulty identifying feelings (5 items), difficulty describing feelings (7 items), and externally oriented thinking (8 items). Participants are required to indicate their level of agreement with the statements on a 5-point likert scale from (1) "strongly disagree" to (5) "strongly agree". Five items are reverse scored (Berthoz & Hill, 2005) and the total score can vary from 20 to 100. A score equal to or less than 51 indicates no alexithymia, 52 to 60 indicates possible alexithymia, and scores equal to or greater than 61 indicate alexithymia (Bagby et al., 1994).

The TAS-20 shows good internal consistency for difficulty identifying feelings (α = .78) and difficulty describing feelings (α = .75) subdomains, but only adequate for externally oriented thinking (α = .66) (Bagby et al., 1994). The overall internal reliability is good (α = .81). It is also reported that there is good test-retest reliability in the first study (α = .77), with students completing the scale at the beginning of class on two occasions, three weeks apart.

Focusing on autistic traits in a non-clinical sample, Gökçen et al., (2016) report good overall internal reliability (α = .81). The TAS-20 demonstrated good internal consistency in the present sample for the difficulty identifying feelings (α = .82) and difficulty describing feelings (α = .89) subdomains, although was lower for the externally oriented thinking subdomain (α = .57). The total internal consistency was good for the present sample (α = .86). The TAS-20 was used in Chapter 4 as a correlate of autistic traits to assess the validity of a proposed AQ model.

3.6.4 The Empathy Quotient

The Empathy Quotient (EQ; Wakabayashi, Baron-Cohen, Wheelwright, Goldenfeld et al., 2006) is a shortened version of the original measure developed by Baron-Cohen and Wheelwright (2004), which consisted of 60 items, 20 filler items, measuring the drive or ability to attribute mental states to another person / animal and appropriate affective response to another person's mental state. The shortened version has 22 items. Participants indicate their level of agreement with the statements on a 4-point likert scale (strongly agree, slightly agree, slightly disagree, and strongly disagree) (Wakabayashi, Baron-Cohen, Wheelwright, Goldenfeld et al., 2006), with five of the items reverse scored. Identical to the original measure, if the participant records the empathic behaviour mildly, then 1 point is scored or if the participant displays a strong response for the empathic behaviour, 2 points are scored (Baron-Cohen & Wheelwright, 2004). The maximum score on the EQ short version is 44.

Correlation between the original 40-item (excluding the 20 filler questions) and the 22-item is good (r = .93) (Wakabayashi, Baron-Cohen, Wheelwright, Goldenfeld et al., 2006) and Cronbach's alpha also suggests good internal consistency for the shortened version (α = .90). As the internal consistency is higher for the shortened version compared to the original (α = .88), the researchers suggest the full version included some unnecessary items. Focusing on autistic traits in a non-clinical adult sample there is also good internal consistency (α = .93) (Kung, 2020). The EQ demonstrated good internal consistency in the present sample (α = .90) and is used as a measure of ToM in Chapter 4 to assess the validity of a proposed AQ model.

3.6.5 The Rosenberg Self-Esteem Scale

The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965) is a 10-item scale measuring global self-esteem. Participants are required to state their level of agreement with responses on a 4-point scale (agree, strongly agree, disagree, and strongly disagree), with half of the items reverse scored (Sinclair et al., 2010). A higher score represents increased self-esteem. Sinclair et al. report that items on the RSES have been scored two ways (1-4 vs 0-3), meaning scores range from either 10-40 or 0-30. In line with the original work and more recent autism literature (e.g., McChesney & Toseeb, 2018), the 0-3 coding was selected.

When exploring the psychometric properties of the RSES within a large non-clinical adult sample from the US, Sinclair et al. (2010) report that for the overall sample, the internal

consistency of the measure is good (α = .91). They considered possible differences within the age categories and report the Cronbach alpha's ranged from .84 to .93, with the lower value for those aged 66+ and the upper value for the 18-25 age group. There is also a good Cronbach's alpha for university students (α = .86) (Olenik-Shemesh et al., 2018). Focusing on autistic traits in a non-clinical adult sample, there is also good internal reliability for the measure (α = .91) (Rodgers et al., 2018). The RSES demonstrated good internal consistency in the present sample (α = .91). The measure was used in Chapter 4 as a correlate of autistic traits to assess the validity of a proposed AQ model.

3.6.6 The Self-Consciousness Scale Revised

The Self-Consciousness Scale Revised (SCS-R; Scheier & Carver, 1985) is a 22-item self-report scale measuring self–awareness. The three subdomains are private self-awareness (9 items), public self-awareness (7 items), and social anxiety (6 items). However, for the thesis only the private and public subdomains are being assessed, see section 2.2.2 for an explanation of why the third subdomain was not included. Participants are required to indicate their level of agreement with the statements on a 4-point likert scale (a lot like me, somewhat like me, a little like me and not like me at all). One of the items for private self-awareness is reverse scored.

The Cronbach's alpha internal consistency scores are good for private (α = .75) and public self-awareness (α = .84) (Scheier & Carver, 1985). Furthermore, the test-retest reliability, with a four-week interval between administration, was good for the private (α = .76) and public self-awareness (α = .74). Internal consistency has not been reported in the limited literature that has explored autistic traits in a non-clinical sample. However, Burns et al. (2019) focus on autistic adults and report good internal consistency for private self-awareness (α = .73) and public self-awareness (α = .85). The SCS-R demonstrated good internal consistency in the present sample for both the private (α = .74) and public subdomains (α = .78). The private and public subdomains were used in Chapters 5, 6, and 7 as a measure of the self. In Chapter 5 the measure was used to assess the direct relationships between autistic traits and the self and in Chapter 6 this was extended so that indirect relationships were explored for both subdomains. Finally, in Chapter 7 the measure was used to explore the individual correlations between the mediation models and attitudes and beliefs toward help-seeking to identify potential barriers for university students.

3.6.7 The Metacognitions Questionnaire

The Metacognitions Questionnaire (MCQ; Wells & Cartwright-Hatton, 2004) is an adaption of the original metacognitive measure by Cartwright-Hatton and Wells (1997) which consisted of 65 items. The shortened version has 30 items; six items were selected from each of the original five MCQ factors. Participants are required to indicate their level of agreement with the statements on a 4-point likert scale (agree very much, agree moderately, agree slightly, and do not agree). The MCQ short form has a maximum score of 120.

For each of the factors the Cronbach's alpha internal consistency scores are good: lack of cognitive confidence (α = .93), positive beliefs (α = .92), cognitive self-consciousness (α = .92), uncontrollability and danger (α = .91), and need to control thoughts (α = .72) (Wells & Cartwright-Hatton, 2004). An overall Cronbach's alpha also reports good internal consistency (α = 0.93). Similarly, in a large sample of students and non-students (n = 1,304) internal consistency scores are good: lack of cognitive confidence (α = .86), positive beliefs (α = .89), cognitive self-consciousness (α = .86), uncontrollability and danger (α = .87), and need to control thoughts (α = .77) (Spada et al., 2008).

Whilst the internal consistency scores are good, not all subdomains are assessed within the thesis but are included so that an overall score can be computed. Focusing on specific subdomains is consistent with the earlier work by Grainger et al. (2014) who only assessed the lack of cognitive confidence and cognitive self-consciousness subdomains. They selected these because the subdomains address attention paid to their own thoughts and confidence in their own cognitions; the remaining subdomains focus on worrying and the effects of intrusive negative thoughts. The MCQ demonstrated good consistency in the present sample for the lack of cognitive confidence (α = .87) and cognitive self-consciousness (α = .91) subdomains. The metacognitive measure was used to assess the self. It was used in Chapter 5 to assess the relationship with autistic traits and also the relationship with self-awareness to explore whether there was an overlap between the constructs. Finally, the MCQ was used in Chapter 6 as part of a model investigating whether an MCQ subdomain mediated the relationship between autistic traits and self-awareness.

3.6.8 Metacognition: Social metacognitive monitoring measure

Metacognitive monitoring was assessed separately for a social and non-social context. Beginning with the social context, a new task was developed for the thesis to focus specifically on awareness of one's own behaviour. A structured interview was used to ask

participants about their expectations of university (see Appendix 4 for the structured interview based on an existing measure by Pancer et al. (2000)). The interview was conducted in a psychology laboratory and was recorded. Once completed, participants were asked to complete a self-report questionnaire (thus a non-verbal task) on their behaviour from the social interaction with the researcher. The questionnaire asked participants to indicate on a five-point scale how frequently they had demonstrated a specific behaviour during the interview, ranging from "not at all" to "very frequently" (see Figure 1). Typically, metacognitive literature consists of a test phase whereby participants answer recall questions. However, with the social behavioural measure assessing awareness of own behaviour a likert scale referring to frequency levels was opted for. "Frequently" was identified as 65% of the time as the value suggests the behaviour occurs often. When identifying the range for the "rarely" response, 25% was considered too high, so it was halved resulting in 13%. To account for the difference between the frequency levels, the "occasionally" response was 26% of the time.

Not at all	Rarely	Occasionally	Frequently	Very frequently
0%	Up to 13%	Up to 26%	Up to 65%	More than 65%

Figure 1

Five-Point Scale to Show Frequency of a Specific Behaviour During the Interview.

Altogether, 10 behaviours were considered: eye contact, smiling, fidgeting, touching neck/face, folding and unfolding arms, folding and unfolding legs, tapping foot, shaking leg, using hand gestures, and shrugging shoulders. Eye contact was selected due to its association with autism (Lai & Baron-Cohen, 2015; Trevisan et al., 2017). The remaining behaviours were non-verbal: facial expression, gestures, and posture, with all of these communicated through body movement (Bonaccio et al., 2016). Focusing on the broad area of body movement is also consistent with the recommendation by Burling et al. (2019) that stimuli should not always be one's face or speech because we see and hear these frequently, instead suggesting the focus could be on our own body actions. Additional information was provided about the behavioural categories to the participants (see Table 2) to address the potential lack of clarity in terms of whether the data reflects the target behaviours (Sandercock et al., 2020) and thus improve the validity. After each item on the questionnaire, which focused on a different behaviour, participants were asked to rate on a scale from 0-100% how confident they were with their response.

Table 2

Behavioural Categories and Examples of Behaviour for the Social Metacognitive Monitoring Task.

Behavioural category	Examples of behaviour
Eye contact	Looking directly into the researcher's eyes
Smiling	Expression where ends of the mouth curve up
Fidgeting	Hair twiddling, picking nails, moving on chair, and wringing hands
Touch face / neck	Touching face or neck, excluding hair or ears
Folding and unfolding arms	Arms being crossed and tucked in
Folding and unfolding legs	Crossing at the thighs
Tapping foot	Repetitive up and down movement of the foot
Shaking leg	Repetitively moving leg(s)
Using hand gestures	Movement of the hands, such as to show a size
Shrugging shoulders	To raise and contract the shoulders

The structured interview was recorded so that the behaviour could be coded by the researcher with the software Mangold INTERACT version 16.1.5.8. to provide an objective measure. The output included the percentage over time that each behaviour was demonstrated, which could then be converted into the same five-point ranking system that participants used. Following this, it was possible to identify the participants' item correctness for each behaviour. The association between item correctness and their confidence during the task was assessed to provide a gamma correlation, also known as a Judgement of Confidence (JoC) rating. A gamma score was obtained for each participant to assess their metacognitive monitoring ability. For the task, 40% of the responses were double-rated. When setting the criteria for matches at 80%, with a 2 second tolerance window, the Kappa was .73. The value indicates substantial inter-rater reliability and that the ratings are objective. The social metacognitive task was used in Chapter 5 as an objective measure of the self to explore a possible relationship with autistic traits. It was also used in Chapter 7 to investigate if there is a relationship between the metacognitive task and an outcome measure that uses metacognitive skill. The novel measure was not validated, although it was initially piloted with a small sample to ensure the behaviour categories were clear and the examples of behaviour provided were relevant and detailed enough.

3.6.9 Metacognition: Non-social metacognitive monitoring measure

For the non-social self-awareness task, participants completed a memory task. A pool of words was selected from the Psycholinguistic database. These words had between 4-5 letters and were common parts of speech with only nouns selected (see Appendix 5). Participants were asked to remember 60 stimuli, inclusive of 12 stimuli used as buffer words (six appearing at the beginning and six at the end). These buffer words were designed to eliminate primary and recency effects (Joordens et al., 2008) and were therefore not shown during the test phase. Using PsychoPy, each word appeared for 1.5 seconds, followed by a 0.5 second inter-stimulus interval before automatically moving to the next word. Consistent with the study by Elmose and Happé (2014), for 30 seconds participants counted down aloud from a given number in 7s. In doing so, rehearsal is prevented (Rai & Harris, 2013) as the complex counting is deemed as demanding (Van den Hout et al., 2010). The test phase included the 48 stimuli (excluding the buffer words) (old items) plus an additional 48 new words (new items), whereby participants indicated if they had previously seen the word (old item) or not (new item). The number of stimuli was based on the early work by Tulving et al. (1982) and the latter work by Joordens et al. (2008), which also influenced the response keys. Participants responded with the "z" key if they believed the stimuli were new or the "/" key if they believed the stimuli were old. The task was not timed and words stayed on the screen until a key was pressed. After each response, participants rated their confidence in their response from 0-100% on a sliding scale, as is the case in the studies by Sawyer et al. (2014) and Williams et al. (2016). A practice trial was completed first with three old items and three new items. Altogether a total of 114 stimuli are needed: six for the practice, 60 for the study phase, and an additional 48 for the test phase. For ease of reading, all stimuli were presented in blue lettering with a grey background; aiming to avoid light text on a dark background (Evett & Brown. 2005) and limit the contrast between colours (Plakopiti & Bellou, 2014). Instructions were presented on the screen with no verbal instructions necessary. The approach is consistent with the suggestion by Maras et al. (2020) that explicit instructions are beneficial for all individuals and it can lower the chance of ambiguity and reduce social demands for the individual. Additionally, it also addresses the finding by Lin et al. (2020) that from a non-clinical sample, adults with high autistic traits experience difficulties processing social cues, although not non-social cues. Responses were also non-verbal, despite the tendency for existing measures to rely on verbal responses.

Similar to the social task, for the non-social task the association between item correctness and confidence provides a gamma correlation for each participant, also known as a Judgement of Confidence (JoC) rating. To establish the item correctness for the non-social task, accuracy was coded as 0 or 1, to indicate whether they correctly identified if the word had been seen before. The association between item correctness and confidence during the task was then analysed to identify the metacognitive monitoring ability of each participant for the non-social task. The non-social metacognitive task was used in Chapter 5 as an objective measure of the self to explore a possible relationship with autistic traits. Additionally, it was used in Chapter 7 to investigate a possible relationship with an outcome measure that uses metacognitive skill.

For both the social and non-social tasks gamma correlation was used to assess metacognitive monitoring ability. This non-parametric method is commonly used in metacognitive monitoring studies (Grainger et al., 2016; Williams et al., 2016). There are two suggestions for its popularity that are relevant to this study. First, it does not assume interval scales, which might not be used on a likert scale. A second reason is that it does not assume a linear relationship between confidence and accuracy which allows for more complex relationships (Nelson et al., 2004).

3.7 Data analysis

Data will be analysed with Analysis of Moment Structures (AMOS) and Statistical Package for Social Sciences (SPSS) version 26. Using AMOS, in Chapter 4, Confirmatory Factor Analysis (CFA) will be performed, to identify the appropriateness of the suggested AQ models. Following this, through SPSS, Cronbach's alpha will establish the internal consistency of the proposed models and Pearson's correlational analysis will explore the relationship with established correlates of autism to assess the validity of the identified model. In Chapter 5, for the objective metacognitive monitoring measures, gamma correlations will be calculated to identify metacognitive monitoring ability in participants. Separate one-sample t-tests will then assess JoC monitoring for a social and non-social task. Pearson's correlational analysis will explore the relationship between autistic traits, self-awareness, and metacognition, through existing self-report measures and a newly developed metacognitive monitoring measure for the thesis. Mediational analysis using model 4 of PROCESS macro version 3 for SPSS will be used in Chapter 6 to identify possible indirect associations between autistic traits and self-awareness for a non-social and social model,

based on the findings from Chapter 5. Finally, for Chapter 7, Pearson's correlational analysis will explore the relationship between the variables from the social model and the perceived benefits and costs of help-seeking.

Alongside the assumptions for parametric analysis, a more specific overview of the analysis for each study can be found in the relevant empirical chapter.

Chapter 4: Exploring the psychometric properties of the Autism Quotient: factor structure and scoring approach

This chapter presents a study investigating the psychometric properties of the Autism Quotient (AQ) questionnaire. It draws on factor analytic studies to identify commonly used factor structures and the scoring approaches used so that the appropriateness of different approaches can be assessed for the data set. The known correlates of autism are reviewed to establish whether these are also correlates of autistic traits for a non-clinical population so that they can be used to assess the validity of an identified model. This is a preliminary investigation within the thesis to identify a reliable model to use in subsequent studies and to guide future research focusing on 18 – 25-year-old university students from a non-clinical population.

4.1 Introduction

4.1.1 Overview of the Autism Quotient

The Autism Quotient (AQ) questionnaire, designed by Baron-Cohen et al. (2001), is the most widely used measure to quantify autistic traits in the general population (English et al., 2020; Ruzich et al., 2015; Stevenson & Hart, 2017). It identifies where individuals are on the spectrum (Baron-Cohen et al., 2001; Woodbury-Smith et al., 2005) providing a bridge between clinical and non-clinical populations (Lai et al., 2013; Stewart et al., 2018).

Despite being widely used, the measure was designed around five pre-existing subgroups with 10 questions incorporated into each of these (Bralten et al., 2018). As the subdomains were not data driven there is the potential for the researcher's personal opinions regarding key autistic traits to influence the identified subdomains. It is also reliant on the individual's self-awareness (Ruzich et al., 2015) which not all researchers believe is appropriate as individuals may have limited awareness of their difficulties (Ashwood et al., 2016; Bishop & Seltzer, 2012). However, the relationship between autism and self-awareness is debated; one of the overarching aims of the thesis is to investigate the relationship in a non-clinical population. After reviewing alternative measures in section 3.6.1.1 the AQ is considered as the most appropriate measure for the thesis. However, the psychometric properties need to be reviewed because since the original model there are a range of factor structures and two scoring approaches, yet no agreed approach for a non-clinical sample. Thus, this chapter will assess the psychometric properties of the AQ, with the identified

model used in subsequent chapters when assessing autistic traits through either the overall score or the subdomains to identify nuanced relationships with the self.

4.1.2 Factor structure of the Autism Quotient

The original AQ questionnaire (Baron-Cohen et al., 2001) consists of five subdomains (social skills, attention switching, attention to detail, communication, and imagination). When assessing the reliability of the model, all scores range from adequate to good for the subdomains. However, these results have not been replicated in subsequent studies (see Table 3) suggesting a lack of reliability in the original model.

Table 3

Coefficient Alphas for Factor Analytic Studies Using the Five-Factor Model.

Research study	Social skills	Attention switching	Attention to detail	Communication	Imagination
Baron-Cohen et al. (2001)	.77	.67	.63	.65	.65
Austin (2005)	.75	.58	.66	.61	.65
Freeth et al. (2013)	.63	.56	.56	.59	.53
Hurst, Mitchell et al. (2007)	.66	.41	.60	.47	.40

Alternative factor structures have since been proposed. Austin (2005) proposed three factors (social skills, details/patterns, and communication/mindreading). When assessing the reliability of these, social skills have good internal consistency ($\alpha = .85$), whilst attention to detail and communication are both adequate ($\alpha = .70$ and $\alpha = .66$). There is support for the model from subsequent studies; both Hurst, Mitchell, et al. (2007) and Russell-Smith et al. (2011) (study 1) identify a three-factor model (social skills, details/patterns and communication/mindreading factors) which neatly replicates the model.

However, Hoekstra et al. (2008 propose four of the five subdomains (social skills, communication, attention switching, and imagination) highly correlate and can therefore be under one factor of social interaction, with a small second factor for attention to detail. They recruited two samples (student and general population) and reported good internal consistency scores for the overall autistic trait score and the subdomains for both samples. Despite appearing to be reliable, there is a lack of support as recent factor analytic studies have not replicated the model.

Stewart and Austin (2009) proposed an alternative four-factor model (socialness, patterns, understanding others/communication, and imagination). The internal consistency scores for three of the factors range from adequate to good, but there is poor reliability for the imagination subdomain (α = .55). However, it is supported in a second study by Russell-Smith et al. (2011) who identified four similar subdomains (social skills, details/patterns, understanding/communication and imagination). Again, the internal consistency is below the recommended standard for the fourth factor, imagination (α = 53). A lack of reliability for the fourth subdomain indicates further exploration into the psychometric properties is necessary.

Finally, after reviewing the existing models outlined so far, Kloosterman et al. (2011) proposed an alternative five-factor model (social skills, communication/mindreading, restricted/repetitive behaviour, imagination, and attention to detail). The internal consistency scores range from poor for restricted/repetitive behaviour (α = .40) to good for social skills (α = .86). The variability in the internal consistency scores means the psychometric properties of the model are questioned.

After reviewing the existing factor analytic studies there is a lack of agreement in an alternative model. Low reliability across multiple models and a lack of agreement supports the psychometric properties of the AQ being improved. As the models by Austin (2005) and Stewart and Austin (2009) have been replicated in subsequent studies, suggesting reliability, they will be used within this study alongside the original five-factor model. Within this preliminary investigation, the first aim is to identify whether the five-factor (Baron-Cohen et al., 2001), four-factor (Stewart and Austin, 2009), or three-factor (Austin, 2005) model is supported for the data set. The second aim is to explore if the scoring approach used, binary or 4-point likert, affects the model fit.

4.1.3 Scoring approaches for the Autism Quotient

A second psychometric property of the AQ relates to the scoring approach. The binary approach was used in the initial design of the AQ by Baron-Cohen et al. (2001) and involves each item being scored as 1 or 0. An alternative approach is the 4-point likert scoring with each item scored on a scale from one to four (definitely disagree, slightly disagree, slightly agree, and definitely agree) (Austin, 2005).

When comparing these approaches, the likert approach has greater sensitivity because it accounts for all the response variability (Austin, 2005; Barros et al., 2022). As well as greater sensitivity, the 4-point likert approach also appears to have greater reliability. From a

large undergraduate sample (n = 403) Stevenson and Hart (2017) report that the internal consistency scores significantly improve for the overall score and three of the subdomains when the 4-point scoring approach is used.

When reviewing the factor analytic studies, the 4-point approach was favoured by: Austin (2005), Hoekstra et al. (2008), Stewart and Austin (2009), Kloosterman et al. (2011), and Russell-Smith et al. (2011), with only Hurst, Mitchell et al. (2007) opting for the binary method. The 4-point approach is often seen as a precedent (Lau et al., 2013), with only some limited justifications provided by the researchers themselves. Austin (2005) suggests that the approach makes it easier to discriminate between individuals, whilst Stewart and Austin (2009) refer to the fact that it retains more information about the participants' responses. However, not all researchers provide a rationale for the selection of their scoring method such as Hoekstra et al. (2008) or Russell-Smith et al. (2011). With limited justifications and a lack of empirical evidence assessing the scoring method in factor analytic studies, the thesis will assess the scoring method alongside the factor structure.

The second aim of Chapter 4 is to explore if the scoring approach used, binary or 4-point likert, affects the model fit. Once a model has been identified, the validity will be measured by assessing the model with the known properties of autism.

4.1.4 The known properties of autism in non-clinical populations

Before using the correlates of autism to assess the validity of an identified AQ model, the third aim is to establish that the properties of autism (anxiety, alexithymia, Theory of Mind (ToM), and self-esteem) can also be used as correlates of autistic traits in a non-clinical sample.

The first correlate to be explored is anxiety. There is evidence to suggest that anxiety is high in autistic university students; from a sample of 4,365 students more than a fifth of students report a Generalised Anxiety Disorder (GAD) (McLafferty et al., 2017). Replicating these findings, when exploring autistic traits in non-clinical populations, a positive correlation is commonly reported, as a higher level of anxiety constantly correlates with a higher level of autistic traits in university students (Cassidy et al., 2020; Krumm et al., 2017; Kunihira et al., 2006). Overall, it appears that like autism, autistic traits in the non-clinical population are negatively associated with anxiety.

A second property associated with autism is alexithymia, which refers to a difficulty in understanding and describing one's emotions (Lombardo & Baron-Cohen, 2010;

Lockwood et al., 2003; Murray, Johnston et al., 2017). In non-clinical populations, higher alexithymia consistently correlates with a higher level of autistic traits in university students (Soker-Elimaliah et al., 2020; Vaiouli & Panayiotou, 2021; Vuillier et al., 2020). However, Albantakis et al. (2020) suggest that alexithymia is more commonly reported in individuals with a diagnosis, although individuals with high levels of traits are still more likely to experience alexithymia compared to those with low levels of traits. Thus, supporting the relationship with autistic traits in a non-clinical sample.

Thirdly, autistic adults can have difficulties with social cognition (Murray, Johnston, et al., 2017), specifically ToM. For non-clinical populations, a robust finding is university students with higher levels of autistic traits self-reporting lower empathy (Donati et al., 2019; Lamport & Turner, 2014; Wheelwright et al., 2006). It therefore seems that autistic traits are associated with reduced empathy and therefore there is a similar relationship for non-clinical populations as there is clinical.

A final property is self-esteem, whereby a considerable amount of research has reported a negative association with autistic traits in non-clinical populations, where lower self-esteem correlates with a higher level of autistic traits in adults (Rodgers et al., 2018) and more specifically university students (Kanne et al., 2009; Olenik-Shemesh et al., 2018). The results suggest that like autism, autistic traits in non-clinical populations are associated with lower self-esteem.

Overall, there is support for the correlates of autism also relating to autistic traits in non-clinical populations. Therefore, the known properties of autism can be used as correlates to assess the validity of the AQ model that will be used to measure autistic traits in a non-clinical population in the thesis. The third aim of this chapter is therefore to examine the relationship between the AQ model opted for and the correlates of autism.

4.1.5 Summary of chapter aims

Altogether three aims are investigated in this chapter. The first aim is to explore the factor structure of the AQ and to identify whether the five-factor (Baron-Cohen et al., 2001), four-factor (Stewart and Austin, 2009), or three-factor (Austin, 2005) model is supported for the data set. The second aim is to explore whether the scoring approach, binary or 4-point likert, affects the model fit. Both aims assess the psychometric properties of the AQ. Finally, the third aim is to explore the relationship between the AQ and the correlates of autism to assess the validity of the model identified as the best fit for the data.

4.2 Method

4.2.1 Measures

This study used self-report measures to assess: autistic traits, anxiety, alexithymia, ToM, and self-esteem. These include the Autism Quotient (AQ), a 50-item scale measuring autistic traits in the general population (Baron-Cohen et al., 2001), the State-Trait Anxiety Inventory, a 40-item measure for anxiety, with 20 items measuring state and 20 items measuring trait anxiety (Spielberger et al., 1970), the Toronto Alexithymia Scale (TAS), a 20-item scale for alexithymia, measuring difficulty identifying feelings, difficulty describing feelings and externally oriented thinking (Bagby et al., 1994), the shortened version of the Empathy Quotient (EQ), a 22-item measure for assessing ToM (Wakabayashi, Baron-Cohen, Wheelwright, Goldenfeld et al., 2006) and the Rosenberg Self-Esteem Scale (RSES), a 10 item scale measuring self-esteem (Rosenberg, 1965). A full description of each of these measures is reported in Chapter 3 (section 3.6).

4.2.2 Participants

The total sample size for this study was n = 291 (236 females, 54 males, and 1 other who did not specify their gender). The total excludes four outliers that were identified in the boxplots, all of which had AQ scores greater than or equal to 40. To test validity against the established correlates of autism, many subsets of the data were used depending on the data collection stage. There is reduced data for the measures assessing the correlates of autism because participants from stage two data collection did not all opt to complete the laboratory study where the data was collected. As well as the AQ, there was complete data for 252 participants (203 females, 48 males, and 1 other who did not specify their gender) on measures of anxiety, alexithymia, and ToM and from 181 participants (147 females, 33 males and 1 other who did not specify their gender) on self-esteem which was measured in the first stage of data collection but was not included at the beginning of the second stage of data collection. The omission is a limitation of the study which is further discussed in section 4.4.1.

The average age of students was 19.68 (*SD*=1.59). All participants were aged between 18-25-years.

4.2.3 Procedure

The procedure differed for the first two stages of data collection. Participants from stage one completed self-report questionnaires online, via the online survey platform, Qualtrics. To begin with, participants completed a demographic questionnaire including their: age, gender, university course, and if they had an autism diagnosis. Participants then completed the self-report measures for autistic traits, anxiety, alexithymia, ToM, and self-esteem as part of the same Qualtrics survey. The order in which the measures appeared was randomised to avoid order effects.

During stage two data collection, participants completed the same demographic questionnaire and the autistic traits measure (AQ) via the online survey platform, Qualtrics. They were then invited into the psychology laboratory for further self-report questionnaires for anxiety, alexithymia, ToM, and self-esteem. Two objective metacognitive monitoring tasks were also completed, which are reported and analysed in Chapter 5.

The full ethical considerations are discussed in the methodology chapter (section 3.5).

4.2.4 Analysis

Descriptive statistics are outlined first for the original five-factor AQ model and independent t-tests assess whether there is an effect of gender. Confirmatory Factor Analysis (CFA) is used to determine which of the existing factor structures best fits the data, testing the original five-factor (Baron-Cohen et al., 2001), four-factor (Stewart & Austin, 2009) and three-factor (Austin, 2005) models (aim 1). For each of these, CFA is conducted for both scoring approaches; binary and 4-point likert (aim 2). Therefore, in total, six analyses will be reported. Once a model is identified, analysis is undertaken including internal consistency using Cronbach's alpha and independent t-tests to identify if there is an effect of gender for the sample which is predominately female. Finally, Pearson's correlational analysis will explore the relationship between the identified model and the known properties of autism: anxiety, alexithymia, ToM, and self-esteem, to assess the validity of the model (aim 3).

4.3 Results

4.3.1 Descriptive statistics

The descriptive statistics for the five-factor AQ model (Baron-Cohen et al., 2001), both the binary and likert scoring methods, are presented in Table 4. Focusing on the range of the autistic trait scores, as described in Chapter 3 (section 3.4.1), outliers were excluded from

the data set. When exploring the possible effect of gender, for both scoring approaches females had a slightly higher average score for the overall score and the subdomain scores, except for imagination. Although females scored higher, there was no effect of gender. Focusing on the overall autistic trait score, for the binary scoring approach, with equal variance assumed (F=1.37, p=.24), an independent t-test reported no gender difference (t(288)=-.1.16, p=.25) between females (M=19.09, SD=7.37) and males (M=17.81, SD=6.73). Similarly, for the 4-point likert method, with equal variance assumed (F=2.40, p=.12) there was no gender difference (t(288)=-.72, p=.47) between females (M=113.25, SD=16.34) and males (M=111.54, SD=13.00). No effect of gender supports both females and males being studied collectively within the thesis, despite the unequal split.

Normal distribution across the sample of participants was confirmed for the binary method with skewness of .28 (SE = .14) and kurtosis of -.28 (SE = .29) and the 4-point likert with skewness of -.01 (SE = .14) and kurtosis of .50 (SE = .29).

Table 4

Sample Descriptive Statistics for Both Scoring Approaches of the AQ.

		Total sample				Female				Male			
		Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD
Binary soring	AQ - Total	2	38	18.85	7.25	2	38	19.09	7.37	3	32	17.81	6.73
	AQ - Social skills	0	10	2.94	2.27	0	10	3.03	2.35	0	7	2.61	1.85
	AQ - Attention switching	0	10	5.05	2.29	0	10	5.15	2.34	0	9	4.56	2.03
	AQ - Attention to detail	0	10	5.19	2.16	0	10	5.24	2.19	1	9	4.94	2.03
	AQ - Communication	0	10	2.94	2.23	0	10	2.98	2.20	0	8	2.78	2.37
	AQ - Imagination	0	8	2.73	1.73	0	8	2.69	1.69	0	7	2.93	1.87
4-point likert	AQ - Total	60	159	112.91	15.74	60	159	113.25	16.34	85	145	111.54	13.00
	AQ - Social skills	10	39	21.19	5.00	10	39	21.28	5.19	12	31	20.94	4.08
	AQ - Attention switching	11	38	25.31	4.51	11	38	25.47	4.72	16	33	24.52	3.37
	AQ - Attention to detail	10	39	20.93	4.75	10	39	20.99	4.81	12	31	20.69	4.56
	AQ - Communication	12	39	25.10	4.50	12	39	25.19	4.63	14	32	24.61	3.89
	AQ - Imagination	10	29	20.39	3.66	10	29	20.31	3.64	12	27	20.78	3.80

4.3.2 Factor structure and scoring approach of the Autism Quotient

Table 5 demonstrates the CFA results for the five-factor, four-factor, and three-factor models. A series of CFA, with robust and oblique factors, was conducted to determine which of the existing models the data fits best. To address the first two aims of this chapter, to assess the psychometric properties of the AQ, for each of the factor structures (five, four, and three) both scoring approaches are tested.

CFA was performed using AMOS. The models are evaluated with several model fit indices: Root-Mean-Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), the Standardised Root-Mean-square Residual (SRMR) and the Comparative Fit Index (CFI) (Kim et al., 2016; Kloosterman et al. 2011). The RMSEA and SRMR are seen as two absolute close-fit indices (English et al., 2020). For a model to have a good fit, the various model fit indices should meet the suggested requirements. By reviewing existing literature, Kim et al. (2016) suggest good values are: RMSEA < .05, GFI > .90, AGFI > .90, NFI > .90, CFI > .90. Schreiber et al. (2006) refer to similar levels, although often report the cut-off as > .95 and suggest the RMSEA should be between .06 and .08. They also indicate the SRMR should be < .08.

When comparing several models, the smallest Akaike Information Criterion (AIC) value indicates the optimal model (Kloosterman et al., 2011). Based on the lowest AIC values, the three-factor model (Austin, 2005) offered the best fit for the data in this study. Furthermore, scoring the AQ using the binary approach yielded the lowest AIC value, followed by the model being scored by the 4-point likert approach. Therefore, the appropriateness of the three-factor model, for both scoring methods was assessed further. For both methods of scoring the GFI and AGFI were slightly below the recommended value of .90, although these are known to depend on the sample size (Kim et al., 2016). The RMSEA values are < .08 and close to the preferred value of .05. The SRMR values are equal to or less than .08. Although the CFI values are slightly below the ideal value of .90, and therefore may not suggest a good fit, this is known to be dependent on the sample size and why a close model fit may be opted for rather than an exact model fit (Goretzko et al., 2024). Schreiber et al. (2006) also suggest if many of the indexes suggest a good fit, then there probably is.

The CFA results initially suggest the three-factor model for both scoring approaches could be a good fit for the data. However, the standardised estimates of factor loadings differ between the two models. For the binary scoring approach, the standardised estimates of factor loadings ranged from .24 to .77 for the social skills subdomain, .32 to .63 for details/patterns,

and .34 to .61 for communication/mindreading. Altogether, 10 of the 26 items had standardised estimates < .40. Whilst for the 4-point likert scoring approach the standardised estimates of factor loadings ranged from .26 to .83 for the social skills subdomain, .35 to .62 for details/patterns and .43 to .59 for communication/mindreading. For this scoring method only three of the 26 items had standardised estimates < .40. With this less than the binary scoring method the three-factor model, using the 4-point likert scoring approach, has the best fit to the data (χ^2 (296) = 766.13 (p < .001), RMSEA = .07, 90%CI = [.07; .08], SRMR = .08, CFI = .80).

Table 5

Fit Indices for CFA Models.

Model	Scoring	Chi-Square	df	RMSEA	RMSEA Lower	RMSEA Upper	GFI	AGFI	NFI	CFI	SRMR	AIC
Five-factor (Baron-Cohen et al., 2001)	Binary	2130.81***	1165	0.05	0.05	0.06	0.74	0.72	0.42	0.61	0.08	2350.81
Five-factor (Baron-Cohen et al., 2001)	Four-point	2891.34***	1165	0.07	0.07	0.08	0.67	0.64	0.45	0.57	0.10	3111.34
Four-factor (Stewart & Austin, 2009)	Binary	1526.66***	855	0.05	0.05	0.06	0.79	0.77	0.50	0.68	0.08	1708.66
Four-factor (Stewart & Austin, 2009)	Four-point	2065.80***	855	0.07	0.07	0.07	0.73	0.70	0.53	0.66	0.09	2247.80
Three-factor (Austin, 2005)	Binary	622.31***	296	0.06	0.06	0.07	0.85	0.83	0.67	0.79	0.07	732.31
Three-factor (Austin, 2005)	Four-point	766.13***	296	0.07	0.07	0.08	0.82	0.79	0.71	0.80	0.08	876.13

*Note. *p < .05, **p < .01, ***p < .001.*

4.3.3 Internal consistency for the three-factor model

To further compare the two scoring approaches for the three-factor model, the internal consistency was assessed for the subdomains (social skills, details/patterns, and communication/mindreading), as shown in Table 6. For the binary scoring, the internal consistency ranged from poor (α = .58) for communication/mindreading to good (α = .82) for social skills. For the 4-point likert scoring, the scores ranged from adequate (α = .66) for communication/mindreading to good (α = .87) for social skills. In summary, scores were higher for each of the subdomains of the AQ measure when scored with the 4-point likert approach compared to the binary approach.

Based on the CFA, and supported by the internal consistency, the three-factor model with the 4-point likert scoring approach has been identified as the best model fit for the data.

Table 6

Coefficient Alphas for Each Subdomain of the Three-Factor AQ Model for Both Scoring Approaches.

Scoring	Social skills	Details/Patterns	Communication/Mindreading
Binary	.82	.67	.58
Four-point	.87	.73	.66

4.3.4 Overview of the identified three-factor model

Figure 2 represents the model that will be adopted for in further analysis within the thesis, the 26-item three-factor model proposed by Austin (2005). The social skills subdomain consists of 12 items, the details/patterns subdomain comprises of 8 items, and the communication/mindreading subdomain consists of 6 items. The factors are shown in Table 7, with the item number referring to the original item from the AQ measure proposed by Baron-Cohen et al. (2001). Despite the factor analysis demonstrating three of the 26 items had standardised estimates < .40, all items were included because it is in keeping with an existing model proposed by Austin (2005) which explored group differences. A more equal gender split (79 males and 122 females) and the inclusion of science and non-science degree courses means the model proposed by Austin is not limited to psychology students who are mainly female and therefore more representative of a student population. Of the multiple models that are presented within the existing literature, this is the most representative of the data set.

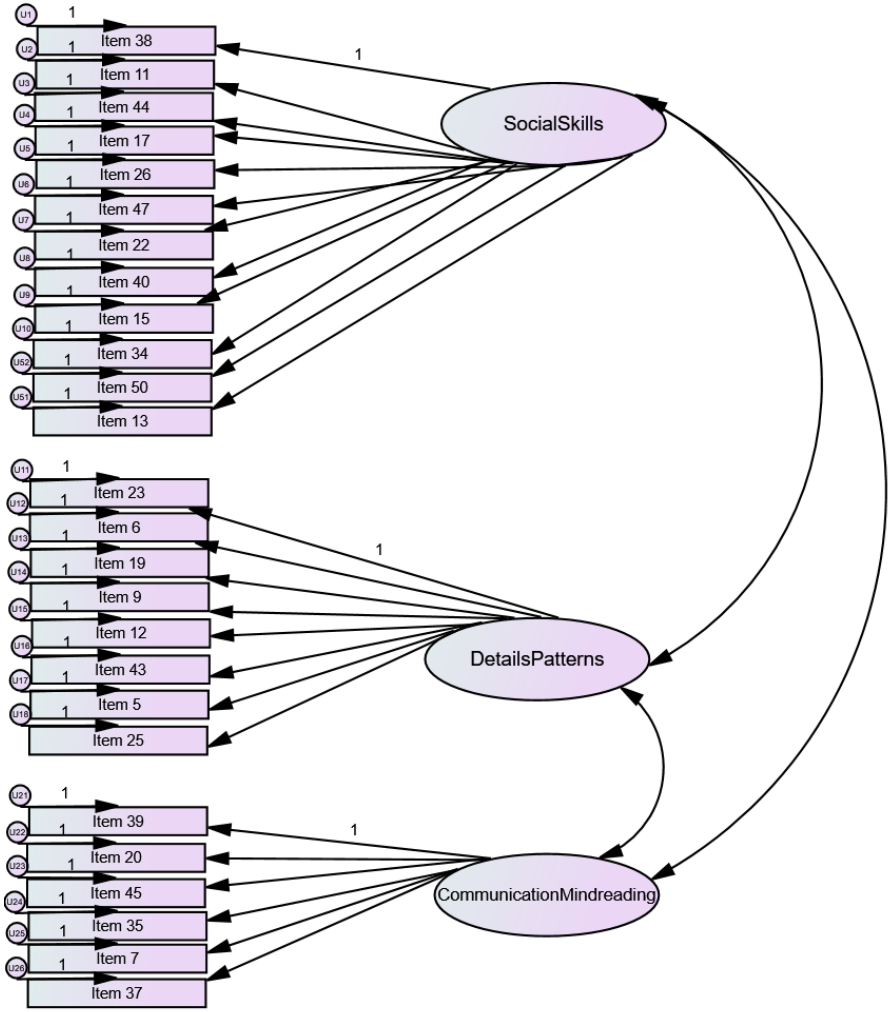

Figure 2

CFA of Three-Factor AQ Model (26 Items).

Table 7

Results from the Factor Analysis of the AQ.

Item	Standardised estimates
Factor 1. Social skills	
38) I am good at social chit-chat.	.83
11) I find social situations easy.	.78
44) I enjoy social occasions.	.79
17) I enjoy social chit-chat.	.79
26) I frequently find that I don't know how to keep a conversation going.	.64
47) I enjoy meeting new people.	.77
22) I find it hard to make new friends.	.65
40) When I was young, I used to enjoy playing games involving pretending with other children.	.26*
15) I find myself drawn more strongly to people than to things.	.53
34) I enjoy doing things spontaneously.	.45
50) I find it very easy to play games with children that involve pretending.	.26*
13) I would rather go to the library than a party.	.43
Factor 2. Details/patterns	
23) I notice patterns in things all the time.	.62
6) I usually notice car number plates or similar strings of information.	.55
19) I am fascinated by numbers.	.47
9) I am fascinated by dates.	.55
12) I tend to notice details that others do not.	.57
43) I like to plan activities that I participate in carefully.	.40
5) I often notice small sounds when others do not.	.54
25) It does not upset me if my daily routine is disturbed.	.35*
Factor 3. Communication/mindreading	
39) People often tell me that I keep going on and on about the same thing.	.58
20) When I'm reading a story, I find it difficult to work out the characters' intentions.	.51
45) I find it difficult to work out people's intentions.	.57
35) I am often the last to understand the point of a joke.	.56
7) Other people frequently tell me what I've said is impolite, even though I think it is polite.	.40
37) If there is an interruption, I can switch back to what I was doing very quickly.	.43

Note. * Items whose loadings are less than .40

4.3.4.1 Investigating a gender difference in the identified model for the data set

Section 4.3.1 indicated no gender difference for the original five-factor model for either scoring approach. There was also no significant difference in any of the comparisons between female and male participants for the three-factor model with the 4-point likert scoring approach (see Table 8). Therefore, females and males are studied collectively within the thesis.

Table 8

Comparison of Female and Male Scores for the AQ.

	Gender	Mean	SD	t	*p*
AQ - Total	F	58.28	11.15	-.28	.78
	M	57.83	8.88		
AQ - Social skills	F	25.13	7.05	.002	.99
	M	25.13	5.60		
AQ - Details / Patterns	F	19.99	4.32	.51	.61
	M	20.31	3.42		
AQ - Communication / Mindreading	F	13.16	3.24	-1.60	.11
	M	12.39	3.00		

4.3.5 Association between the three-factor model and the known properties of autism (aim 3)

The descriptive statistics for the correlates of autism (anxiety, alexithymia, ToM, and self-esteem) are in Table 9.

Table 9

Sample Descriptive Statistics for the Known Properties of Autism.

	Min	Max	Mean	SD
State Anxiety	20	74	41.98	11.72
Trait Anxiety	20	80	48.72	11.13
Alexithymia Total	23	86	51.45	12.77
Alexithymia - Difficulty describing feelings	5	25	14.92	5.02
Alexithymia - Difficulty identifying feelings	7	35	17.43	6.74
Alexithymia - Externally oriented thinking	8	33	19.10	4.38
Empathy Quotient	4	44	24.29	8.44
Self-Esteem	11	40	25.35	6.07

Addressing aim 3, Table 10 shows the correlational analyses for the three-factor model with 4-point scoring and the known properties of autism: anxiety, alexithymia, EQ, and self-esteem. The autistic traits overall score was used to assess the relationship with the correlates of autism and the subdomain scores were used to test whether specific subdomains were independently related to the properties.

Beginning with state anxiety, there was a weak positive correlation with the aggregate AQ score (r=.34, p<.001) and the three subdomains of social skills (r=.29, p<.001), details/patterns (r=.22, p<.05) and communication/mindreading (r=.24, p<.001). However, for trait anxiety, there was a moderate positive relationship with the total AQ score (r=.49, p<.001) and the social skills subdomain (r=.44, p<.001), but a weak positive relationship with details/patterns (r=.31, p<.001) and communication/mindreading (r=.32, p<.001). There was a moderate positive relationship between the alexithymia overall score and total AQ score (r=.54, p<.001) as well as the social skills (r=.49, p<.001), and communication/mindreading subdomains (r=.40, p<.001), although only a weak positive relationship with the details/patterns subdomain (r=.27, p<.001). For the alexithymia difficulty describing feelings, there was a moderate positive relationship with both the total AQ score (r=.47, p<.001) and the social skills subdomain (r=.46, p<.001), although a weak positive relationship with details/patterns (r=.25, p<.001) and communication/mindreading (r=.27, p<.001). There was a moderate positive relationship between alexithymia difficulty identifying feelings and total AQ score (r=.49, p<.001) and the social skills subdomain (r=.40, p<.001), although only a weak positive relationship with details/patterns (r=.34, p<.001) and communication/mindreading (r=.36, p<.001). There was a weak positive relationship between alexithymia externally orientated thoughts and the total AQ score (r=.28, p<.001) as well as the social skills (r=.30, p<.001) and communication/mindreading subdomains (r=.30, p<.001). Although no significant relationship with the details/patterns subdomain (r=-.01, p=.91). For EQ, there was a moderate negative relationship with the total AQ score (r=-.53, p<.001), the social skills (r=-.50, p<.001) and communication/mindreading subdomains (r=-.49, p<.001). Although a weak negative relationship with the details/patterns subdomain (r=-.16, p<.05). Finally, there was a moderate negative relationship between self-esteem and the aggregate AQ score (r=-.46, p<.001). There was a weak negative relationship with each subdomain, social skills (r=-.39, p<.001), details/patterns (r=-.28, p<.001), and communication/mindreading (r=-.34, p<.001).

The significant correlations suggest that the known correlates of autism are related to autistic traits. However, the size of the correlations differ, for example when exploring the relationship between trait anxiety and autistic traits, there is a moderate positive relationship with the total AQ score and the social skills subdomain, but a weak positive relationship with the remaining two autistic trait subdomains. With a difference in the size of the correlations, it can be inferred that autistic trait subdomains may differentially relate to the different constructs of autism and thus support the exploration of subdomains throughout the thesis.

Table 10

Correlations Between the AQ and the Known Properties of Autism.

Measure	1	2	3	4	5	6	7	8	9	10	11	12
1. AQ - Total	–	–	–	–	–	–	–	–	–	–	–	–
2. AQ - Social Skills	.85***	–	–	–	–	–	–	–	–	–	–	–
3. AQ - Details / Patterns	.65***	.24***	–	–	–	–	–	–	–	–	–	–
4. AQ - Communication / Mindreading	.71***	.40***	.39***	–	–	–	–	–	–	–	–	–
5. State Anxiety	.34***	.29***	.22**	.24***	–	–	–	–	–	–	–	–
6. Trait Anxiety	.49***	.44***	.31***	.32***	.79***	–	–	–	–	–	–	–
7. Alexithymia Total	.54***	.49***	.27***	.40***	.49***	.52***	–	–	–	–	–	–
8. Alexithymia - Difficulty describing feelings	.47***	.46***	.25***	.27***	.41***	.47***	.84***	–	–	–	–	–
9. Alexithymia - Difficulty identifying feelings	.49***	.40***	.34***	.36***	.50***	.56***	.87***	.63***	–	–	–	–
10. Alexithymia - Externally oriented thinking	.28***	.30***	-.01	.30***	.18**	.13*	.61***	.34***	.26**	–	–	–
11. Empathy Quotient	-.53***	-.50***	-.16*	-.49***	-.21**	-.18**	-.38***	-.30***	-.31***	-.35***	–	–
12. Self-esteem	-.46***	-.39***	-.28***	-.34***	-.56***	-.74***	-.51***	-.48***	-.49***	-.18*	.24**	–

*Note. *p < .05, **p < .01, ***p < .001.*

4.4 Discussion

This study set out to explore the psychometric properties of the Autism Quotient (AQ) questionnaire by assessing the factor structure and the scoring approaches. Beginning with the factor structure, an aim was to explore which of the models, the five-factor (Baron-Cohen et al., 2001), four-factor (Stewart & Austin, 2009) or three-factor (Austin, 2005) presents the best fit for the data set. For the scoring approach, another aim was to explore whether using a binary or 4-point likert approach affected the model fit. Assessing both dimensions contributes to our knowledge of the psychometric properties of the AQ for university students and leads to a theoretical discussion about why the identified factor structure and scoring approach might be more appropriate for the sample. The model identified in this study will be used in all subsequent analyses to assess autistic traits throughout the thesis. It will also contribute to the research field by identifying whether an alternative factor structure might be more appropriate for a non-clinical university population, which has the potential to develop our understanding of autistic traits across the spectrum.

The existing factor structures assessed included Baron-Cohen et al.'s (2001) original five-factor AQ model (social skills, communication/mindreading, restricted/repetitive behaviour, imagination, and attention to detail), Stewart and Austin's (2009) four-factor model (socialness, patterns, understanding others and imagination) and Austin's (2005) three-factor model (social skills, details/patterns and communication/mindreading). Baron-Cohen et al.'s (2001) model was included as it is the original design and as detailed in section 4.1.2, the other two models appear to be reliable as they have been identified as the best model fits in different contexts. To our knowledge, this study is the first to directly test each model fit against a single data set, as well as testing both scoring approaches. Although Kloosterman et al. (2011) tested all three models, they did not consider both scoring approaches.

Findings from the current analysis revealed that the three-factor model with a binary scoring approach had the lowest AIC values, and therefore was initially identified as the best fit. This was followed by the three-factor model with the 4-point likert scoring approach highlighting that regardless of the scoring approach, the three-factor model was the most appropriate fit for the data. In terms of differentiating between the scoring approaches, when examining the standardised estimates of factor loadings for the binary scoring approach, 10 of the 26 items standardised estimates were below acceptable levels, while only three items did not reach the recommended cut-off point when using the likert rating. Thus, showing more weak correlations between the variable and the factor for the binary scoring approach; in

other words, the 4-point likert scoring offered a more acceptable representation of the data. Further support for the approach comes from the internal consistency scores which revealed adequate to good consistencies with the likert scoring, but poor for some factors using the binary approach.

Collectively, the findings identify an appropriate factor structure (aim 1) and an appropriate scoring approach (aim 2) with the three-factor model using the 4-point scoring approach identified as the best fit for the sample. The identification of a three-factor model is consistent with the findings by Russell-Smith et al. (2011) (study 1), who use the 4-point likert scoring approach, and Hurst, Mitchell et al. (2007) who use the binary method. The sample size could explain the proposal of multiple models, with a larger sample needed for the imagination to be its own factor. This study has a sample size of 291 students which is similar to that reported by Russell-Smith et al. (2011), 362 undergraduate students. The study by Hurst, Mitchell et al. (2007) does not support the idea as their sample size was considerably larger at 1,005, but the use of the binary scoring approach would result in a smaller range of scores which could reduce the number of factors elicited, regardless of sample size.

A psychometric reason for the identified model is the use of a likert scoring method which offers variance in responses and can reflect nuanced views of students. The method could be particularly important for the sample as personality traits associated with psychology students may be impacting responses. Through a systematic review, Vedel (2016) identified that psychology students score higher on the openness to experience subdomain on a personality questionnaire, compared to students studying economics, engineering, law, and the sciences. From the original personality measure, the openness to experience subdomain refers to curiosity and interest in a range of ideas and thinking (Costa & McCrae, 1988; McCrae, 1993). If students show openness through their ideas and thinking, then their responses on a self-report questionnaire might not be as restricted as they would consider the whole scale.

Only recruiting psychology students also means the sample is not from a typical scientific background which may be impacting the results. Cross-culturally there are reported differences in autistic trait scores dependent on degree course. For UK university students, degree course relates to overall autistic traits score, with scientists scoring higher than non-scientists (Baron-Cohen et al., 2001). Similarly, individuals studying the sciences, scored significantly higher on the questionnaire, compared to social science and humanities students in a Japanese sample (Wakabayashi, Baron-Cohen, Wheelwright & Tojo, 2006). When

exploring the possible effect of degree course, Stewart and Austin (2009) suggest the difference may be subdomain specific (when focusing on the original five-factor model), with a higher mean score for students studying mathematical science degree subjects compared to other degree courses for both the patterns and the imagination subdomain within the four-factor model. Thus, students studying scientific subjects report they notice details more than others, yet also experience more difficulties with the latter domain. Difficulties in the imagination subdomain for students from the scientific subjects provides an explanation as to why the fourth factor was not identified in the sample, with psychology not typically viewed as a scientific subject. Alternatively, not identifying the fourth factor of imagination is consistent with the removal of delays in imaginative play from the DSM criteria (Golan, 2023), and the measure no longer fully representing the diagnostic criteria.

Finally, the three-factor model may be an appropriate fit for the non-clinical population because the subdomains are broader. Of the eight items included in the second factor of details/patterns, six are from the original attention to detail subdomain, whilst the remaining two are from the attention switching subdomain. Having these items within one factor means there is a wider range of items whereby paying attention to details or patterns is not explicitly named yet is still associated. Whilst a broad approach might be needed, when considering the items from the original attention to detail subdomain from the five-factor model which are not included in the model, such as those that relate to general memory ("I am not very good at remembering phone numbers" and "I am not very good at remembering people's date of birth"), it seems that items might also need to be relevant to a context. Although the AQ is designed for both clinical and non-clinical populations (Kunihira et al., 2006), with the specific nature of the items appearing to be important for a non-clinical sample, researchers must clearly state the sample and not assume that findings can be generalised from one population to another.

To assess the validity of the three-factor model, associations with the known properties of autism (anxiety, alexithymia, ToM, and self-esteem) that were identified as correlates of autistic traits in a non-clinical sample (aim 3) were explored. Autistic traits correlated with each of these properties in the expected ways. For the positive associations, a higher level of autistic traits was associated with higher levels of anxiety and alexithymia. For the negative associations, a higher level of autistic traits was associated with lower levels of ToM and self-esteem. Replicating the clear pattern of associations with the established correlates from the autism literature offers further support for using a three-factor model

based on 4-point likert scoring as a reliable approach for measuring autistic traits in a sample consisting of university students.

4.4.1 Limitations

Despite extending existing literature by considering both the factor structure and scoring approach, there are limitations to this study. One limitation that was referred to in section 4.2.2 is the omission of the self-esteem measure at the beginning of the second data collection stage. When the researcher became aware of the error it was included for the remaining participants. The missing data means there is reduced statistical power for the measure.

Another limitation relates to the sample. Although the aim was to identify the best-fitting model for a sample of university students, and therefore not generalise to the general population, only psychology students were recruited. Thus, the findings are limited to the sample and are not generalisable to the student population. Consequently, the effect of degree course that was initially reported by Austin (2005) could not be explored resulting in a lack of certainty surrounding potential group differences when using the three-factor model.

Finally, also relating to the sample, there was an unequal gender split, with fewer males than females (54 males and 236 females). Although not significantly higher, females typically scored higher than males, which is not consistent with existing literature (e.g., Baron-Cohen et al., 2001; Rosbrook & Whittingham, 2010; Wakabayashi, Baron-Cohen, Wheelwright & Tojo, 2006). However, due to the unequal split, the possible effect of gender could not be investigated.

Recruiting a larger sample size could address the unequal gender split and would also be consistent with the suggestion by English et al. (2020) that a sample size of at least 1,000 is needed to examine the original five-factor AQ model proposed by Baron-Cohen et al. (2001). However, the recommended sample size would be seen as excellent, with Kyriazos (2018) reporting that a more realistic size of 300 is good and 500 is very good. Whilst this study recruited what is commonly seen as an acceptable sample, strengthening the sample would still be advantageous for the robustness of the findings.

4.4.2 Conclusion

The findings from this study have two main implications in relation to the psychometric properties of the AQ. First, from the multiple models, the three-factor structure

is identified as the model that presents the best fit for the data. The model is also endorsed by Hurst, Mitchell et al. (2007) and Russell-Smith et al. (2011) (study 1). Second, the findings support the use of the 4-point likert scoring approach, which is consistent with existing factor analytic studies. Assessing the psychometric properties identified the three-factor model with the 4-point likert scoring approach is a reliable model to assess autistic traits in a non-clinical sample in the subsequent chapters.

Chapter 5: Exploring the relationship between autistic traits, self-awareness, and metacognition

To recap the previous chapter, the preliminary investigation addressed two methodological issues, factor structure and scoring approach, from the original Autism Quotient (AQ) measure. It identified the three-factor model (social skills, details/patterns, and communication/mindreading) with 4-point scoring as a reliable model fit for the data. As well as identifying the model that will be used to assess autistic traits throughout the thesis, the first empirical chapter also considered why the model was appropriate for a non-clinical sample. For instance, a broader approach is needed for non-clinical samples, and for university students aged between 18 – 25-years a likert scale offers more variance in responses and nuanced responding.

This chapter examines the direct association between autistic traits, both overall levels and each subdomain, and the self which is conceptualised through the lens of self-awareness and metacognition. Studying both self-awareness and metacognition is an extension of existing literature and will contribute to our knowledge about how these may relate to one another and their relation to autistic traits. A further extension of existing literature is the exploration of whether there are relationships between particular subdomains of autistic traits and self-awareness and metacognition. Previously, research has only considered autistic traits as an aggregated overall score in relation to these constructs rather than examining the role of specific subdomains.

5.1 Introduction

The classification of autism focuses on specific characteristics, yet when defining autism from its root syntax it is a form of "self-ism", whereby individuals are living in a world confined to the self because of social difficulties that are experienced (Duff & Flattery, 2014; Ford & McLean, 2023; Uddin, 2011). Consistent with the definition, the early accounts of autism by Kanner (1943) and Asperger (1944) suggest autistic individuals are egocentric (Lombardo et al., 2010). Despite the extreme self-focus that was originally proposed, the self has not been referred to in any of the diagnostic criteria. The egocentrism view is just one account. Through technological advances, an alternative view is that autistic individuals have self-referential cognitive processing difficulties (Uddin, 2011; Lombardo & Baron-Cohen, 2010; Lombardo et al., 2010). The difficulties relate to the processing of information

concerning the self (Ford & McLean, 2023) and typically refer to the cognitive distinction between the self and other (Grisdale et al., 2014; Lombardo et al., 2010) which can extend to difficulties in one's false beliefs, emotional awareness, such as alexithymia, and memories (Lombardo et al., 2010). Whilst it is acknowledged that self-referential difficulties may appear to be opposite to the original egocentric view, one idea is that egocentrism is a label for when individuals do not distinguish between self and other (Lombardo & Baron-Cohen, 2010). It is therefore possible that both egocentrism and self-referential cognitive processing can be associated with difficulties with the self, specifically the ability to distinguish the self from other (Lombardo et al., 2010). Lombardo et al. (2010) suggest social skills may have an impact on the ability to decode mental states of self and other, yet limited research has explored this. Exploring self-awareness through its subdomains has the potential to account for both a social and non-social construct which also distinguishes between self and other. Once our knowledge of the self is enhanced, the construct can be explored with an educational outcome in the final empirical chapter. Understanding the relationship with the self could identify potential changes at university level to benefit all students, regardless of whether they have a diagnosis or not.

The thesis aims to explore the relationship between autistic traits and the self, with the latter construct assessed through the construct of self-awareness or metacognition. Self-awareness is a state of self-directed attention (Fenigstein et al., 1975) that requires individuals to actively identify, process, and store information about the self (Morin, 2011). Within the construct, there is private self-awareness which refers to attending to one's inner thoughts and feelings, and public self-awareness which refers to an awareness of the self as a social entity that influences and is influenced by others (Fenigstein et al., 1975). A key distinction is private self-awareness focusing on thinking about the self while public focusing on the self in relation to others and how one might appear (Burns et al., 2019; Carden et al., 2022). Thus, assessing both constructs allows for a non-social construct (relating to the self) and a social construct (relating to others) which accounts for the social difficulties typically associated with autism.

The self can also be explored by assessing the extent to which individuals can represent their own mental states, also known as metacognition (Williams et al., 2016). Metacognition is broadly defined as the processes involved in thinking about thinking (Frith, 2012; Grainger et al., 2014). It can be assessed through a self-report questionnaire, the Metacognitions Questionnaire (MCQ), which assesses beliefs of one's metacognitive abilities and a more objective component of metacognition, metacognitive monitoring which explains

how we represent the occurrence of cognitive activity (Carpenter & Williams, 2023). The objective measure can also allow for the context to be assessed, with tasks being either social or non-social which has rarely been the focus within metacognitive literature. Exploring the context is consistent with the approach also taken for self-awareness to extend the idea that social difficulties may be contributing to difficulties distinguishing between the self and other.

With the reference to cognitive processes in both self-awareness and metacognition and with the latter construct seen as a way to assess self-awareness (Elmose and Happé, 2014), this study will therefore seek to understand the role of metacognition on the subdomains of self-awareness. Typically, research considers just one of these which means there is little known about the relationship between self-awareness and metacognition. The first aim of this study is to explore the relationship between self-awareness and metacognition. Exploring the relationship will develop our knowledge about whether awareness of one's cognitive processes (metacognition) relates to both awareness of the self (private) and others (public), or if the relationship might only be between constructs that specifically focus on the self.

The second aim is to explore the relationship between autistic traits (aggregate score and subdomains) and self-awareness (private and public subdomains). Beginning with private self-awareness in autistic adults, the first known study by Blackshaw et al. (2001) identifies autistic individuals self-report significantly more private self-awareness compared to the control group. However, more recent studies (Burns et al., 2019; Lombardo et al., 2007; Grisdale et al., 2014) have not replicated the finding. Lombardo et al. (2007) and Grisdale et al. (2014) used a diagnostic categorical approach and identified no difference in private self-awareness between autistic adults and a control group, suggesting autistic adults do not have difficulties with their private self-awareness. Lombardo et al. (2007) also collapsed their data to take an autistic traits perspective, who along with Burns et al. (2019) report no relationship between the overall level of autistic traits and private self-awareness, suggesting no direct association. There is consistency in the findings despite the inclusion of clinical and non-clinical participants in the study by Lombardo et al. (2007) and only clinical participants in the study by Burns et al. (2019). Thus, across both clinical and non-clinical populations overall level of autistic traits does not appear to relate to private self-awareness.

Research has focused less on public self-awareness in autistic adults. From a clinical approach, there is no reported difference in scores between autistic adults and a control group (Blackshaw et al., 2001), suggesting autistic adults do not have difficulties with public self-

awareness. It also seems that like private self-awareness, autistic traits in a clinical population do not relate to public self-awareness with Burns et al. (2019) reporting no relationship with the overall level of autistic traits. Alongside there being limited literature for public self-awareness from a clinical approach, a gap in the existing literature is public self-awareness from an autistic trait perspective in a non-clinical population.

Collectively, the literature suggests that there is no difference in self-awareness between autistic adults and a control group and there is no relationship between the overall level of autistic traits and either subdomain of self-awareness. These findings suggest there is a lack of support within existing literature for the historical view of egocentrism or self-referential difficulties in autistic individuals. However, the lack of relationship could be due to autism being considered from either a categorical perspective whereby a comparison is made with a non-autistic control group or because autistic traits are assessed only in terms of an overall level, without investigation of each subdomain. An alternative idea is that it might be specific subdomains of autistic traits that are independently related to self-awareness. Focusing on the subdomains is consistent with the idea proposed in section 2.2.4 that the construct of self-awareness can be understood in terms of its context, either social or non-social context. Private self-awareness refers to one's inner thoughts and feelings and is arguably non-social, whilst public self-awareness can be seen as more of a social construct as it refers to others. The subdomains of the three-factor AQ measure (social skills, details/patterns, and communication/mindreading) identified in Chapter 4 can also be viewed in terms of their context, with social skills and communication/mindreading seen as social and details/patterns as non-social. The two social subdomains will be discussed first (social skills and communication/mindreading) before the non-social (details/patterns) subdomain is reviewed.

Beginning with the social skills autistic trait subdomain, social difficulties are a trait seen in individuals with a high level of autistic traits in both clinical and non-clinical populations (Cassidy et al., 2020). These skills require engagement in reciprocal conversation (Wright et al., 2020) and the items included in the AQ measure typically refer to social interactions with others (e.g., "I am good at social chit-chat"). There is theoretical support for a positive relationship between the subdomain and public self-awareness; if individuals are rating the social skill subdomain higher it suggests awareness of difficulties in relation to others which would suggest awareness of their self as a social entity. Contributing to awareness of the self in relation to others could be the media, where autistic characteristics are often presented negatively with strengths rarely considered (Wright et al., 2020).

Awareness of these potentially negative views would support a positive relationship with public self-awareness because of a concern about the views that others have. As well as the possible relationship with public self-awareness due to the social nature, there could also be a positive relationship with private self-awareness because of the social difficulties influencing one's thinking. Difficulties with social skills can result in autistic individuals overlearning social rules and becoming rigid in their views on behaviour therefore suggesting they are privately self-aware (Blackshaw et al., 2001). If true, then social difficulties may be directly related to private self-awareness as well as public.

The communication/mindreading subdomain of the AQ measure relates to others (e.g., "people often tell me that I keep going on and on about the same thing"), which means like the social skills difficulties, if individuals are aware of the difficulties, then they might be more conscious of how they appear to others. However, the relationship between communication/mindreading with public self-awareness could also be negative because autistic traits are associated with difficulty understanding social communication (Cassidy et al., 2020) which can result in the misunderstanding of other people's attitudes toward themselves (Huang et al., 2017). Therefore, a lack of awareness of the views of others, because of communication difficulties, could limit one's ability to represent the self as a social entity that influences and is influenced by others.

For the non-social autistic trait subdomain of details/patterns, rigid behaviour also provides support for a positive relationship with private self-awareness. The potential link is supported by considering systemising, which is an autistic trait often perceived as a dimension of the male brain (Baron-Cohen et al. 2002). Systemising is defined as the drive to analyse or construct systems that follow rules and is a way to explain the non-social features of autism, such as narrow interests, repetitive behaviour, and resistance to change (Baron-Cohen, 2002; Baron-Cohen, Ashwin et al., 2009; Bury et al., 2020). Although limited, some research, such as that by Blackshaw et al. (2001) suggests that rigidity can mean individuals are privately self-aware. With theoretical support for all three of the autistic trait subdomains relating to an aspect of self-awareness, the second aim of this chapter is to explore the direct relationship between the autistic trait subdomains (social skills, communication/mindreading and details/patterns) and self-awareness subdomains (private and public).

An alternative way to explore the self, specifically awareness of thought processes is through the construct of metacognition. Beginning with the MCQ, a self-report questionnaire, two of the subdomains are of particular interest, cognitive confidence (lack of) and cognitive self-consciousness. A lack of cognitive confidence refers to confidence in memory, whilst

cognitive self-consciousness is the amount of attention paid to thoughts (Wells & Cartwright-Hatton, 2004). Grainger et al. (2014) is the only known study to use the self-report questionnaire to assess the beliefs of autistic adults, without comparing them to actual performance. Their results show that autistic adults have higher levels of cognitive self-consciousness (not consistent with the hypothesis) suggesting they feel they are more aware of their own thought processes compared to adults in the control group. There is no difference between the groups for lack of cognitive confidence. Overall, metacognitive difficulties were not identified, with potential increases in metacognitive ability instead.

However, when using metacognitive monitoring ability tasks which are seen as more objective, the superiority in monitoring has not been identified in either autistic children or autistic adults. For autistic children, there are mixed findings, with some reporting metacognitive difficulties (e.g., Grainger et al., 2016; Wilkinson et al., 2010; Williams et al., 2016) and others reporting no difficulties (e.g., Elmose & Happé, 2014; Maras et al., 2017). The studies focusing on autistic adults, therefore directly relevant to the thesis, will be discussed next.

Beginning with metacognitive difficulties, Wilkinson et al. (2010) used a facial recognition task (social context) and report subtle difficulties, whilst Nicholson et al. (2019) used a line and dot task (non-social) where participants had to respond within three seconds and report difficulties. However, Carpenter et al. (2019) did not impose time restrictions on a wagering task and reported no difficulties. Autistic adults may require additional processing time to reach the same level of cognitive processing as reported by the Dual Process Theory (Evans & Frankish, 2009). One study, by Sawyer et al. (2014), considered an emotional recognition task (social) and general knowledge (non-social) and also reported no difficulties in either task. Relying on images may not be representative of a real-world context though and results could be more pronounced if stimuli are more complex and representative of social interactions (Sawyer et al., 2014). To address the lack of real-world application, the social metacognitive monitoring measure for this study will focus on awareness of one's own behaviour from a social interaction.

When addressing autistic traits in non-clinical populations, metacognition has been assessed in terms of metacognitive monitoring ability. The findings are again mixed, despite the known studies focusing on a non-social context. Williams et al. (2016) report no association between the overall level of autistic traits and metacognitive monitoring ability, although a more recent study by Carpenter et al. (2019) found a negative association, as overall autistic traits score increases, metacognitive monitoring ability decreases. Similar to

the clinical literature above, a difference between these studies is that Williams et al. (2016) provided participants an unlimited time to respond. Thus, for non-clinical populations, difficulties might only be present when processing time is limited. Further exploration, particularly by removing processing time constraints in non-clinical populations and examining performance in both social and non-social contexts, are areas previously neglected and will shed further light on the link between autistic traits and metacognition. The third aim is to investigate the direct relationship between autistic traits, both the overall level and the subdomains, and metacognition. The final aim is exploratory due to there being no existing literature. Examining the specific subdomains of autistic traits rather than depending only on an aggregated overall score, would offer a more nuanced understanding of the relationship.

5.1.2 Summary of chapter aims

The first aim of this chapter is to explore the relationship between self-awareness and metacognition. The second aim is to explore the relationship between autistic traits (both aggregated score and subdomains) and self-awareness (private and public). The third aim is to explore the relationship between autistic traits (overall levels and subdomains) and metacognition (subdomains).

5.2 Method

5.2.1 Measures

The Autism Quotient (AQ), three-factor model (social skills, details/patterns, and communication/mindreading) was used to measure autistic traits. The self-consciousness scale revised (SCS-R) was used as a measure of self-awareness. The 22-item self-report scale assesses three subdomains: private self-awareness (9 items), public self-awareness (7 items), and social anxiety (6 items) (Fenigstein et al., 1975). Throughout the thesis only the private and public subdomains are used, with good internal consistency in the present sample for both the private ($\alpha = .74$) and public subdomains ($\alpha = .78$). The MCQ is a 30-item self-report questionnaire which was used to assess metacognitive beliefs, judgements, and tendencies (Wells & Cartwright-Hatton, 2004). Only the lack of cognitive confidence and cognitive self-consciousness subdomains were used, with good consistency in the present sample for both: lack of cognitive confidence ($\alpha = .87$) and cognitive self-consciousness ($\alpha = .91$). Metacognitive monitoring tasks, which were developed for the thesis, assessed metacognitive monitoring ability for both a social and non-social task. These measures were fully discussed

in the methodology chapter (section 3.6) as they have been used in multiple studies within the thesis.

5.2.2 Participants

The maximum sample size for this study (n=252) included participants from both stages one and two of the data collection who had full data sets for all self-report measures of autistic traits, self-awareness, and metacognition. All participants were aged between 18 – 25-years. For analysis of the metacognitive monitoring tasks, the sample size was reduced (n = 100; 80 females, 20 males), as the measure was only completed in stage two of the data collection.

5.2.3 Procedure

Identical to Chapter 4, participants from stages one and two of data collection completed a demographic questionnaire online assessing: age, gender, university course enrolled on, and if they have an autism diagnosis. All participants completed the measures assessing autistic traits, self-awareness, and metacognition as part of the battery of measures described in the methodology chapter (section 3.6). The autistic traits measure was completed online by all participants, however, the self-awareness and metacognition self-report measures were completed online in stage one data collection and in the psychology laboratory in stage two. Participants in the latter stage of data collection also completed the social and non-social metacognitive monitoring tasks.

Ethical approval for the current study was obtained as part of the ethical considerations discussed in the methodology chapter (section 3.5) for the entire project.

5.2.4 Analysis

Self-awareness was assessed via a self-report measure with a total score, sum of private and public, and subdomain scores calculated. Metacognition was measured through both a self-report questionnaire and objective metacognitive monitoring tasks. The self-report was measured by a total score, the sum of the subdomains, and subdomain scores (lack of cognitive confidence, positive beliefs about worry, cognitive self-consciousness, negative beliefs about uncontrollability, and the need to control thoughts). The metacognitive monitoring tasks were assessed by two subdomains (social and non-social), it was not

possible to have a total score as it is assessed by gamma scores which do not exceed the value of one.

Descriptive statistics for autistic traits, self-awareness, and metacognition are outlined first. The average scores are compared to the original studies to show how the restricted sample of university students aged between 18 – 25-years fairs. Only subdomain scores are assessed as the original studies did not report aggregated overall scores.

For both the social and non-social metacognitive monitoring tasks, gamma correlations were calculated for each participant to provide a JoC accuracy. These correlations were based on the participants' answers to an objective task and their corresponding confidence judgements about their performance on that task (Carpenter & Williams, 2023; Williams et al., 2016). Separate one-sample t-tests investigated whether JoC monitoring ability was significantly above chance (Grainger et al., 2014) for the social and non-social tasks.

For the first aim, Pearson's correlational analysis explored the association between self-awareness and metacognition, for both the overall scores and the subdomains. To address the second and third aims, Pearson's correlational analysis investigated the association between autistic traits and self-awareness, and between autistic traits and metacognition. For the analysis, the overall autistic trait score and autistic traits subdomain scores were assessed, although only the subdomain scores were assessed for self-awareness and metacognition.

5.3 Results

5.3.1 Descriptive statistics: autistic traits, self-awareness, and metacognition

The preliminary investigation, Chapter 4, identified that there was no gender difference for the AQ subdomain (see section 4.3.4.1), supporting females and males being studied collectively within the thesis. The descriptive statistics for autistic traits, self-awareness, and metacognition (overall scores and subdomain scores) are presented in Table 11. The average scores for autistic traits, self-awareness, and metacognition are compared to the original studies to show how the restricted sample of university students aged between 18 – 25-years fairs.

Table 11

Sample Descriptive Statistics for Autistic Traits, Self-Awareness, and Metacognition.

	Min	Max	Mean	SD
AQ - Total	27	90	58.35	10.92
AQ - Social skills	12	45	25.20	7.02
AQ - Details / Patterns	9	32	20.15	4.06
AQ - Communication / Mindreading	6	22	12.99	3.29
Self-awareness	7	47	30.63	7.30
Private self-awareness	5	26	16.04	4.61
Public self-awareness	0	21	14.59	4.05
MCQ - Total	35	110	66.85	14.73
MCQ - Lack of cognitive confidence	6	24	12.65	4.36
MCQ - Positive beliefs about worry	6	24	10.68	4.39
MCQ - Cognitive self-consciousness	6	24	16.23	4.43
MCQ - Negative beliefs about uncontrollability	6	22	14.08	5.26
MCQ - Need to control thoughts	5	26	13.21	3.50
Social metacognitive monitoring	-.1.00	1.00	.25	.52
Non-social metacognitive monitoring	-.32	.80	.22	.20

For the autistic traits, self-awareness, and the self-report metacognitive questionnaire, there is a comparison of the mean scores from the original study and values from the thesis in Table 12. When comparing the autistic traits subdomain scores to the original scores reported by Austin (2005) the social skills average was significantly higher than the average of 22.50 (*SD*=6.10) originally reported ($t(251)=6.12$, $p<.001$). Similarly, the details/patterns subdomain was also significantly higher than the average of 19.55 (*SD*=4.35) ($t(251)=2.36$, $p<.05$). However, the communication/mindreading score was not different from the average of 12.75 (*SD*=3.35) ($t(251)=1.17$, $p=.24$). These findings are not explained by the sample being predominately female (203 females) as in the original study by Austin (2005) males scored significantly higher in the first two subdomains compared to females, yet this predominately female sample had higher mean scores than the males alone. Although both samples were students, a key difference is the recruitment of only psychology students in the thesis, but Austin (2005) recruited from a broader range of courses.

For self-awareness, when comparing to the original measure by Scheier and Carver (1985), private self-awareness was not different from the average of 16.40 (*SD*=4.75) ($t(251)=-1.23$, $p=.22$). However, public self-awareness was significantly higher than the average of 13.85 (*SD*=4.45) ($t(251)=2.91$, $p<.01$) suggesting public self-awareness scores were higher within the sample of university students than the general population average.

For the self-report metacognitive questionnaire, the scores are significantly different from the non-autistic control group that was assessed by Grainger et al. (2014). The average score for the lack of cognitive confidence subdomain was significantly lower in this study compared to the average of 19.83 (*SD*=5.17) ($t(251)=-26.13$, $p<.001$) in a non-autistic control group. Similarly, the average score across participants for the cognitive self-consciousness subdomain was significantly lower than the average of 16.89 (*SD*=4.31) ($t(251)=-2.35$, $p<.05$) for a non-autistic control group. The metacognitive monitoring tasks (social and non-social) were developed for this study meaning no comparisons can be made.

Table 12

Comparing the Mean Values with the Original Papers.

	Original paper				
Subdomain	Author	Sample	Mean	Mean	Sig.
Social skills	Austin (2005)	Student (n=201)	22.50 (*SD*=6.10)	25.20 (*SD*=7.02)	Sig.
Details/ patterns	Austin (2005)	Student (n=201)	19.55 (*SD*=4.35)	20.15 (*SD*=4.06)	Sig.
Communication/ mindreading	Austin (2005)	Student (n=201)	12.75 (*SD*=3.35)	12.99 (*SD*=3.29)	Non
Private self-awareness	Scheier and Carver (1985)	Student (n=213)	16.40 (*SD*=4.75)	16.04 (*SD*=4.61)	Non
Public self-awareness	Scheier and Carver (1985)	Student (n=213)	13.85 (*SD*=4.45)	14.59 (*SD*=4.05)	Sig.
Cognitive confidence	Grainger et al. (2014)	Adult (n=18)	19.83 (*SD*=5.17)	12.65 (*SD*=4.36)	Sig.
Cognitive self-consciousness	Grainger et al. (2014)	Adult (n=18)	16.89 (*SD*=4.31)	16.23 (*SD*=4.43)	Sig.

5.3.2 Metacognitive monitoring ability for a social and non-social task

Judgement of Confidence (JoC) scores were calculated for each participant for both the social and non-social metacognitive monitoring tasks. Participants were highly accurate in the JoC rating for both the social and non-social tasks. Participants produced an average JoC gamma significantly above zero, for both the social ($t(97)=4.74$, $p<.001$) and non-social task ($t(97)=11.09$, $p<.001$). These results suggest JoC monitoring ability for both tasks.

5.3.3 Association between self-awareness and metacognition

Correlational analysis was used to address the first aim, exploring the relationship between self-awareness and metacognition (see Table 13). Beginning with the self-report

questionnaire for metacognition, there was a moderate positive relationship between the overall score for self-awareness and metacognition (r=.44, p<.001). For the subdomains of these constructs, there was a weak positive relationship between the metacognitive subdomain of a lack of cognitive confidence and public self-awareness (r=.17, p<.05), but no relationship for private self-awareness (r=.05 p=.44). For the metacognitive subdomain of cognitive self-consciousness there was a moderate positive relationship with private self-awareness (r=.58, p<001.) and a weak positive relationship with public self-awareness (r=.23, p<.001).

When assessing metacognitive monitoring, for the social context there was a weak negative correlation with overall self-awareness (r=-.28, p<.01). When considering the subdomains, there was a weak negative relationship with public self-awareness (r=-.28, p<.05), but no relationship with private self-awareness (r=-.18, p=.07). Metacognition monitoring for the non-social context did not correlate with overall self-awareness (r=.08 p=.45) or the private (r=.08, p=.43) and public subdomains (r=.05, p=.66) Thus, the relationship between self-awareness and metacognition seems dependent on the self-report metacognitive questionnaire.

5.3.4 Association between autistic traits and self-awareness

Correlational analysis was used to address the second aim, which was to explore the relationship between autistic traits (both aggregated score and subdomains) and self-awareness (private and public) (see Table 13).

Beginning with the subdomains, for private self-awareness, there was a weak positive relationship with the details/patterns subdomain (r=.22, p<.001). However, no significant relationship with either the social skills subdomain (r=.05, p=.47) or the communication/mindreading subdomain (r=.02, p=.79). For public self-awareness there was a weak positive relationship with the social skills subdomain (r=.14, p=<.05). However, no significant relationship with the details/patterns (r=.04, p=.54) or communication/mindreading subdomain (r=-.01, p=.90). A lack of correlations suggests that only specific subdomains of autistic traits are related with self-awareness.

For the aggregated overall score, the results indicated no relationship for either private (r=.12, p=.06) or public (r=.10, p=.10) self-awareness. In a non-clinical sample, there is no relationship between the overall level of autistic traits and either aspect of self-awareness

5.3.5 Association between autistic traits and metacognition

The third aim was to explore the relationship between autistic traits (overall levels and subdomains) and metacognition (subdomains), see Table 13 for correlational analysis. Beginning with the self-report metacognitive questionnaire, there was a weak positive relationship between the overall level of autistic traits and a lack of cognitive confidence (r=.32, p<.001) and cognitive self-consciousness (r=.15, p<.05) (see Table 13). However, when exploring the relationship with the autistic traits subdomains instead of an overall score there is a difference between the metacognitive subdomains. There was a weak positive relationship between a lack of cognitive confidence and all three subdomains, social skills, (r=.27, p<.001) details/patterns (r=.13, p<.05), and communication/mindreading(r=.31, p<.001). While for cognitive self-consciousness there was a weak positive relationship with the details/ patterns subdomain (r=.22, p<.001) but no relationship with social skills (r=.09, p=.15) or communication/mindreading (r=.03, p=.63).

For the metacognitive monitoring tasks, the overall level of autistic traits did not relate to either social (r=-.08, p=.41) or non-social metacognitive monitoring ability (r=-.06, p=.57). The lack of relationships was also true for the autistic traits subdomains. For the social metacognitive monitoring ability task there was no relationship with the social skills (r=-.07, p=.48), details/patterns (r=-.05, p=.60), or communication/mindreading subdomain (r=-.06, p=.57). Likewise, there was no relationship for the non-social metacognitive ability task with the social skills (r=-.02, p=.83), details/patterns (r=-.04, p=70.), or communication/mindreading subdomain (r=-.10, p=.34).

Table 13

Correlations Between Autistic Traits, Self-Awareness, and Metacognition.

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. AQ - Total	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2. AQ - Social Skills	.85***	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3. AQ - Details / Patterns	.65***	.24***	–	–	–	–	–	–	–	–	–	–	–	–	–
4. AQ - Communication / Mindreading	.71***	.40***	.39***	–	–	–	–	–	–	–	–	–	–	–	–
5. Self-awareness	.13*	.10	.16*	.01	–	–	–	–	–	–	–	–	–	–	–
6. Private self-awareness	.12	.05	.22***	.02	.86***	–	–	–	–	–	–	–	–	–	–
7. Public self-awareness	.10	.14*	.04	-.01	.82***	.42***	–	–	–	–	–	–	–	–	–
8. MCQ - Total	.45***	.35***	.34***	.34***	.44***	.38***	.37***	–	–	–	–	–	–	–	–
9. MCQ - Lack of cognitive confidence	.32***	.27***	.13*	.31***	.12	.05	.17**	.61***	–	–	–	–	–	–	–
10. MCQ - Positive beliefs about worry	.26***	.15*	.15*	.35***	.23***	.23***	.15*	.62***	.28***	–	–	–	–	–	–
11. MCQ - Cognitive self-consciousness	.15*	.09	.22***	.03	.49***	.58***	.23***	.63***	.13*	.24***	–	–	–	–	–
12. MCQ - Negative beliefs about uncontrollability	.37***	.31***	.30***	.18**	.40***	.25***	.43***	.79***	.32***	.29***	.42***	–	–	–	–
13. MCQ - Need to control thoughts	.44***	.36***	.32***	.29***	.20**	.14*	.20**	.69***	.32***	.28***	.29***	.52***	–	–	–
14. Social metacognitive monitoring	-.08	-.07	-.05	-.06	-.28**	-.18	-.28*	-.08	-.02	-.10	-.08	-.02	-.02	–	–
15. Non-social metacognitive monitoring	-.06	-.02	-.04	-.10	.08	.08	.05	-.08	.02	-.23*	-.01	.01	-.09	.08	–

*Note. *p < .05, **p < .01, ***p < .001.*

5.4 Discussion

This study explored how autistic traits relate to the self by assessing the constructs of self-awareness and metacognition. Exploring the relationships between these constructs alongside autistic traits in terms of both subdomains and absolute levels contributes to our knowledge surrounding whether a more nuanced approach is needed to understand how individual subdomains and trait profiles might be associated with related constructs of the self.

The first aim of the chapter was to explore the relationship between self-awareness and metacognition. In examining the overall constructs, there was a positive relationship observed, as self-awareness increased so too did metacognition. When assessing the subdomains of both constructs, cognitive self-consciousness correlated with both subdomains of self-awareness, although the effect size was moderate with private it was only weak for public. There was a weak correlation between a lack of cognitive confidence and public self-awareness, however no relationship with the private subdomain. Collectively, the findings develop our understanding by indicating that whilst there is an overlap between self-awareness and metacognition, the weak effect sizes suggest they are assessing different constructs. From the findings, a unique contribution is the recommendation that the constructs should be explored separately.

The second aim was to explore the relationship between the autistic traits (both aggregated score and subdomains) subdomains and self-awareness (private and public subdomains). Beginning with the autistic traits subdomains, the results indicated there was a positive relationship between the social skills subdomain of autistic traits and public self-awareness, albeit weak. There was also a weak positive association between the details/patterns subdomain and private self-awareness. It is important to note that although these relationships are weak, there is theoretical support.

The positive relationship between the social skills subdomain and public self-awareness suggests that being aware of social skills difficulties also meant individuals were aware of themselves as a social entity that influences and is influenced by others. A similarity between the autistic trait subdomain and public self-awareness is that they are inherently social and involve the other. In terms of the relationship being positive, it is important to note that the autistic trait subdomain focuses on difficulties. Therefore, it is possible that if an individual is aware of their difficulties, then they may also be aware of how these traits are

perceived in society, which due to the diagnostic criteria characterising autism in terms of difficulties (Wright et al., 2020) is often negative. Being aware is consistent with the concept of masking, whereby autistic individuals use techniques to appear more socially competent and try to prevent others from seeing their difficulties (Hull et al., 2017; Lai et al., 2016). Whilst masking was not assessed in this study, the findings raise the question as to other possible relationships that are specific to an education context.

In terms of the significant relationship between the details/patterns subdomain of autistic traits and private self-awareness, theoretical insights presented in section 5.1 propose that attention to detail could be linked with a systemising cognitive style that predisposes individuals to follow rules and have increased private self-awareness. However, systemising itself was not assessed in this study and therefore the explanation remains speculative and needs to be specifically addressed in future research.

For the communication/mindreading subdomain, there was no association with either private or public self-awareness. A lack of relationship with private self-awareness is not surprising as none of the items in the factor relate to own thoughts or feelings. However, a lack of relationship with public self-awareness is not consistent with the idea that autistic traits can result in the misunderstanding of other people's attitudes toward themselves (Huang et al., 2017). Although both subdomains relate to others, the items for the autistic trait subdomain are from different subdomains from the original AQ measure (e.g., "other people frequently tell me what I've said is impolite, even though I think it is polite" from the communication subdomain and "when I'm reading a story, I find it difficult to work out the characters' intentions" from the imagination subdomain). Thus, while Chapter 4 suggested that a three-factor model might more suitably represent the broader subdomains within a non-clinical sample, the current analysis suggests this may not be the case across all subdomains when exploring the relationship with self-awareness. Furthermore, the findings could also be a result of not all the items directly referring to others (e.g., "I am often the last to understand the point of a joke").

The second aim also explored the relationship between autistic traits (aggregate score) and self-awareness (subdomains). There was no relationship reported, which is consistent with existing autism research taking a trait approach for private (Burns et al., 2019; Lombardo et al., 2007) and public self-awareness (Burns et al., 2019). The awareness for both subdomains means the findings do not appear to support self-referential difficulties in autism in terms of distinguishing between self and other (Lombardo & Baron-Cohen, 2010).

Overall, the findings indicate that autistic traits in a non-clinical population are associated with an increase in self-knowledge, although only for two of the three autistic trait subdomains. Interestingly, specific to the sample, scores for the social skills subdomain and details/pattern were significantly higher compared to the average reported by Austin (2005) and it was these subdomains that related to self-awareness. Higher scores may be needed in a non-clinical population for there to be a relationship with self-awareness. In terms of the scores being higher in this sample, it could be due to the sample only consisting of psychology students. Whilst under-studied, and typically concerning mental health, it is suggested that individuals might have a better understanding of themselves through their academic knowledge (Punton et al., 2022). The two relationships that exist also support the role of the context, with social skills and public self-awareness both being social and details/patterns and private self-awareness both being non-social. In terms of theories associated with autism, the increased self-awareness suggests individuals with autistic traits may have extreme self-focus as there is greater attention being paid to thoughts and feelings and also the self as a social entity. This is partially consistent with the historical view that autistic individuals are egocentric (Lombardo et al., 2010) as individuals are paying more attention to the self. Whilst there is greater attention to the self, there is a lack of evidence to suggest that it may be due to individuals having difficulties distinguishing the self from other. The positive relationship between the social skills subdomain and public self-awareness suggests individuals are aware of others and therefore potentially able to differentiate between self and other, which means in a non-clinical population there may not be self-referential difficulties. To our knowledge, the current study is the first to explore the association between the subdomains of autistic traits and self-awareness.

The third, and final, aim was to explore the relationship between autistic traits (overall levels and subdomain scores) and metacognition. The results show a difference when metacognition is measured through a self-report questionnaire compared to an objective metacognitive monitoring task. Focusing on the self-report questionnaire first, a lack of cognitive confidence and cognitive self-consciousness, correlated with overall levels of autistic traits, although both of the effect sizes were weak. When focusing on the subdomains of autistic traits, a lack of cognitive confidence correlated with all the autistic trait subdomains, again with weak effect sizes. However, cognitive self-consciousness only correlated with the details/patterns subdomain. Whilst the effect size for the relationship was also weak, the results suggest that cognitive self-consciousness, which relates directly to the self is somewhat related to a non-social aspect of autistic traits in this sample. This is a

unique finding within this study. When comparing these findings to the earlier study by Grainger et al. (2014) which focused on autism, there is an element of agreement for the cognitive self-consciousness subdomain; Grainger et al. (2014) reported that autistic adults believed they were superior at monitoring their thoughts compared to the control group and there was a positive relationship with autistic traits in this study. The findings for a lack of cognitive confidence scores differ, which suggests that although confidence was not affected in the clinical literature, for a non-clinical sample, as autistic traits increased there was reduced confidence. Although the effect size was weak, there is theoretical support to support the difference between clinical and non-clinical populations. For instance, accepting an autistic identity involves individuals being aware of their differences from others and developing an understanding of themselves, both of which were identified as an important way to improve one's well-being (Cooper et al., 2021). It is therefore possible that acceptance creates a difference between clinical and non-clinical populations for the relationship with confidence. The difference highlights why clinical and non-clinical populations should be explored separately within research.

Focusing on the objective metacognitive monitoring task which distinguished between a social and non-social context, there was no relationship with the overall level of autistic traits or the autistic traits subdomains for either the social or non-social task. No relationship is consistent with existing autism literature which has taken a clinical approach (Carpenter et al., 2019; Elmose & Happé, 2014; Sawyer et al., 2014) and autistic traits literature in non-clinical populations (Embon et al., 2023; Williams et al., 2016), thus highlighting that the use of real-world behaviour and not relying on static images did not affect the results. These results may be reflective of the restricted sample sizes, as suggested in the two clinical studies which have considered both a social and non-social context. Elmose and Happé (2014) had a sample size of 24 autistic children and 21 in the control group and suggested larger groups might have allowed group differences. With no relationship identified with autistic traits, the measure will not be included in the indirect models assessed in the subsequent chapters. Concerning the third aim, the findings suggest that when assessing metacognition via a self-report questionnaire there is a relationship with autistic traits, however, the relationship is not evident for an objective metacognitive monitoring task.

In summary, the findings suggest that whilst there is an overlap between self-awareness and metacognition, they are assessing different constructs. This supports the exploration of both constructs in subsequent studies. Another key finding, and an area for

further exploration, is that although there was no relationship between autistic traits and self-awareness when they were assessed by their aggregate scores, there was a relationship when assessing both constructs through the subdomains. These weak relationships will guide the focus of the next chapter in terms of identifying whether there is a mediating variable for the relationship between autistic traits and self-awareness. Having identified self-awareness and metacognition are related, and existing literature suggesting self-awareness might be a metacognitive process itself (Lou, 2015; Zlotnik & Toglia, 2018) the next chapter will identify whether metacognition is an important factor for the relationship between autistic traits and self-awareness for a model focusing on constructs specific to the self (non-social) and a model which also includes others (social).

Chapter 6: Exploring the relationship between autistic traits and self-awareness in a non-social and social context

The previous chapter focused on autistic traits and the self. No direct relationships were found between the overall level of autistic traits and levels of private or public self-awareness. However, a closer examination of autistic trait subdomains revealed some direct relationships with self-awareness, albeit weak. Supporting the idea that metacognition may be related to self-awareness (Lou, 2015) relationships were identified between these constructs as well as autistic traits. Thus, this chapter aims to identify if metacognition is an important underlying process in the relationship between autistic traits and self-awareness.

The current chapter is exploratory in nature due to limited literature and, to our knowledge, is the first study to bring together the constructs of self-awareness and metacognition in terms of a possible mediating role. The chapter will begin by reviewing findings from the previous chapter, along with broader theoretical insights that support the exploration of two potential mediation models, a non-social model focusing on constructs specific to the self and a social model that includes constructs referring to the self and others.

6.1 Introduction

6.1.1 Self-awareness and metacognition

Self-awareness and metacognition are rarely studied together, as outlined in section 2.2.3, however, it is plausible to argue that self-awareness could be related to metacognition (Lou, 2015), which focuses on awareness of one's mind (Grainger et al., 2014). Metacognition is broadly referred to as the processes involved in thinking about thinking (Frith, 2012; Grainger et al., 2014) and is defined as a cognitive process (Carpenter & Williams, 2023). These constructs may be related, self-awareness might be a metacognitive process itself requiring cognitive ability (Lou, 2015; Zlotnik & Toglia, 2018). Extending the idea further, DeMink-Carthew et al. (2020) propose that metacognition involves a process where individuals engage in reflection on their thought processes, an ability that naturally extends to incorporate self-awareness. However, despite the plausible connection, there is limited research investigating these constructs and the potential relationship that may exist between them. The current chapter aims to address the gap in existing research.

Chapter 5 revealed no direct relationship between the overall levels of autistic traits and the subdomains of self-awareness within a non-clinical sample, a finding that is

consistent with existing clinical literature adopting a continuum approach (e.g., Burns et al., 2019; Lombardo et al., 2007). As an extension of existing literature, the previous chapter examined the autistic traits subdomains to determine if specific factors could be influencing the relationship. Notably, a positive relationship was found between the social skills subdomain and public self-awareness, as well as between the details/patterns subdomain and private self-awareness. In both instances, an increase in the specific autistic trait subdomain corresponded with a rise in the related self-awareness subdomain. Despite a direct association, both correlations were weak. Thus, this chapter aims to identify whether the pathway between the two variables is statistically mediated by a third variable.

The focus is on metacognition, which assesses knowledge of the self by concentrating on cognitive processes (Grainger et al., 2014) and is believed to be linked somewhat to self-awareness. As already identified, these constructs have rarely been studied together which means the relationship is not known. The construct is measured via the self-report questionnaire, focusing on two subdomains, a lack of cognitive confidence and cognitive self-consciousness. The approach is consistent with Grainger et al. (2014) who focused on a clinical sample. The subdomains included specifically address thought processes, distinguishing them from the others which are concerned with worrying and negative thoughts. Since the study by Grainger et al. (2014) no subsequent autism research has been published that uses the self-report measure (Campbell et al., 2018).

This chapter will begin by reviewing the relationship between autistic traits, self-awareness, and metacognition in a non-social context. Section 6.1.3 will then assess a social model and propose anxiety as a mediating variable rather than metacognition.

6.1.2 Exploring the relationships for the non-social model

When analysing the results from the previous chapter for a direct association between metacognition and the details/patterns subdomain and private self-awareness, distinct differences emerge between the metacognitive subdomains. The cognitive self-consciousness metacognitive subdomain showed a positive correlation with both the details/patterns subdomain (weak correlation) and private self-awareness (moderate correlation). In contrast, a lack of cognitive confidence was only weakly associated with the details/patterns subdomain and showed no relationship to private self-awareness. A discrepancy in the metacognitive subdomains could be explained by the lack of cognitive confidence subdomain focusing on memory-related concerns (e.g., “I do not trust my memory” and “I have little

confidence in my memory for actions"), which is a much narrower concept compared to the broader scope of private self-awareness which encompasses attentiveness to one's thoughts and feelings. As the cognitive self-consciousness subdomain correlated with both an autistic trait and self-awareness it will be the metacognitive focus in this study.

In addition to the findings from Chapter 5 supporting this study, there is also theoretical support. By definition, cognitive self-consciousness refers to the active monitoring of one's thoughts, while private self-awareness is characterised by attention to one's internal thoughts and feelings. Both make specific reference to cognitive awareness of thoughts and therefore it seems reasonable to predict that cognitive self-consciousness, as a form of thought monitoring, plays a crucial role in the mechanism of private self-awareness. This proposition supports the idea that self-awareness might require a specific cognitive capacity (Lou, 2015; Zlotnik & Toglia, 2018). The link to cognitive ability is also relevant for the details/patterns subdomain which can be seen as a processing bias or cognitive style (Happé and Frith, 2006). A partial overlap between the constructs supports the idea of a possible relationship.

When exploring the possible relationship between autistic traits, self-awareness, and metacognition, it is important to return to the study by Austin (2005) which introduced the three-factor AQ model (social skills, details/patterns, and communication/mindreading). As well as proposing an alternative model, Austin also investigated the association between autistic traits and personality traits and revealed a positive association between paying attention to details and conscientiousness. The personality trait is a broad term comprising several aspects (Austin, 2005) many of which require attention to one's thought processes, such as organisation, thoroughness, self-discipline, and goal-directed behaviour (Lewis & Cardwell, 2020). With Austin (2005) identifying a relationship between the details/patterns subdomain and a personality trait that refers to thought processes, it means there is theoretical support for the autistic trait subdomain to positively relate with both cognitive self-consciousness and private self-awareness as these also refer to thought processes. Furthermore, there is support for a potential relationship between the autistic trait subdomain and private self-awareness by considering systemising, which is the drive to analyse or construct systems that follow rules (Baron-Cohen, 2002; Baron-Cohen, Ashwin et al., 2009). Systemising is believed to relate to excellent attention to detail (e.g., Bury et al., 2020) with Blackshaw et al. (2001) suggesting private self-awareness may be enhanced as rigidity could be guiding behaviour.

The exploration of the potential indirect relationship gains further support when considering the similarity across these variables - they are non-social in nature and specifically focus on the self rather than on others. The details/patterns subdomain is the only factor to focus on non-social autistic traits (e.g., “I notice patterns in things all the time”). Similarly, both cognitive self-consciousness and private self-awareness concern the individual’s own views and internal thought processes about the self. The shared emphasis on self-observation rather than the ability to distinguish the self from other (Lombardo et al., 2010) could contribute to the relationship. Therefore, within the constructs, there is a specific link to the self rather than others. The social model will be reviewed next.

6.1.3 Exploring the relationships for the social model

When analysing the results from the previous chapter for a direct association between social skills and public self-awareness there was a positive relationship, although the effect size was weak. The aim of this chapter is to explore the relationship through a mediating factor, concentrating on metacognition to extend research into the pathway between self-awareness and metacognition. Chapter 5 identified that when exploring the autistic trait subdomain in relation to the metacognitive subdomains of cognitive confidence and cognitive self-consciousness there was only a weak positive relationship with cognitive confidence. Whilst for public self-awareness, there was only a moderate positive relationship with cognitive self-consciousness. As the autistic trait and self-awareness subdomains were associated with different metacognitive subdomains there is no support from the last chapter that one of these factors mediates the pathway between autistic traits and self-awareness.

However, this exploratory study can also investigate the remaining metacognitive subdomains which were included in the last chapter so that a total metacognitive score could be computed. A positive relationship was found between public self-awareness and the negative beliefs about uncontrollability metacognitive subdomain. The metacognitive subdomain refers to worrying (e.g., “when I start worrying I cannot stop” and “I could make myself sick with worrying”). There was also a positive relationship with the social skills subdomain. The metacognitive subdomain has not been empirically tested with autistic traits, although the items refer to anxiety and there is evidence to suggest a possible relationship between the metacognitive subdomain and anxiety. Nordahl et al. (2019) propose that the metacognitive subdomain is a possible cause and consequence of trait anxiety in a non-clinical adult sample and when exploring the possible relationship, Campbell et al.’s. (2018)

investigation revealed a positive relationship between the metacognitive subdomain and anxiety in autistic children. Anxiety will be an alternative measure to the negative beliefs about uncontrollability metacognitive subdomain to explore a possible indirect relationship between social skills and public self-awareness.

Anxiety is a known property of autistic traits and is also one of the most common comorbidities of autism (Anderson, 2020; Dickter et al., 2018). Existing literature has commonly reported a positive association with autistic traits in university students from non-clinical populations (Cassidy et al., 2020; Krumm et al., 2017; Kunihira et al., 2006). Therefore, as autistic traits increase, so too do traits for anxiety. Despite being a robust finding, the studies used the overall level of autistic traits, rather than considering the subdomains, but as Chapter 5 identified, the trait profiles can be important for the relationship and this may also be true for anxiety. Thus, taking a subdomain approach is novel within the thesis.

There is theoretical support for the possible relationship between the social skills subdomain, anxiety, and public self-awareness. Being aware of social difficulties could contribute to autistic children being more vulnerable to symptoms of anxiety (Mazurek & Kanne, 2010). Furthermore, anxiety appears to involve awareness of others. First, the autistic trait subdomain focuses on skills that often require engagement in reciprocal conversation in social interactions (Wright et al., 2020) (e.g., "I am good at social chit-chat" and "I frequently find that I don't know how to keep a conversation going"). Whilst these refer to the skills of the individual, they also relate to how successful interactions are with others. Second, trait anxiety refers to how one generally feels and whilst not explicitly referring to others, there is a link as many feelings for some of the items on the measure stem from comparing oneself to others (e.g., "I feel like a failure" and "I feel inadequate"). Focusing on some of the items supports the idea that anxiety requires an awareness of the self and how one is viewed by others (Mazurek & Kanne, 2010).

It is possible that the relationship between the autistic trait subdomain and anxiety might be bi-directional, with anxiety and social isolation reducing one's self-beliefs in their social abilities (Huggins et al., 2021). Anxiety can increase social difficulties, for example, when an autistic person becomes anxious they might experience increased repetitive questions, slowness, ritualising, social blunders, and aggression (Tantam, 2003). It therefore seems reasonable to hypothesise that individuals may be more self-aware about how they appear to others in a social context.

The supportive evidence means it is reasonable to predict that the relationship between the social skills subdomain and public self-awareness will be mediated by anxiety. Exploring this gap in the literature has the potential to develop our knowledge surrounding whether the relationship between autistic traits and self-awareness is context-dependent. Following the identification of a non-social and social model, there will now be a brief review of the possible contributions of these models, before a summary of the chapter's aim.

6.1.4 Reviewing the contributions of a non-social and social model

Through the exploration of two models, one with social constructs and the other with non-social constructs, this study has the potential to contribute to our understanding of the self in relation to non-social and social autistic traits and related aspects of self-awareness. There are wider implications in terms of understanding whether the relationship might be context-dependent.

6.1.5 Summary of chapter aim

The aim of this study is to explore two models that test the relationship between autistic traits subdomains and self-awareness subdomains through mediating factors. The first model tests the role of cognitive self-consciousness as a potential mediator in the association between the details/patterns subdomain and private self-awareness. The second model tests the role of trait anxiety as a potential mediator of the association between the social skills subdomain and public self-awareness.

6.2 Method

6.2.1 Measures

The Autism Quotient (AQ), three-factor model (social skills, details/patterns, and communication/mindreading) was used to assess autistic traits. The first mediation analysis included the details/patterns and the second model included social skills (difficulties). The self-consciousness scale revised (SCS-R) is a 22-item self-report scale assessing three subdomains: private self-awareness (9 items), public self-awareness (7 items), and social anxiety (6 items) (Fenigstein et al., 1975). It was used as a measure of self-awareness, with the private subdomain included in the non-social model and the public in the social model in the current study. Internal consistency for the present sample was good for private ($\alpha = .74$) and public self-awareness ($\alpha = .78$). The Metacognitions Questionnaire (MCQ) is a 30-item

self-report questionnaire that was used to assess metacognitive beliefs, judgements, and tendencies (Wells & Cartwright-Hatton, 2004). Only the cognitive self-consciousness subdomain was used in the non-social model, with a higher score indicating increased attention to one's thoughts (Grainger et al. 2014). Internal consistency for the subdomain in the present sample was high (α = .91). Finally, the trait anxiety is a 20-item self-report questionnaire (Spielberger et al., 1970), from the STAI, with good internal consistency in the present sample (α = .93). The anxiety subdomain was included in the social mediation analysis. These measures were fully discussed in the methodology chapter (section 3.6) as they have been used in multiple studies within the thesis.

6.2.2 Participants

The sample size for this study was the same as in Chapter 5, n = 252, including participants who completed self-report measures from both stages one and two of the data collection. All participants were aged between 18 – 25-years (203 females, 48 males, and 1 other who did not specify their gender).

6.2.3 Procedure

Like Chapters 4 and 5, data was used from stages one and two of data collection. All participants completed a demographic questionnaire online assessing: age, gender, university course enrolled on, and whether they have an autism diagnosis. Participants completed the measures assessing autistic traits, self-awareness, and metacognition as part of the battery of measures described in the methodology chapter (section 3.6). The autistic traits measure was completed online by participants, irrespective of the data collection stage, however, the self-awareness and metacognition measures were completed online in stage one data collection and in the psychology laboratory in stage two.

For the current study, ethical approval was obtained as part of the ethical considerations discussed in the methodology chapter (section 3.5) for the entire project.

6.2.4 Analysis

Descriptive statistics and regression analysis were performed for both the non-social and social models. The average scores are compared to the original studies to show how the restricted sample of university students aged between 18 – 25-years fairs. The descriptive statistics included correlations which were computed to assess the zero-order relationships

between the variables. Based on these results, regression analysis was performed. For both the non-social and social models, three simple regression analyses were performed to assess the relations between the variables, the first being between *x* and *y*, the second between *x* and *m,* and the third between *m* and *y* (see Figure 3, a). For each model, one multiple linear regression was performed to evaluate the relations between *x* and *m* on *y* (see Figure 3, b). These were run to ensure assumptions were met and to create the mediation models.

Two mediation models were used to examine whether there was a mediated relationship between autistic traits and self-awareness. For the non-social model, cognitive self-consciousness was the mediator, and for the social model, the mediator was trait anxiety. They were conducted using model 4 of the PROCESS macro version 3 for SPSS. The PROCESS macro estimates direct and indirect effects based on percentile-based 5000 bootstrapped 95% confidence intervals (CI). A CI that does not include 0 reflects a significant result.

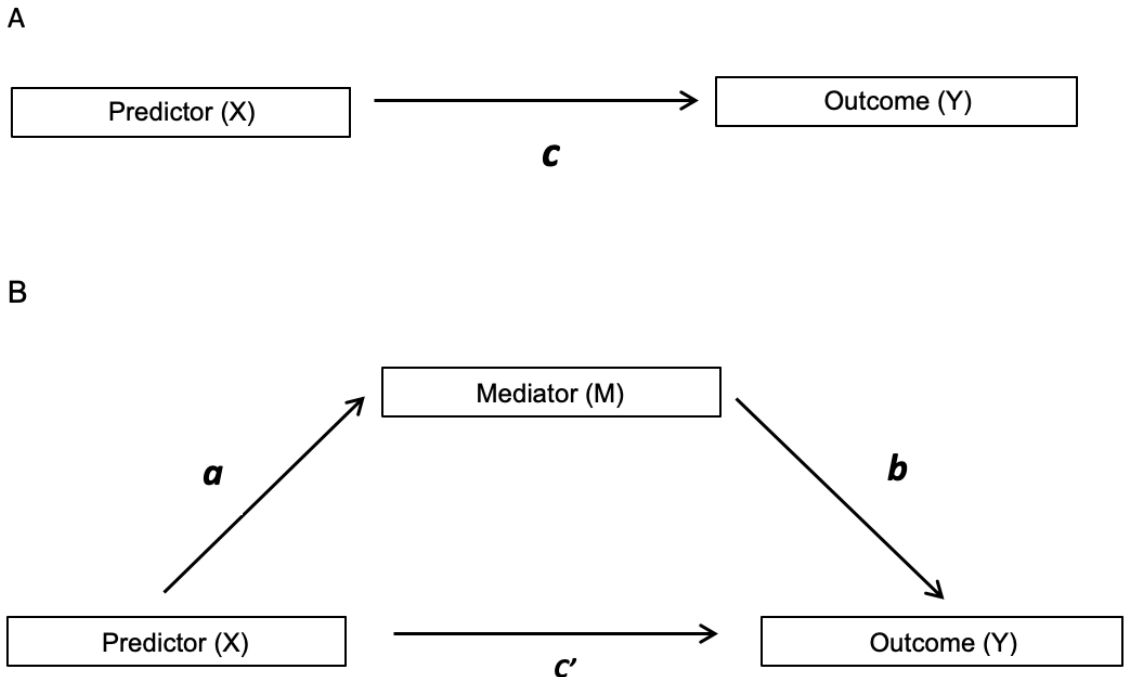

Figure 3

A. Illustration of Direct Effect. B. Illustration of Mediation Design.

6.3 Results

6.3.1 Descriptive statistics and regression analysis for the non-social model

The details/patterns subdomain was significantly higher than the original score of 19.55 (*SD*=4.35) reported by Austin (2005) ($t(251)=2.36$, $p<.05$). While the cognitive self-

consciousness metacognitive subdomain was significantly lower than the average of 16.89 (*SD*=4.31) reported by Grainger et al. (2014) ($t(251)=-2.35$, $p<.05$). However, there was no significant difference when comparing private self-awareness with the score of 16.40 (*SD*=4.75) originally reported by Scheier and Carver (1985) ($t(251)=-1.23$, $p=.22$).

Table 14

Comparing the Mean Values with the Original Papers.

	Original paper				
Subdomain	Author	Sample	Mean	Mean	Sig.
Details/ patterns	Austin (2005)	Student (n=201)	19.55 (*SD*=4.35)	20.15 (*SD*=4.06)	Sig.
Private self-awareness	Scheier and Carver (1985)	Student (n=213)	16.40 (*SD*=4.75)	16.04 (*SD*=4.61)	Non
Cognitive self-consciousness	Grainger et al. (2014)	Adult (n=18)	16.89 (*SD*=4.31)	16.23 (*SD*=4.43)	Sig.

The descriptive statistics and correlations for the details/patterns subdomain, private self-awareness, and the cognitive self-consciousness metacognitive subdomain are presented in Table 15. The correlations demonstrate that whilst all three variables are related, these are not strong correlations suggesting multicollinearity was not a significant concern.

Table 15

Sample Descriptive Statistics and Correlations for Details/Patterns Autistic Trait Subdomain, Private Self-Awareness, and the Cognitive Self-Consciousness.

	Min	Max	Mean	SD	1	2	3
1. AQ – Details/patterns	9	32	20.15	4.06	–	–	–
2. Private self-awareness	5	26	16.04	4.61	.22***	–	–
3. MCQ - Cognitive self-consciousness	6	24	16.23	4.43	.22***	.58***	–

*Note. *p < .05, **p < .01, ***p < .001.*

The mediation model can be broken down into three simple regressions and one multiple regression where the assumptions must be met.

The first simple regression analysis was conducted using the details/patterns subdomain as the predictor and private self-awareness as the dependent variable ($R^2=.05$,

$F(1,250)=12.92$, $p<.001$) (path c). The next regression was the details/patterns subdomain as the predictor and cognitive self-consciousness as the mediator ($R^2=.05$, $F(1,250)=13.11$, $p<.001$) (path a). The third simple regression model was cognitive self-consciousness as the mediator and private self-awareness as the dependent variable ($R^2=.33$, $F(1,250)=123.97$, $p<.001$) (path b). Finally, for the multiple regression, the details/patterns subdomain and cognitive self-consciousness were the predictors and private self-awareness was the dependent variable ($R^2=.34$, $F(2,249)=64.32$, $p<.001$). The assumptions that need to be met are linearity, homoscedasticity, normality of estimation error, and independence of observations. All four P-P plots show normality of estimation error, with data fitting well with the diagonal line. The scatterplots of standardised predicted values demonstrate homoscedasticity. For each of the four models, the scatterplots indicate a linear relationship, with the Loess curve centre close to zero along the entire x-axis (Kane & Ashbaugh, 2017). The data also met the assumption of collinearity indicating that multicollinearity was not a concern (Cognitive self-consciousness, *Tolerance* = .95, *VIF* = 1.05; Details/patterns subdomain, *Tolerance* = .95, *VIF* = 1.05).

6.3.2 Descriptive statistics and regression analysis for the social model

The social skills score was significantly higher than the average of 22.50 (SD=7.02) originally reported by Austin (2005) ($t(251)=6.12$, $p<.001$). The public self-awareness score was also significantly higher than the score of 13.85 (SD=4.45) initially reported by Scheier and Carver (1985) ($t(251)=2.91$, $p<.01$). Finally, the trait anxiety score was also significantly higher than the average of 41.31 (SD=3.14) from a recent publication by South et al. (2022) who also recruited a non-clinical university sample with their study ($t(251)=10.57$, $p<.001$). However, they only recruited participants scoring high or low levels of both autistic traits and trait anxiety with no specification of degree course.

Table 16

Comparing the Mean Values with the Original Papers and Existing Literature.

	Original paper				
Subdomain	Author	Sample	Mean	Mean	Sig.
Social skills	Austin (2005)	Student (n=201)	22.50 (*SD*=6.10)	25.20 (*SD*=7.02)	Sig.
Public self-awareness	Scheier and Carver (1985)	Student (n=213)	13.85 (*SD*=4.45)	14.59 (*SD*=4.05)	Sig.
Trait anxiety	South et al. (2022)	Student (n=89)	41.31 (*SD*=3.14)	48.72 (*SD*=11.13)	Sig.

The descriptive statistics and correlations for the social skills subdomain, public self-awareness, and trait anxiety are presented in Table 17. The correlations show that whilst the variables are related, the fact that they are not strong correlations supports multicollinearity not being a concern.

Table 17

Sample Descriptive Statistics and Correlations for Social Skills Autistic Trait Subdomain, Public Self-Awareness and Trait Anxiety.

	Min	Max	Mean	SD	1	2	3
1. AQ – Social skills	12	45	25.20	7.02	–	–	–
2. Public self-awareness	0	21	14.59	4.05	.14*	–	–
3. Trait anxiety	20	80	48.72	11.13	.44***	.14*	–

*Note. *p < .05, **p < .01, ***p < .001.*

The first simple regression for the social model was conducted using the social skills subdomain as the predictor and public self-awareness as the dependent variable (R^2=.02, $F(1,250)=5.20$, $p<.05$) (path c). The next regression was the social skills subdomain as the predictor and trait anxiety was the mediator (R^2=.19, $F(1,250)=58.20$, $p<.001$) (path a). The next model was trait anxiety as the mediator and public self-awareness as the dependent variable (R^2=.18, $F(1,250)=52.92$, $p<.001$) (path b). Finally, the social skills subdomain and trait anxiety were the predictors and public self-awareness was the dependent variable (R^2=.17, $F(2,249)=26.70$, $p<.001$). In relation to the assumptions, all four P-P plots show normality of estimation error, with data fitting well with the diagonal line. For the four

models, the scatterplots indicate a linear relationship and demonstrate homoscedasticity. The assumption of collinearity was met indicating that multicollinearity was not a concern (Trait anxiety, *Tolerance* = .81, *VIF* = 1.23; Social skills autistic trait subdomain, *Tolerance* = .81, *VIF* = 1.23).

6.3.3 Final mediation models

For the non-social model, the path (direct effect) from the details/patterns subdomain to cognitive self-consciousness was positive and significant (b=.24, s.e=.07, *p*=.01) indicating that individuals with a high level of attention to details/patterns were likely to report a greater tendency to focus attention on thoughts. The direct effect of cognitive self-consciousness on private self-awareness was positive and significant (b=.58, s.e=.06, *p*<.001), indicating an increase in the monitoring of one's thoughts was related to an increase in the attendance of one's inner thoughts and feelings. The statistical mediation was also significant (IE=.14, 95% CI [.05, .23]), suggesting that the relationship between paying attention to details/patterns and private self-awareness is mediated by cognitive self-consciousness (see Figure 4).

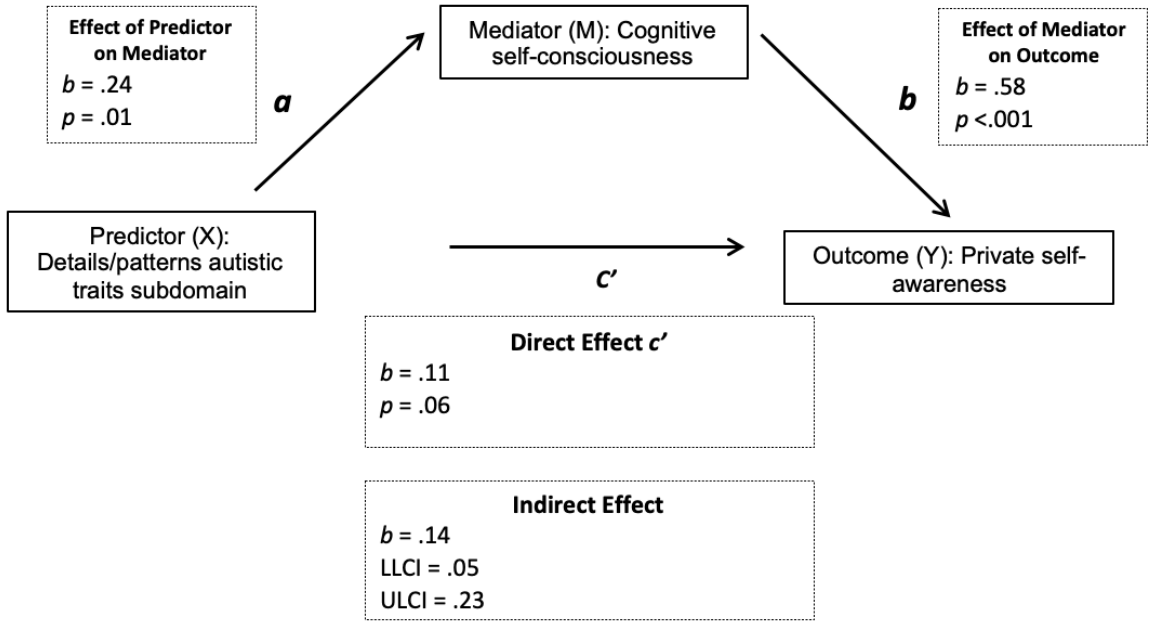

Figure 4

The Relationship Between the Details/Patterns Autistic Trait Subdomain, Private Self-Awareness, and Cognitive Self-Consciousness.

For the social model, the path (direct effect) from the social skills subdomain to anxiety was positive and significant (b=.69, s.e=.09, *p*<.001) indicating that individuals with a high

level of social skills difficulties were likely to report a greater tendency to experience anxiety. The direct effect of trait anxiety on public self-awareness was positive and significant (b=.16, s.e=.02, p<.001), indicating an increase in trait anxiety was related to an increase in the awareness of the self as a social entity that influences others. The statistical mediation was significant (IE=.11, 95% CI [.07, .16]), suggesting that the relationship between the autistic trait of social skills difficulties and public self-awareness is statistically mediated by trait anxiety (see Figure 5).

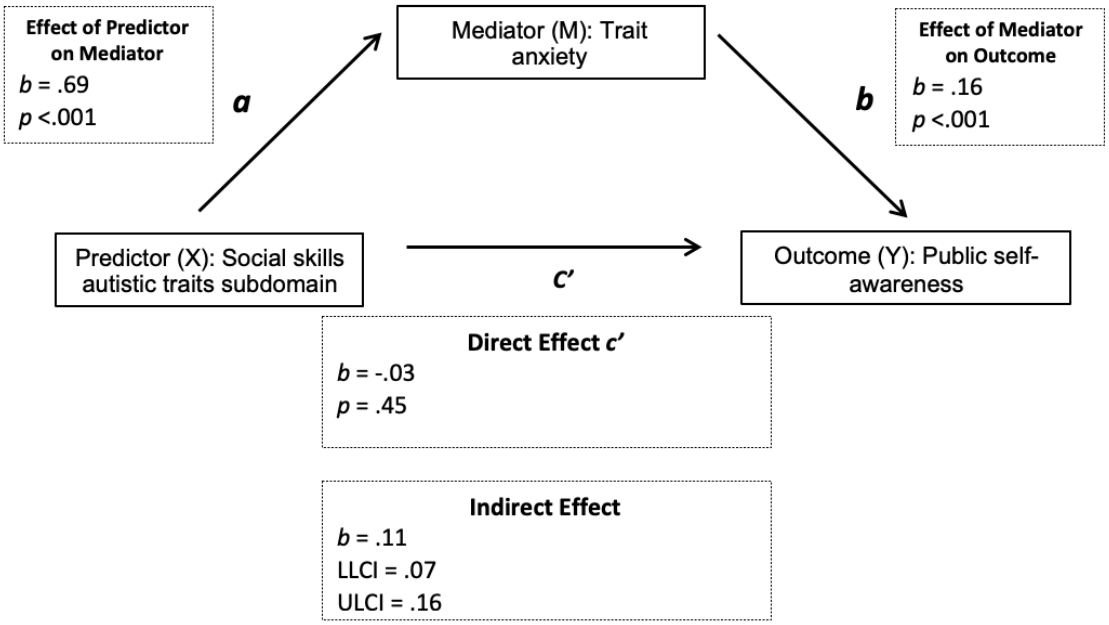

Figure 5

The Relationship Between the Social Skills Autistic Trait Subdomain and Public Self-Awareness as Mediated by Anxiety.

6.4 Discussion

This chapter aimed to explore the relationship between autistic trait subdomains and self-awareness through mediating factors. One model focused on a non-social context and whether the pathway between autistic traits and self-awareness is mediated by cognitive self-consciousness and a second model explored if the pathway for a social context is mediated by trait anxiety. Exploring these models extends the findings from Chapter 5 which identified no direct relationship between the overall levels of autistic traits and self-awareness, yet identified relationships when assessing the subdomains. This study has the potential to contribute to our knowledge in terms of the relationship between autistic traits and self-awareness, specifically whether there is a mediating variable. Exploring the relationship can

develop our understanding allowing future research to investigate the potential relationship with an educational outcome.

For the non-social model, the mediation effect of cognitive self-consciousness within the relationship between attention to details/patterns and private self-awareness was significant. Therefore, within this restricted sample, it appears that a metacognitive subdomain might play an important role in private self-awareness. The positive direction of the relationship is important to note as it suggests there is consistency in self-report in university students. The consistency supports the finding from Chapter 5 where participants had good metacognitive monitoring ability on an objective measure, as demonstrated by the consistency between self-report and an objective measure. From an autistic trait approach in a non-clinical sample, the results suggest that individuals appear to accurately report information about themselves in terms of beliefs about their performance. Whilst the thesis is not aiming to assess self-report per se, these results highlight that in a non-clinical sample, self-report appears to be appropriate, which supports its use throughout the thesis.

The statistical mediation effect of cognitive self-consciousness within the relationship between details/patterns and private self-awareness is theoretically supported. There may be a latent variable underlying the cognitive self-consciousness subdomain and private self-awareness as both constructs acknowledge an awareness of thoughts. However, they are distinct, as there was only a moderate correlation between them. There is also theoretical support for the details/patterns subdomain having a cognitive underlying mechanism as it is often viewed as a processing bias or cognitive style (Happé and Frith, 2006). It therefore seems reasonable to propose that the relationship could in part be due to the cognitive aspect of the variables.

A relationship between the details/patterns subdomain and the remaining two constructs is consistent with the idea proposed in the previous chapter (section 5.1) that paying attention to details is linked with systemising, the drive to analyse or construct systems that follow rules (Baron-Cohen, 2002; Baron-Cohen, Ashwin et al., 2009; Bury et al., 2020) and this can guide behaviour. To assess this and to understand the relationship between the constructs, away from a metacognitive approach, systemising could be studied in future research. Although further exploration is needed, the positive relationship extends our knowledge into how autistic traits are perceived, specifically concerning the idea that paying attention to details and patterns, alongside other potential skills, are associated with context-dependent advantages by autistic individuals (Bury et al., 2020; Russell et al., 2019). By this, it means in some contexts the trait may be advantageous, whilst in others it could be

disadvantageous. Overall, the statistical mediation in the non-social model contributes to the idea that cognitive self-consciousness could be an important step for private self-awareness and that there is a relationship between these constructs.

However, when interpreting the data caution is needed as the scores on the details/patterns autistic trait subdomain were significantly higher than the original score reported by Austin (2005). This is despite Austin (2005) suggesting students studying sciences scored significantly higher in the details/patterns subdomain compared to those studying the non-sciences and this thesis only recruiting psychology students. This indicates that a sample largely consisting of female psychology students presented with higher levels of autistic traits compared to other non-clinical studies and it should not be assumed that the findings can be generalised to non-clinical populations without further testing. It is also necessary to acknowledge university students use metacognitive strategies. Students are encouraged to take responsibility for their learning, especially their independent study, which means they rely on their metacognition to make these decisions and their studying (Stanton et al., 2021). It is also important for students in terms of planning, monitoring, and regulating their thinking and learning e.g., setting subgoals (Pintrich, 2002). The reliance on metacognition from an educational experience, especially in relation to the independent learning at university, could explain why metacognition plays an important role in this population.

Regarding the social model, the results indicate there is a statistical mediation between the social skills subdomain and public self-awareness which is driven by anxiety. The statistical mediation showcases the pathway between the social skills subdomain and public self-awareness is statistically mediated by the third variable. The increased public self-awareness does not support the concept of self-referential difficulties as individuals can differentiate between the self and other. However, a unique finding and contribution of the thesis is that the pathway is statistically mediated by a third variable, which is a known property of autistic traits. Although it is commonly reported within existing literature that autistic traits in university students from non-clinical populations positively associates with anxiety (Cassidy et al., 2020; Krumm et al., 2017; Kunihira et al., 2006) the potential role of the property has been further highlighted in the model in relation to self-awareness. It is of particular importance from an educational perspective as anxiety is often under-diagnosed in university students (Dickter et al., 2018), yet the finding suggests universities need to be aware of anxiety due to its relationship with self-awareness. The effect of awareness on an educational context is under-researched from an autistic trait approach and will be explored

in the following chapter in relation to attitudes and beliefs toward help-seeking, which is also a social construct.

In terms of understanding the statistical mediation, within the model, all constructs were social and referred to others. The findings suggest that the relationship is evident when the context is the same for all of the constructs. There is theoretical support for the social mediation model. Whilst it can be exciting to begin university, it can also be challenging in terms of personal adjustment (Parker et al., 2017). During the first year, students typically become socially and academically integrated (Lei et al., 2018), however, developing new relationships requires sufficient social skills and confidence to approach others (Lei et al., 2020). It is therefore probable that awareness of social difficulties and social pressures could be contributing to anxiety. It is possible that being aware of difficulties could increase public self-awareness as individuals are aware of how others perceive them. The relationship is consistent with the idea that the context of the constructs is important in the relationships. In the social model, all three constructs were social and related to others.

Despite contributing to the research area and extending the previous chapter, caution is needed when interpreting the results. Participants in this study scored significantly higher on the social skills subdomain compared to the original findings by Austin (2005) who recruited students from a range of degree courses and analysed their results across groups. Thus, a sample largely consisting of female psychology students presented with higher levels of autistic traits compared to other non-clinical studies. As discussed in Chapter 5 (section 5.4), students can have a better understanding of themselves through their academic knowledge (Punton et al., 2022), which could mean increased awareness of psychosocial difficulties including social difficulties (Connor et al., 2020). Thus, it should not be assumed that the findings concerning self-awareness can be generalised to non-clinical populations without further testing.

This chapter identified that the mediation effect of cognitive self-consciousness within the relationship between attention to details/patterns and private self-awareness was significant, as was the statistical mediation effect of trait anxiety within the relationship between social skills and public self-awareness. Thus, both models suggest an increase in self-awareness. The models suggest that for non-clinical populations context might play an important role in self-awareness as the variables in the models were either social (involving others) or non-social (only referring to the self). However, a key distinction between these models is that the social model included two constructs (social skills and anxiety) which are typically viewed as difficulties, whereas this was not the case in the non-social model. Thus,

the positive direction in both models, one of which did not centre around difficulties, suggests that self-awareness is not always a deficit in autism. To understand this further, the next chapter will assess the variables from the social model in relation to an outcome that has a crucial metacognitive component, attitudes and beliefs toward help-seeking. The outcome variable is also social and relates to others and is therefore consistent with the constructs from the social model.

Chapter 7: The perceived benefits and costs of help-seeking in relation to autistic traits, self-awareness, and metacognition

The thesis has focused on self-awareness and metacognition in relation to autistic traits in a non-clinical population. This chapter brings these constructs together and examines the relationship between autistic traits, self-awareness, and metacognition in relation to an educational outcome of the perceived benefits and costs of help-seeking. The exploratory nature of this study has been determined by the restricted sample size (n = 25), which is a subsample of the larger sample from earlier chapters, which means there is the potential for a lack of statistical power. The sample is restricted due to recruitment being unexpectedly stopped because of the COVID-19 pandemic and not all participants opting to complete the follow-up questionnaire (see section 3.1 for further details). As well as the sample, the exploratory nature is also necessary because of limited existing research to guide the aims and develop hypotheses in terms of a potential relationship between autistic traits in non-clinical populations and the perceived benefits and costs of help-seeking.

The following section begins with an overview of the perceived benefits and costs of help-seeking, before a review of how the findings from earlier chapters and existing literature provide theoretical support for further exploration.

7.1 Introduction

This chapter aims to build on insights from earlier chapters by exploring how previously identified findings relate to the perceived benefits and costs of help-seeking. Currently, existing literature tends to focus on success at university by assessing grades, but help-seeking and subsequently attitudes and beliefs toward help-seeking can be a key contributing factor to success (Chu et al., 2018; Micari & Calkins, 2021). Help-seeking is seen as a cost-benefit analysis (Dueñas et al., 2021) which affects student behaviour in terms of whether students seek help to solve academic challenges (Fan & Lin, 2023). Therefore, there is the potential to impact student success (Micari & Calkins, 2021). Taking an autistic trait approach in the thesis is a novel extension of autism literature which has identified that whilst autistic university students report academic strengths, they also report dissatisfaction with their overall performance at university (Anderson et al., 2020). Focusing on a potential contributing factor supports the exploration of specific experiences of university students (McLeod & Anderson, 2022) and is therefore consistent with the thesis focusing on the self

and one's perceptions. Moreover, focusing on attitudes and beliefs, both benefits and costs, means there is the potential to determine whether self-awareness has a positive or negative relationship with an educational outcome. The chapter will focus on attitudes and beliefs toward help-seeking in relation to the social model assessed in Chapter 6 (social skills subdomain, trait anxiety, and public self-awareness). The focus is on the social model as help-seeking is typically seen as social due to help often sought from either a formal source like teachers or informal such as peers (Fan & Lin, 2023). Furthermore, help-seeking is often viewed as a sign of weakness (Micari & Calkins, 2021) which implies there is consideration of the perspective of others. Finally, there is also evidence to suggest that a supportive social network is a predictor of the perceived benefits of help-seeking in an educational setting (Dueñas et al., 2021), thus supporting the social nature of attitudes and beliefs of help-seeking. Developing our understanding of the relationship between knowledge about the self and attitudes toward help-seeking could enable universities to tailor their support for students if specific barriers are identified.

The first step of the help-seeking process is to identify the need for it, and then to decide whether to seek help or not (Chu et al., 2018; Martín-Arbós et al., 2021). The benefits of help-seeking include an improvement in performance (Horowitz et al., 2013; Martín-Arbós et al., 2021; Payakachat et al., 2013), an improvement in one's learning and sense of intelligence (Newman, 1990), and the achievement of personal goals (Martín-Arbós et al., 2021). In terms of the perceived costs of help-seeking, there is often reference to the emotional costs, particularly negative affective states as a result of seeking help (Dueñas et al., 2021; Rosas & Pérez, 2015). For instance, the measure developed by Newman (1990), references negative feelings, such as feeling dumb, scared, and shy. The measure also considers potential repercussions on others, such as whether the teacher would be angry, either as a result of seeking or needing help, suggesting that costs can refer to one's emotions as well as the impact on others and relationships.

To summarise the main findings of the thesis that are relevant to this study, Chapter 6 identified a statistical mediation between the social skills subdomain and public self-awareness, mediated through trait anxiety. Given that all these constructs are socially oriented and refer to others to some extent, this chapter aims to explore how these constructs are related to outcomes that have a crucial metacognitive component, specifically students' attitudes and beliefs toward help-seeking.

In reviewing existing literature on anxiety specific to the education domain, there is a lack of literature exploring its relationship with the perceived benefits and costs of help-

seeking. Ryan and Shin (2011) suggest that when students believe in the benefits of help-seeking, their confidence reduces any worry they may have about other's negative opinions, such as being judged as incompetent. It can be inferred that the perceived costs could arise due to the concerns of being judged and therefore there may be a positive relationship between anxiety and the perceived costs of help-seeking. However, no further literature from either clinical or non-clinical populations has been identified to explore the relationship.

A further under-researched area is the relationship between social skill difficulties, which are associated with autistic traits and identified as key characteristics of autism in the Diagnostic and Statistical Manual-Fifth Edition (DSM-5), and the perceived benefits and costs of help-seeking. Although to our knowledge the potential relationship has not been directly explored, there is a theoretical basis to suggest a relationship, particularly with the perceived costs. Research suggests that autistic students (Thompson et al., 2019; Ward & Webster, 2018) and students with a higher overall level of autistic traits (Stice & Lavner, 2019) often experience a lack of relationships or have difficulties in navigating social interactions with staff or peers. Whilst these findings are not directly related to attitudes and beliefs toward help-seeking, they provide a context for understanding how perceived social dynamics can influence help-seeking behaviour. For a non-clinical population, Payakachat et al. (2013) identified that factors such as respect, accessibility, approachability, and friendly demeanour can make help-seeking appear less threatening. Identifying these factors suggests that how individuals believe others will respond to their difficulties could impact their attitudes and willingness to seek help. Taken together, the literature from both clinical and non-clinical populations suggests that if social skills difficulties are affecting personal relationships, either through the absence of relationships or through difficulties in maintaining them, then individuals may perceive greater costs associated with seeking help. Although the evidence is limited for both anxiety and social skills, there is support for a possible relationship with attitudes and beliefs toward help-seeking.

Similarly, for public self-awareness, there is also a lack of research into its possible relationship with attitudes and beliefs toward help-seeking, both in the general literature and autism literature. However, examining goal orientation provides indirect support for their possible association. A systematic review by Martín-Arbós et al. (2021) identified that costs associated with help-seeking were related to performance goals, which are used to validate one's ability or to avoid demonstrating a lack of ability, in contrast to mastery goals which focused on acquiring new knowledge or skills (Grant & Dweck, 2003). Students with a performance-oriented goal orientation do not prioritise their learning and its process but

rather focus on how their performance compares to others, valuing grades and external motivation and validation (Kadivar et al., 2011). The emphasis on comparison to others means there is a parallel with the construct of public self-awareness which refers to an individual's awareness of themselves as a social entity that influences and is influenced by others. With Chapter 6 identifying that the nature of the relationship between autistic traits and self-awareness was context-dependent, assuming the same is true when assessing self-awareness with a social outcome, then it is theorised that public self-awareness will positively relate with the perceived costs of help-seeking.

As well as exploring goal orientation, examining emotional responses can also provide support for the potential relationship between public self-awareness and the perceived costs of help-seeking. One suggestion is that a consequence of help-seeking in university students can be shame (Rosas & Pérez, 2015), with concerns about how the individual is perceived by others affecting help-seeking behaviour. As well as being evident more generally in university students, some findings indicate the concern is also reported by autistic university students (Cai & Richdale, 2016; Ward & Webster, 2018). Again, the external focus supports the idea that public self-awareness, which concerns how individuals view themselves in relation to others, may be positively associated with the perceived costs of help-seeking. Although direct research on public self-awareness and its impact on help-seeking costs is limited, the wider literature suggests it could potentially be a fruitful avenue to explore.

To investigate the role of these constructs further, specifically, whether their social (involving others) or non-social (referring only to the self) nature affects the perceived benefits and costs of help-seeking, this study has two aims. The first aim is to investigate how the constructs from the indirect associations identified in Chapter 6 are related to the perceived benefits and costs of help-seeking. The inclusion of a non-social model, alongside the social model, offers an alternative context to the typically social context of the perceived benefits and costs of help-seeking. Exploring the relationships will contribute to our understanding of the role of context in the relationship between these constructs and help-seeking outcomes. The second aim is to investigate how the remaining constructs assessed throughout the thesis relate to the social outcome of the perceived benefits and costs of help-seeking. Investigating the constructs further will allow a more nuanced analysis of how in their varying social context they contribute to attitudes and beliefs toward help-seeking.

7.1.1 Summary of chapter aims

The first aim is to investigate how the constructs from the indirect associations identified in Chapter 6 are related to the perceived benefits and costs of help-seeking. From the social model, the social skills subdomain, trait anxiety, and public self-awareness subdomains will be explored with the perceived benefits and costs of help-seeking, and from the non-social model the details/patterns subdomain, cognitive self-consciousness, and private self-awareness subdomains will be explored. The second aim is to investigate how the remaining metacognitive constructs assessed throughout the thesis relate to the social outcome.

7.2 Method

7.2.1 Measures

The Autism Quotient (AQ), three-factor model (social skills, details/patterns, and communication/mindreading) was used to measure autistic traits. The self-consciousness scale revised (SCS-R) was used as a measure of self-awareness, with the 22-item self-report scale assessing three subdomains: private self-awareness (9 items), public self-awareness (7 items) and social anxiety (6 items) (Fenigstein et al., 1975). Consistent with the previous studies, only the private and public subdomains were used. The State-Trait Anxiety Inventory (STAI) is a 40-item self-report measure for anxiety (Spielberger et al., 1970), with 20 items focusing on each subdomain, with this study focusing on trait anxiety. The Metacognitions Questionnaire (MCQ) is a 30-item self-report questionnaire that was used to assess metacognitive, beliefs, judgements, and tendencies (Wells & Cartwright-Hatton, 2004), with only the lack of cognitive confidence and cognitive self-consciousness subdomains used. Finally, the metacognitive monitoring tasks, which were developed for the thesis, were included to assess metacognitive monitoring ability for both social and non-social tasks. These measures are all fully reviewed in the methodology chapter (section 3.6) and the internal consistency scores for the larger samples were presented in the earlier chapters. In addition to these measures, a self-report help-seeking measure was also used, which is reported in the next section.

7.2.1.1 Help-seeking questionnaire

The Mathematics Learning in the Classroom Questionnaire (MLCQ) explores the intentions to seek help and attitudes and beliefs about help-seeking. For the attitudes and beliefs, there are two subdomains: benefits of help-seeking (3 items) and costs of help-

seeking (5 items). For both subdomains participants are required to indicate their level of agreement on a five-point scale from (1) “not at all true of me” to (5) “very true of me”. The Cronbach’s alpha internal consistency score for the benefits of help-seeking was adequate (α = .65) and for the costs of help-seeking it was good (α = .74) (Newman, 1990). Whilst the measure was designed to explore help-seeking in a mathematics class, Newman (1990) offered no reason for focusing on one subject area and based the items on existing measures not specific to mathematics. The questions were slightly adapted so that a subject was not referred to, for example, “I think that asking questions helps me learn math” was edited to “I think that asking questions helps me learn”.

The items included in the measure focus on the individual seeking help by asking questions verbally, however, there are alternative preferences that have been explored since the development of the original measure. For instance, university students may prefer to seek help electronically (Hao et al., 2017; Kitsantas & Chow, 2007). Preferences have been important to acknowledge since the COVID-19 pandemic, when many institutions were forced to move learning online and therefore impact patterns of help-seeking (Fan & Lin, 2023). As a result of these recent findings, for both the perceived benefits and costs of help-seeking, there were items added that focused on email as a method of help-seeking. For the perceived benefits, items relating to reading additional material were also added as an extension of re-reading material which is seen as a help-seeking strategy (Koc & Liu, 2016). With the inclusion of the additional items (five for the perceived benefits and five for the perceived costs), within the data set the Cronbach’s alpha internal consistency scores were good for both the perceived benefits of help-seeking (α = .71) and costs of help-seeking (α = .92) (see Appendix 6 for the full measure). As the scores are higher when the additional items are included, compared to the scores originally reported by Newman (1990), these additional items will be used in this study.

7.2.2 Participants

The final sample size was n = 25. Participants were from stage three of the data collection process, which was a follow-up measure for stage two participants. All participants were aged between 18 – 25-years (22 females and 3 males). See section 3.1 for a detailed discussion of how the COVID-19 pandemic affected the sample size for this study.

7.2.3 Procedure

Participants were drawn from stage three of the data collection process which included a follow-up measure taken approximately 6 months after completing their earlier measures. They completed a demographic questionnaire online assessing: age, gender, university course enrolled on, and if they have an autism diagnosis. They then completed an online questionnaire to assess their attitudes and beliefs about help-seeking to assess an educational outcome.

Ethical approval for the current study was obtained as part of the ethical considerations discussed in the methodology chapter (section 3.5) for the entire project.

7.2.4 Analysis

Descriptive statistics for autistic traits, self-awareness, metacognition, trait anxiety, and the perceived benefits and costs of help-seeking are outlined first.

For the first aim, Pearson's correlational analysis investigated the variables from the indirect association from Chapter 6 for the social model (social skills autistic trait subdomain, trait anxiety, and public self-awareness) and the non-social model (details/patterns subdomain, cognitive self-consciousness, and private self-awareness) with the perceived benefits and costs of help-seeking.

For the second aim, Pearson's correlational analysis investigated the association between the remaining metacognitive constructs (metacognitive monitoring ability for the social and non-social tasks and the cognitive self-consciousness subdomain from the self-report questionnaire) and the social outcome of attitudes and beliefs toward help-seeking.

Within the analysis, there were multiple comparisons, yet no Bonferroni corrections were made. Exploratory studies, like this, are typically the first of their kind and therefore often have a small sample, and adjusting the p-value could prevent the development of the research area (Cipriani et al. 2015). Hecker et al. (2022) acknowledge that in their exploratory study to investigate reliable biomarkers for diagnosing autism (16 adult participants with a diagnosis and 19 adults without a diagnosis), the application of Bonferroni correction would result in extremely small p-values. They opted against the corrections as they suggested it is more important to collect meaningful data in a novel area. Similarly, this exploratory study also aimed to identify meaningful patterns which can then inform a theoretical model.

7.3 Results

7.3.1 Descriptive statistics for autistic traits, self-awareness, metacognition, anxiety, the perceived benefits and costs of help-seeking

The descriptive statistics for autistic traits, self-awareness, metacognition, anxiety, and the perceived benefits and costs of help-seeking are presented in Table 18.

Table 18

Sample Descriptive Statistics for Autistic Traits, Self-Awareness, Metacognition, Trait Anxiety, and the Perceived Benefits and Costs of Help-Seeking.

	Min	Max	Mean	SD
AQ - Total	37	80	59.48	9.75
AQ - Social skills	14	39	26.24	7.13
AQ - Details/Patterns	13	27	20.12	3.43
AQ - Communication/Mindreading	7	19	13.12	3.32
Private self-awareness	7	24	16.28	4.89
Public self-awareness	8	20	14.96	3.65
MCQ – Lack of cognitive confidence	6	24	13.92	5.13
MCQ - Cognitive self-consciousness	7	24	16.12	4.74
Social metacognitive monitoring	-.17	1.00	.46	.32
Non-social metacognitive monitoring	.01	.80	.28	.19
Trait Anxiety	33	68	48.84	10.06
Perceived benefits of help-seeking	4	14	10.04	2.23
Perceived costs of help-seeking	5	23	14.88	5.10

Table 19 shows the correlational analyses for autistic traits, self-awareness, metacognition, anxiety, and the perceived benefits and costs of help-seeking. Autistic traits include the total score and the subdomain scores, whilst for self-awareness it focuses on private and public subdomains, and for metacognition it includes the lack of cognitive confidence and cognitive self-consciousness subdomains as well as the social and non-social metacognitive monitoring measures.

7.3.2 Exploring the individual correlations from the mediation models and the perceived benefits and costs of help-seeking

From the social mediation model from Chapter 6, there was a moderate positive relationship between public self-awareness and the perceived costs of help-seeking (r=.44, p<.05), although there was no relationship between private self-awareness and the perceived

benefits of help-seeking (r=.02, p=.94). The results suggest as individuals pay more attention to the self in relation to others (public self-awareness) they perceive more costs of seeking help from others. However, the social skills subdomain was not related to attitudes and beliefs toward seeking help, with no relationship between the autistic trait subdomain and either the perceived benefits (r=-.01, p=.98) or costs of help-seeking (r=.19, p=.36). There was also no relationship between trait anxiety and either the perceived benefits (r=.12, p=.56) or costs of help-seeking (r=.12, p=.59).

The constructs from the non-social mediation model from Chapter 6 are not related to the outcome of the perceived benefits and costs of help-seeking. There was no relationship between details/patterns subdomain and either the perceived benefits (r=.02, p=.92) or costs of help-seeking (r=.27, p=.20). There was also no relationship between cognitive self-consciousness and either the perceived benefits (r=.08, p=.71) or costs of help-seeking (r=.07, p=.75). Finally, there was no relationship between private self-awareness and either the perceived benefits (r=.23, p=.28) or costs of help-seeking (r=-.29, p=.16). The correlations are shown in Table 19.

7.3.3 Association between metacognitive constructs and the perceived benefits and costs of help-seeking

For the objective metacognitive monitoring measures, there was no relationship between social metacognition and the perceived benefits (r=.18, p=.39), but there was a moderate negative relationship with the perceived costs of help-seeking (r=-.57, p<.01). There was also no relationship between non-social metacognition and either the perceived benefits (r=.25, p=.26) or costs of help-seeking (r=.21, p=.29).

For the remaining self-report metacognitive measure, there was no relationship between a lack of cognitive confidence and the perceived benefits of help-seeking (r=-.25, p=.23), although there was a moderate positive relationship with the perceived costs of help-seeking (r=.50, p<.05), which suggests that as individuals lack confidence in their own ability they also perceive more costs of seeking help. For the cognitive self-consciousness subdomain, there was no relationship with either perceived benefits (r=.08, p=.71) or perceived costs of help-seeking (r=.07, p=.75). The correlations are shown in Table 19.

Table 19

Correlations Between Autistic Traits, Self-Awareness, Metacognition, Trait Anxiety and the Perceived Benefits and Costs of Help-Seeking.

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
1. AQ Total	–	–	–	–	–	–	–	–	–	–	–	–	–
2. AQ - Social skills	.87***	–	–	–	–	–	–	–	–	–	–	–	–
3. AQ - Details/Patterns	.62**	.31	–	–	–	–	–	–	–	–	–	–	–
4. AQ - Communication/Mindreading	.44*	.08	.11	–	–	–	–	–	–	–	–	–	–
5. Private self-awareness	-.23	-.11	-.14	-.28	–	–	–	–	–	–	–	–	–
6. Public self-awareness	.09	.24	.09	-.33	.44*	–	–	–	–	–	–	–	–
7. MCQ – Lack of cognitive confidence	.13	.04	.03	.27	-.11	.10	–	–	–	–	–	–	–
8. MCQ - Cognitive self-consciousness	.23	.30	.18	-.14	.57**	.38	.10	–	–	–	–	–	–
9. Social metacognitive monitoring	-.05	-.04	-.15	.07	-.07	-.37	-.52**	-.08	–	–	–	–	–
10. Non-social metacognitive monitoring	-.07	-.03	.16	-.29	.13	.27	.12	.01	-.23	–	–	–	–
11. Trait Anxiety	.54**	.39	.32	.43*	-.08	-.04	.13	.35	.05	.03	–	–	–
12. Perceived benefits of help-seeking	-.06	-.01	.02	-.19	.23	.02	-.25	.08	.18	.25	.12	–	–
13. Perceived costs of help-seeking	.29	.19	.27	.15	-.29	.44*	.50*	.07	-.57**	.21	.12	-.29	–

*Note. *p < .05, **p < .01, ***p < .001.*

7.4 Discussion

This chapter aimed to explore the perceived benefits and costs of help-seeking, a social outcome that has a crucial metacognitive component, among university students. This extends Chapter 6 which investigated the indirect relationships between autistic traits and self-awareness, but did not specifically address educational outcomes. Previous chapters highlighted that these relationships tend to be context-dependent, with Chapter 6 differentiating between non-social and social contexts. The current chapter aimed to extend the investigation from Chapter 6 by examining how these constructs relate to the outcome of the perceived benefits and costs of help-seeking, which itself is arguably social. The aim was to contribute to our understanding of how self-awareness interacts with an outcome that has a crucial metacognitive component and to further examine the role of context, whether social (reference to self and others) or non-social (only refers to the self). Understanding these relationships could contribute to the research field by helping to identify potential barriers and facilitate the development of tailored support mechanisms for university students in the future.

The findings for the current study are mixed in terms of how the variables from the mediated model (social skills autistic trait subdomain and public self-awareness through trait anxiety) relate to attitudes and beliefs toward help-seeking. Public self-awareness was found to be positively associated with the perceived costs of help-seeking; as individual's awareness of themself as a social entity in relation to others increased, so too did the perceived costs of seeking help. The positive relationship suggests that a heightened awareness of oneself in social contexts aligns with findings in both autistic and non-clinical university students who report concerns about others' perceptions and a reluctance to seek help. The relationship has been identified in autistic university students, with students reporting concerns about how others are perceiving them and subsequently reporting a lack of help-seeking (Cai & Richdale, 2016; Ward & Webster, 2018). Similarly, for non-clinical populations, a consequence of help-seeking in academic contexts can be shame (Dueñas et al., 2021; Rosas & Pérez, 2015) which suggests a level of concern about how one is being perceived by others. Concern in both clinical and non-clinical populations supports the relationship between public self-awareness and attitudes and beliefs toward help-seeking. It highlights that awareness of social perceptions can increase the perceived costs of help-seeking. When understanding the relationship between public self-awareness and the perceived costs of help-

seeking, it is important to recall the finding from Chapter 5, a positive albeit weak correlation between the social skills subdomain and public self-awareness. The earlier finding suggests that an increase in autistic traits is associated with an increase in how aware individuals are of others. The relationship might be particularly evident in the sample due to its focus on students aged between 18-25 years old, which is a developmental stage where social relationships are crucial for identity formation and comparisons with others are particularly salient (Mattys et al., 2018). The stage is especially relevant for first-year students who are navigating their social and academic integration into university life (Lei et al., 2018). Overall, when exploring self-awareness and attitudes and beliefs toward help-seeking, not taking anxiety into account, the finding suggests that increased self-awareness could negatively influence attitudes and beliefs toward help-seeking, highlighting an important area for future research and support strategies.

However, neither the social skills subdomain nor trait anxiety were associated with the perceived benefits or costs of help-seeking. No relationship suggests that despite associations between autism and social interaction difficulties with staff and peers (Thompson et al., 2019; Ward & Webster, 2018), as well as the presence of a high level of autistic traits in the sample, these factors did not relate to the perceived costs of help-seeking from others. Whilst the results need to be interpreted with caution, due to the small sample size increasing the risk of type 2 errors, it appears that difficulties related to social skills or avoidance of others due to anxiety may not be related to attitudes and beliefs toward help-seeking.

Focusing on social skills difficulties, the absence of a relationship could indicate actual social abilities may not directly influence attitudes and beliefs toward help-seeking, within the sample. Despite the established association between autism and social difficulties, and the inherently social nature of help-seeking behaviours (Ryan & Shin, 2011; Schenke et al., 2015), the results suggest that the presence of social difficulties does not necessarily translate to negative perceptions of help-seeking. Instead, the significance may lie in the reference to others, as evidenced by the link between public self-awareness and the perceived costs of help-seeking. Furthermore, the findings from Chapter 6, which had a larger sample, identified the pathway between social skills and public self-awareness was statistically mediated by anxiety, suggesting a more nuanced interplay between these factors. As a result, a theoretical model will be proposed in the following chapter for future research. The proposed model aims to further explore the potential impact of autistic traits on help-seeking attitudes and beliefs. Understanding whether and how autistic traits influence these attitudes

through indirect associations has the potential to guide future research in developing more targeted strategies to mitigate negative perceptions of help-seeking and reduce potential barriers for university students.

The first aim of this study also investigated how the constructs from the non-social indirect model identified in Chapter 6 (the details/patterns subdomain, cognitive self-consciousness, and private self-awareness) were related to the perceived benefits and costs of help-seeking. No direct associations suggest that the constructs may not directly relate to the social outcome. A lack of relationship appears to support the idea that for there to be a relationship between the constructs of autistic traits, metacognition, and self-awareness the context is important in terms of whether the constructs are social (involving others) or non-social (referring only to the self).

For the remaining metacognitive variables assessed in the second aim, the results are partially consistent with the main finding. The non-social metacognitive monitoring task did not correlate with either the perceived benefits or costs of help-seeking, although there was a significant relationship between the social metacognitive monitoring task and the perceived costs of help-seeking. However, the direction of the relationship is different compared to the social model. The negative relationship here suggests that greater awareness of own behaviour in a social context is related to less concern about how one is perceived by others and less negative feelings toward help-seeking. The difference may represent the measure focusing on one's behaviour and not specifically referring to others, whereas public self-awareness does. From the metacognitive self-report questionnaire, it was also found that having confidence in one's memory, cognitive confidence, was associated with less perceived costs of help-seeking. A possible explanation for the finding is that when individuals feel confident in their ability to remember, they feel less need to seek help. It is therefore reasonable to suggest that individuals have less perceived costs when seeking help as they know the help is needed, which is consistent with metacognitive monitoring ability. When comparing the finding to the positive relationship between public self-awareness and the perceived costs, a distinction between cognitive confidence and the social construct of public self-awareness is that cognitive confidence is positive in terms of how one is feeling, which is why it might be associated with a positive outcome in terms of less perceived costs. Therefore, as well as the context being important in a relationship, the findings also indicate that the outcome should be considered in terms of whether it is positive or not.

Regarding the self, the key finding is that public self-awareness is positively associated with the perceived costs of help-seeking, when awareness of oneself as a social

entity increased, so too did the perceived costs. The relationship suggests that these constructs are not independent of one another and that heightened self-awareness could prevent students from seeking help due to the costs they anticipate. The finding from this exploratory study suggests further investigation is needed, particularly in examining the indirect associations highlighted in Chapter 6. The results from the earlier chapter showed that through the mediator of anxiety, social skills difficulties were related to an increase in public self-awareness. It therefore seems that these constructs, all of which have a social aspect and relate to others, are associated in nuanced ways. Identifying a nuanced understanding of how social constructs and self-awareness interact to influence help-seeking is important for developing a theoretical model for future research to test.

7.4.1 Limitations

A main limitation of this study, as stated at the beginning of this chapter, is the sample size (n = 25), which led to low statistical power and therefore restricted the statistical analysis. Additionally, there is an unequal gender split, which is necessary to acknowledge as it has been suggested that females report higher emotional costs of help-seeking compared to males (Dueñas et al., 2021). It is therefore possible that the positive relationship identified could be reflective of the sample. As well as the COVID-19 pandemic affecting the recruitment it also influenced the methodology of the data collection as it could only be an online questionnaire due to restrictions on laboratory studies. As a result, no supportive strategies could be developed and tested.

Whilst these are limitations, this exploratory chapter has identified some key findings that can be used in conjunction with results from earlier studies to propose a theoretical model for future research to investigate. The model will be presented in the concluding chapter.

Chapter 8: General discussion

The thesis aimed to explore the self, through self-awareness and metacognition, in relation to autistic traits in university students. The final chapter begins by summarising the main findings of the thesis and discussing the possible theoretical implications. This is followed by an outline of general limitations of the empirical studies, and an outline of possible directions for future research, including a proposed theoretical model for further testing. There is no existing framework, to our knowledge, that addresses the relationship between autistic traits and self-awareness in university students, and its impact on key aspects of learning such as the perceived benefits and costs of help-seeking. By drawing together the findings of the thesis a model for future research is proposed.

8.1 Summary of main findings

The main findings will be summarised in relation to the three overarching aims of the research. The first aim was to investigate the psychometric properties of the Autism Quotient (AQ). Chapter 4 addressed this by exploring the factor structure and scoring approach for the data set. The second overarching aim was to understand the relationship between autistic traits and the self, identifying whether autistic traits differentially related to the different aspects of self-awareness and metacognition, thus assessing the specific associations of trait profiles alongside the broad autistic trait approach. This was explored in Chapter 5 by assessing the direct associations and Chapter 6 by exploring possible indirect associations. Finally, using the social self-awareness model from Chapter 6, the third overarching aim which was explored in Chapter 7, was to understand the relationship between self-awareness and an educational outcome of the perceived benefits and costs of help-seeking.

8.1.1 The psychometric properties of the Autism Quotient (AQ)

To investigate the psychometric properties of the AQ, an aim within Chapter 4 was to determine which of the existing factor structures was the best fit for the current data. The factor structures examined were the original five-factor model proposed by Baron-Cohen et al. (2001), as well as the more recent four-factor (Stewart & Austin, 2009) and three-factor (Austin, 2005) models. Another aim related to which of the scoring approaches was the best fit for the current data, with the binary approach originally proposed by Baron-Cohen et al. (2001) and the 4-point likert scoring developed by Austin (2005) explored. Confirmatory

Factor Analysis (CFA) identified that the three-factor model (social skills, details/patterns, and communication/mindreading) with the 4-point likert scoring approach was the best fit for the data. One indicator used to determine the best fit for the data was by identifying the lowest Akaike Information Criterion (AIC) values. The unbiased estimator of accuracy is calculated from the number of independent variables to build the model and results in the best-fitting model explaining the greatest amount of variation using the fewest possible independent variables (Lezcano et al., 2024). The 4-point likert scoring model also offered a more acceptable representation of the data because there were fewer weak correlations and therefore also supported its use for the specific data set. Another key aim of the preliminary investigation was to assess the validity of the identified model, with Pearson's correlation indicating that the model correlated with known autistic traits: anxiety, alexithymia, Theory of Mind (ToM), and self-esteem, suggesting the three-factor model using the 4-point likert scoring approach is a valid model.

One possible implication of the data set supporting the three-factor model, rather than the original five-factor model, is that it emphasises the need for researchers to explore which AQ model fits their data best and not simply rely on the original model. The findings also highlight the importance of considering the sample when researching the psychometric properties. In the thesis, both the factor structure and scoring approach identified can be attributed to the sample. First, the factor structure appears to be dependent on the sample size, with existing research suggesting that a smaller sample elicits a three-factor model. The second reason relates to the scoring approach and the possible effect of recruiting university students, specifically psychology students. These students may show greater curiosity in ideas and thinking (Vedel, 2016) and therefore not be as restricted in their responses, hence using the full scale, rather than being limited to binary responding. The result of the early analysis determined the approach taken in subsequent analysis in the thesis with the three-factor model used throughout.

8.1.2 The relationship between autistic traits and the self

Throughout the thesis, autistic traits were measured in two ways, as an overall aggregate level and as specific subdomain scores. This section will review how self-awareness and metacognition relate to autistic traits using both approaches – aggregate scores and specific subdomain scores to explore the individual trait characteristics.

Despite there being no direct association between autistic traits (aggregate score) and self-awareness (subdomains), Chapter 5 examined the relationship between the autistic trait subdomains and self-awareness subdomains. The results indicated that the social skills subdomain correlated with public self-awareness and the details/patterns subdomain correlated with private self-awareness. These findings suggest that despite there being no direct association between autistic traits (aggregate score) and self-awareness (subdomains) (see section 5.3.4) which is consistent with two existing studies that also take a continuum approach (Burns et al., 2019; Lombardo et al., 2007), there is a direct association with specific autistic trait subdomains. As the autistic trait subdomain is determining the relationship, the results from the thesis support the idea that when assessing self-awareness, the distinct subdomains of autistic traits should be explored rather than taking a general approach and only assessing aggregate levels of autistic traits. Considering the autistic traits subdomains is a unique contribution of the thesis as existing self-awareness literature has favoured the broad autistic trait approach. The approach taken here offers a more nuanced understanding of the relationship between these constructs with a number of differential relationships exposed.

For metacognition, there were two subdomains of interest from the self-report questionnaire, cognitive confidence (lack of) and cognitive self-consciousness. A lack of cognitive confidence refers to diminished confidence in memory, whilst cognitive self-consciousness is the amount of attention paid to thoughts. An aim of Chapter 5 was to investigate the relationship between autistic traits and metacognition. The results showed that both of these metacognitive subdomains related to overall levels of autistic traits suggesting that when assessing distinct metacognitive factors relationships were evident. However, more nuanced relationships were identified when investigating the relationship through the autistic traits subdomain scores. A lack of cognitive confidence correlated with all the autistic traits subdomains, while cognitive self-consciousness only correlated with the details/patterns subdomain. A difference between the subdomains suggests that specific aspects of metacognition are related to particular autistic traits. With nuanced relationships also identified for self-awareness, the findings from the thesis suggest that autistic traits differentially relate to the different aspects of the self. Identifying a difference between the subdomains has implications for future research as it suggests to understand the relationship between the constructs, research needs to consider the autistic trait at a deeper level by considering the individual characteristics of each trait rather than the overall levels of autistic traits combined. It is important to acknowledge that whilst the validated self-report

questionnaire (MCQ) related to autistic traits, the objective social metacognitive monitoring measure that was developed for the thesis did not correlate with either the overall level of autistic traits or the individual subdomains. The objective measure may not relate to autistic traits because it is a non-standardised validated measure and therefore the rating scale might not have been sensitive enough. Overall though, a unique contribution of the thesis is that the distinct subdomains of autistic traits were important for the relationship with both self-awareness and metacognition when measured via a self-report questionnaire, whereas existing literature which has taken a continuum approach to studying autistic traits has typically assessed traits at a general aggregate level for both self-awareness (e.g., Burns et al., 2019; Lombardo et al., 2007) and metacognition (e.g., Carpenter et al., 2019; Williams et al., 2016).

As well as exploring the direct relationship between self-awareness and metacognition, a key, novel aim, of the thesis was to explore whether the pathway between autistic traits and self-awareness is statically mediated by metacognition. Alongside these constructs being related, it has been suggested that self-awareness may be a result of metacognition (Lou, 2015; Zlotnik & Toglia, 2018). Keeping with the idea that a general measure of autistic traits may not be the most effective way of assessing traits and their influence, Chapter 6 aimed to assess whether there were statistical mediations between autistic traits and aspects of self-awareness. The mediation effect of cognitive self-consciousness within the relationship between attention to details/patterns and private self-awareness was significant. This suggests for this sample, self-awareness might be a result of the metacognitive subdomain that was explored. Furthermore, the pathway between the social skills subdomain and public self-awareness was significantly mediated through trait anxiety. In terms of the different mediating factors in the models, metacognition may be an important process for private self-awareness, but not for public self-awareness. One reason for this is the consistency in the context; the private self-awareness model included variables from a non-social context, and referred to self-reflective thinking, whilst the public self-awareness model included variables from a social context which referenced others. Therefore, as well as a general measure not being appropriate for autistic traits, the findings also suggest the social nature of the context is important when assessing the relationship between autistic traits and self-awareness. Identifying the potential role of the context means that when considering the impact of autistic traits, it is important to consider how the context varies in relation to the social referents of self and others.

To examine the role of context further, a key aim of Chapter 7 was to explore how the constructs in the social model (the social skills autistic trait subdomain, trait anxiety, and public self-awareness) related to the outcome of the perceived costs of help-seeking which has a crucial metacognitive component. The model built on the unique contribution that studying the particular subdomains of autistic traits allows for a more nuanced understanding of the relationship between autistic traits and the self by exploring the relationship with a specific educational outcome. The results indicated a positive relationship between public self-awareness and the perceived costs of help-seeking. The relationship means as awareness of the self as a social entity increased, so too did the level of perceived costs associated with seeking help from others. There was no relationship between the social skills subdomain and the perceived costs of help-seeking or between trait anxiety and the perceived costs of help-seeking. The relationship between public self-awareness and the perceived costs of help-seeking cannot solely be explained by the fact that the constructs are social, as the relationship with help-seeking did not extend to the remaining two constructs of social skills and trait anxiety which are also social in nature. The role of the context is not exclusive to whether it is social or non-social, with it also encapsulating the relevance of referring only to the self, and therefore non-social, or others as well, as then social. Both of the social constructs, public self-awareness and the perceived costs of help-seeking, make specific reference to others. However, the focus on others is not as explicitly referred to in social skills and anxiety; section 6.1.3 considered the potential link to others as some of the items for trait anxiety require comparisons with others, but the results suggest that there may need to be explicit reference to others for relationships with a social outcome which has a crucial metacognitive component. From an autistic trait perspective, a notable contribution is that as well as the autistic traits subdomains providing a nuanced understanding of the relationship between self-awareness and metacognition, understanding the self in terms of the relevance of the content, social or non-social, provides a deeper understanding of the relationship.

To further investigate the nature of the constructs, the non-social model from Chapter 7 (details/patterns subdomain, cognitive self-consciousness, and private self-awareness) was investigated with the educational outcome of perceived costs of help-seeking. The results revealed that there was no association between any of the non-social constructs and the perceived costs of help-seeking, thus supporting the idea that the social context of the constructs is important when considering the relationship with a social outcome that involves metacognition.

The next section interprets these main findings from a theoretical perspective before the wider implications of the findings are discussed.

8.2 Theoretical perspectives

Existing autism literature often refers to either self-awareness or metacognition, which means the relationship between these constructs is unknown. The findings from the thesis suggest these constructs are not the same mechanism. When looking at the composite scores for self-awareness and metacognition there is only a moderate, not strong, relationship. The strength of the relationship suggests that they are independent and measure different constructs. Having said this, when assessing the mediation effect of cognitive self-consciousness within the relationship between attention to details/patterns and private self-awareness, the finding is consistent with the idea that metacognition can be extended to the self in relation to one's experiences (DeMink-Carthew et al., 2020). Thus, supporting the exploration of both self-awareness and metacognition rather than one construct exclusively.

The second model identified the pathway between the social skills subdomain and public self-awareness is statistically mediated through trait anxiety. Providing a nuanced understanding of the relationship between autistic traits and self-awareness subdomains. Importantly, in this model, the mediating variable aligned with the same context as the other constructs, which were social and referring to others. Thus, it seems that when focusing on a social autistic trait, which is evident in individuals with a high level of autistic traits in both clinical and non-clinical populations (Cassidy et al., 2020), the context of the variables is important.

The statistical mediation models develop our understanding of the self by exploring the trait profiles, rather than taking a broad autistic trait approach. The findings from the thesis are not consistent with the more recent literature, which commonly reports no relationship between autistic traits, studied as a broad approach, and self-awareness (e.g., Burns et al., 2019; Lombardo et al., 2007). Taking the approach of assessing subdomains allowed more specific and nuanced relationships to be tested which identified that specific autistic traits are associated with increased self-awareness. There is also a wider impact in terms of support for assessing autistic traits by their trait profiles, rather than as a broad approach which is the traditional method. Additionally, the mediating factor for the social statistical mediation model is a correlate of autism which suggests as well as exploring the

autistic trait subdomain, there is support for considering properties of autistic traits as these could be influencing behaviour alongside the traits themselves.

Finally, taking a unique approach within the thesis has contributed to the research field by identifying that autistic traits are associated with increased self-awareness when measured through their subdomains and mediated through trait anxiety and cognitive self-consciousness. Self-awareness was then explored with the perceived benefits and costs of help-seeking to assess the potential impact of awareness on a specific academic behaviour. The analysis revealed a significant relationship between public self-awareness and the perceived costs of help-seeking, both of which are social and refer to others. With the relationship only present for public, and not private self-awareness, the findings suggest that the implication of autistic traits on self-awareness may differ, which therefore supports the assessment of the subdomains.

8.3 Implications for educational and research practice

The findings from the research have the potential to influence educational practice and inform future research into the role of autistic traits in non-clinical populations.

Beginning with educational practice, two key findings emerged that suggest a) autistic traits are related to how the self is viewed as a social entity in relation to others and b) individuals' attitudes and beliefs toward the perceived costs of help-seeking are related to public self-awareness. An under-researched educational outcome, which involves metacognition, is attitudes and beliefs toward the perceived benefits and costs of help-seeking. For the non-clinical sample, the results show a relationship between public self-awareness and perceived costs, which suggests that educational practices need to explore how students feel about seeking help and ways to address concerns. It also highlights the need for tailored support to be developed which could benefit all university students, but particularly those with higher levels of autistic traits. Avenues for future research ideas that build on these initial findings are discussed further in section 8.5.

The results also have the potential to shape future research by suggesting that the constructs should be evaluated through their subdomains as autistic traits are differentially related to various aspects of self-awareness and metacognition. With only public self-awareness associated with the perceived costs of help-seeking, and not private self-awareness, the impact of self-awareness may vary. Identifying a potential difference between

private and public self-awareness supports the alternative approach of examining subdomains rather than assessing the constructs in a general manner.

In terms of research implications, the findings also indicate that self-report methods are appropriate to use in non-clinical student populations. There is consistency observed in results obtained through self-report measures and through participants having good metacognitive monitoring ability, which is indicated by performance on a task indicating metacognitive monitoring ability (Carpenter & Williams, 2023). In other words, when there is consistency in performance and reported confidence. Although not the primary aim, as the focus was on understanding individuals' self-perception, recognising the value of self-report can shape the direction of future research. It is hoped that by acknowledging the importance of the individual's perspective, the focus of autism research may shift towards exploring self-awareness and its implications within broader contexts. The findings from the thesis suggest that self-awareness is related to the perceived costs of help-seeking, with the latter construct focusing on beliefs around seeking help from peers and academic staff. Focusing on academic staff, the measure focused on feeling scared and shy about asking questions, therefore how staff present themselves and opportunities to seek help may be important considerations. For instance, it may be necessary for staff to make themselves easily accessible and have the time clearly allocated to supporting students. Micari and Calkins (2021) identified that ensuring there is always time allocated to asking questions and reminding students to attend office hours was associated with promoting a positive environment that supports students seeking help. In terms of how students feel towards the academic staff, students also reflected on the importance of staff encouraging questions and for example answering fully and happily, as well as showing appreciation for the question through comments such as the asking of a "good" question (Micari & Calkins, 2021). It could also be necessary to provide different formats of support so it is not all inherently social and face-to-face, especially considering that autistic traits include social and communication difficulties. By focusing on societal changes there could be benefits for individuals with autistic traits in both clinical and non-clinical settings.

Whilst there are implications both from an educational and research perspective, the general limitations of the thesis are discussed next. If limitations were specific to one study they were reviewed in the empirical chapter.

8.4 Limitations of the research

One of the main limitations of the research presented in the thesis is the recruitment process and subsequently the sample size and selection. Data was only collected from one university and whilst a large enough sample size could be recruited to reach statistical power, the findings are not representative of all university students (Freeth et al., 2013; White, Ollendick & Bray, 2011). The reliance on university students means the findings are not representative of the entire student body (Reed et al., 2016) or the general population (Donati et al., 2019), which therefore limits the generalisability of the findings (Stevenson & Hart, 2017). However, focusing solely on students aged between 18-25 years old (therefore those within the emerging adulthood developmental stage) is a common approach due to the ease of access (Arnett, 2002). Focusing on the developmental stage is important as it is a way to account for the effect of age in existing research where there are mixed findings in terms of self-awareness between autistic children and autistic adults.

The sample size is a further limitation. Primarily this applies to Chapter 7 where there was a significantly reduced sample. Participants were recruited from stage three of the data collection process, which was a follow-up for stage two participants, and significantly affected by the COVID-19 pandemic (see section 3.1). The sample size in the last exploratory empirical chapter meant there was a lack of statistical power which affected the types of analysis that could be undertaken. Within all the empirical chapters presented in the thesis, increasing the sample size would strengthen the findings and allow different analytic approaches. A larger sample would have supported structural equation modelling (Kyriazos et al., 2018) to understand the relationships of observed and latent attributes and to evaluate the theoretical model proposed in the thesis. A future aim would be to extend the analysis to include confirmatory factor analysis or even exploratory factor analysis with an alternative sample.

Regarding the sample, there is also the potential for sampling bias due to the objective metacognitive monitoring tasks which required participants to be motivated to attend a session in the psychology laboratory. There was also an unbalanced gender split, with fewer males than females in each stage of data collection. Whilst Chapter 4 identified no gender difference in autistic trait scores and therefore supported the combined inclusion of males and females in subsequent analysis, the unequal balance means the effect of gender could not be investigated and it is also not representative of current estimates of autism either. Although there has been an increase in adult females being diagnosed (Russell et al., 2022), males are

still more likely to have an autism diagnosis than females. A common ratio reported is 4:1, although Loomes et al. (2017) suggest it could be closer to 3:1, with Harrop et al. (2024) also supporting a lower ratio. The aim of the thesis was not to generalise to the autistic population, however, the unrepresentative gender split limits our understanding of autistic traits in relation to self-awareness and metacognition.

Although many of the known correlates of autism were included in the analysis like the study by Williams et al. (2016), intelligence, specifically IQ, was not controlled for in the non-clinical university student sample. However, an earlier study by Kunihira et al. (2006) investigated the relationship between autistic traits and two characteristics, personality traits, and cognitive abilities, but also did not control for intelligence. They justified their decision by stating that their sample only consisted of university students meaning the variance may not be representative of the general population. While this is also true for the thesis, not controlling for IQ is a potential limitation because there is a reported relationship between self-awareness and intelligence when comparing self- and other-report, with a larger discrepancy reported for autistic children with lower intelligence scores (Johnson et al., 2009). Despite referring to autistic children, the existing literature highlights the potential need to control for intelligence when relying on self-report. Controlling for intelligence could be of particular importance if future research develops the thesis further by including a clinical sample as typically, intelligence is accounted for in autism research by excluding participants below a cut-off IQ score (Didehbani et al., 2012; Johnson et al., 2009) and therefore would need to be assessed.

A further limitation relates to the exploratory nature of the thesis which resulted in multiple statistical comparisons. Bonferroni corrections were not applied as the thesis was aiming to collect meaningful data in a novel area (Hecker et al., 2022), and adjusting the p-value could prevent the development of the research area (Cipriani et al., 2015), especially when there is a small sample. However, a consequence of not completing the corrections is that type 1 errors were not controlled for and subsequently the results need to be interpreted with caution. Care is also needed when interpreting the results due to the reliance on correlational analyses, whereby although interpretations are still possible in terms of associations (Roussel et al., 2011), causal relationships cannot be made. A larger sample would have supported structural equation modelling, but the COVID-19 pandemic restricted the sample size (see section 3.1) and therefore the possible analysis.

A final consideration relates to the methodology with there being a reliance on self-report. In Chapter 5, objective metacognitive monitoring tasks were used for metacognition to

assess item correctness on a task and confidence in task performance. Through the use of an objective measure, it was identified that all participants had good metacognitive monitoring ability. However, an objective approach was not extended to Chapter 7 to assess whether help-seeking behaviour itself was influenced or if the impact was limited to attitudes and beliefs. The inclusion of an objective measure would have allowed for more definitive conclusions to be drawn in the final empirical chapter.

Despite these limitations, the thesis has made a contribution to addressing an existing gap in the research, and offers a basis for future research to extend the studies included.

8.5 Future directions

A key development for future research would be the inclusion of a clinical sample. The thesis took a continuum approach, focusing on autistic traits in a non-clinical sample, however, it could be extended to include clinical as well. In doing so, the thesis would capture individuals on the higher end of the spectrum and therefore be more in line with the spectrum approach in terms of assessing the full range of autistic traits (McLeod & Anderson, 2022). Capturing the continuum of traits allows for a wider range of results with research suggesting there may be a difference between the populations for a range of properties associated with autistic traits. For instance, as discussed in section 4.1.4, alexithymia is more commonly reported in autistic individuals, although those with higher levels of traits in the general population are more likely to experience alexithymia compared to those with low levels of autistic traits (Albantakis et al., 2020). For anxiety, Normansell-Mossa et al. (2021) report that increased anxiety is associated with a significant increase in autistic traits in autistic adults. Identifying a relationship supports the need to consider the full range of traits, and highlights the variability that exists even within clinical samples. If recruiting from both clinical and non-clinical populations the inclusion criteria of future research must consider whether individuals must have an official autism diagnosis to be autistic. When focusing on an adult sample, due to barriers to receiving a formal diagnosis, as outlined in section 1.1.1, some may choose to "self-diagnose" (McDonald, 2020). To account for little being known about individuals who self-identify as autistic (McDonald, 2020) future research can confirm with participants how their diagnosis has been validated (Fombonne, 2020). Being aware of when participants received a clinical diagnosis could also form part of the inclusion criteria if extending the research to a clinical sample. Cooper et al. (2021) suggest that autistic adults who received a later diagnosis and experienced difficulties that they did not have a full

understanding of may feel a stronger need to identify with the diagnosis. It is therefore possible that the time of diagnosis may impact the views of oneself, thus supporting self-awareness being studied in clinical populations while accounting for the age of diagnosis.

A methodological recommendation for future research is for the design to be developed so that it is longitudinal, which could span over two semesters during the first-year of university (Lei et al., 2020). To account for the transition to university being associated with a changing peer group and establishing new friendships (Lawrence et al., 2006) participants would complete the same measures at multiple timepoints to identify any trends. In doing so there would be stronger evidence for the potential relationships rather than just associations. Constructs including autistic traits, alexithymia, and ToM, are more stable and therefore would not be expected to change. It is unclear from existing literature whether the constructs of self-awareness and metacognition would change in a short time period. Beginning with self-awareness, Gordon et al. (2015) designed a programme to increase autism self-awareness and knowledge. Post-intervention, on average 12.5 weeks after initial assessment, autism self-awareness was significantly higher in the intervention group, with autistic children naming significantly more autism-related strengths and difficulties compared with the control group. Although specific to autistic children, self-awareness could develop over a relatively short time. For metacognition, specifically university students, it is suggested that metacognitive strategies can be developed relatively quickly in students so that they begin to think like academics (Tanner, 2012). Whilst there is research to suggest both constructs could develop over university semesters, the existing literature is specific to a targeted intervention or teaching of skills, which may be driving the change in constructs. Anxiety and self-esteem may be more variable and dependent on contextual changes. Hillier et al. (2018) reported that after a seven-week course focusing on improving outcomes, autistic university students reported significantly reduced anxiety and higher self-esteem. Identifying a change in these autistic traits correlates over a relatively short time period suggests they may not be stable. It is therefore important for future research to take a longitudinal approach, particularly as anxiety significantly mediated the relationship between autistic traits and self-awareness (see Chapter 6). Research also suggests that a lack of peer relationships can result in students feeling negatively about themselves and struggling with the transition (Friedlander et al., 2007). Once friendships are more established, they can have a positive impact in terms of emotional support for stress and providing help and encouragement for academic work (Scanlon et al., 2020). It is therefore possible that perceived benefits and costs of help-seeking could differ at the beginning of the year

compared to once students have fully transitioned to university. If a longitudinal approach was taken, and recruitment was from clinical and non-clinical populations, caution would be needed as Lei et al. (2020) identify that whilst students without an autism diagnosis report a reduction in their social network size and density over the first semester at university, autistic students do not report any significant changes. They proposed that students typically evaluate and change their social network ties as they settle into university, but autistic students do not follow the same process. Subsequently, if a longitudinal study were to be conducted, peer relationships would also be an important factor to include.

Future research should also consider the measures used throughout the thesis. For assessing autistic traits, alternative measures to the AQ were reviewed in Chapter 3 (see section 3.6.1.1). More recently though, there has been a measure for autistic traits developed (Adult Autism Subthreshold Spectrum questionnaire) which aims to assess a broader range of clinical and non-clinical traits, including those specific to females (Donati et al., 2019). Within a participatory research approach, which is slowly becoming more common and includes the autistic community, a key aim is to make research accessible to all members, including through the methodology used within research (Keating, 2021). The specific assessment of autistic traits, both clinical and non-clinical, could provide relevant and beneficial information to the autistic community, especially for those without a clinical diagnosis. Thus, including an additional measure would provide a stronger real-world context for the findings. From a researcher's perspective using the newer measure in conjunction with the established AQ measure would enable the reliability of the results to be assessed. There could also be developments for the perceived benefits and costs of help-seeking measure (used in Chapter 7). The measure was slightly adapted in the thesis so that email as a method of seeking help was included as a response to the COVID-19 pandemic. For the thesis, the pandemic affected the second data collection stage and learning activities being moved online (Fan & Lin, 2023). Whilst adding items specific to online help-seeking was a consequence of the pandemic, future research could also explore whether the perceived benefits and costs of help-seeking are the same for seeking help both in-person and online. Existing research has explored help-seeking behaviour in both contexts, although it has focused on the behaviour. Focusing on attitudes and beliefs would develop our understanding of patterns of help-seeking attitudes and beliefs in different contexts (Fan & Lin, 2023) which is an extension of the social and non-social context that has been explored throughout the thesis.

As well as exploring the social outcome of attitudes and beliefs toward help-seeking, a further avenue to explore is a non-social outcome. Chapter 6 reported that the non-social

autistic trait of details/patterns and private self-awareness was statistically mediated by metacognition and therefore there could be exploration with a non-social outcome. Although rarely investigated, one example is online help-seeking. An online format is believed to have fewer barriers (Hao et al., 2017) which could be important for students who are aware of their strengths and difficulties. Exploring support online is one example of a non-social context that could be explored, although future studies can consider other formats too. Exploring the non-social context is a response to the thesis identifying that public self-awareness (a social context) was associated with increased perceived costs of help-seeking, which could indicate specific difficulties for a social context. Investigating whether the details/patterns subdomain can be seen as a positive autistic trait in some contexts (Bury et al., 2020; Russell et al., 2019) or as a processing bias and a cognitive style in others (Happé & Frith, 2006) relate to a positive or negative academic outcome would be an extension of the thesis. There could then be a comparison to the social context findings to develop our understanding of the context of the constructs and help to tailor support provided by universities.

Finally, whilst attitudes and beliefs toward help-seeking were explored in the last empirical chapter, the impact of these on success is unknown, for example on academic outcomes, employment, or quality of life (Gurbuz et al., 2019). Specifically, there is no consideration of the possible implications on either university success or upon graduating and therefore needs developing in future research. Before investigating further outcomes, future research can test a proposed theoretical model from the results of the thesis which could not be tested due to a restricted sample size.

8.5.1 Proposed theoretical model for attitudes and beliefs toward help-seeking

The thesis has identified that the statistical mediation effect of trait anxiety within the relationship between social skills and public self-awareness was significant. Furthermore, public self-awareness positively correlated with the perceived costs of help-seeking suggesting that paying more attention to oneself as a social entity is related to increased perceived costs of seeking help from others. Although trait anxiety and social skills, from the statistical mediation model, did not correlate with the outcome they are still included in the theoretical model as it may be due to lacking statistical power because of the sample size. The potential effect of the sample is demonstrated by the social skills subdomain not correlating with public self-awareness when there was a reduced sample, but correlating with the larger sample in an earlier chapter. See Figure 6 for the proposed theoretical model.

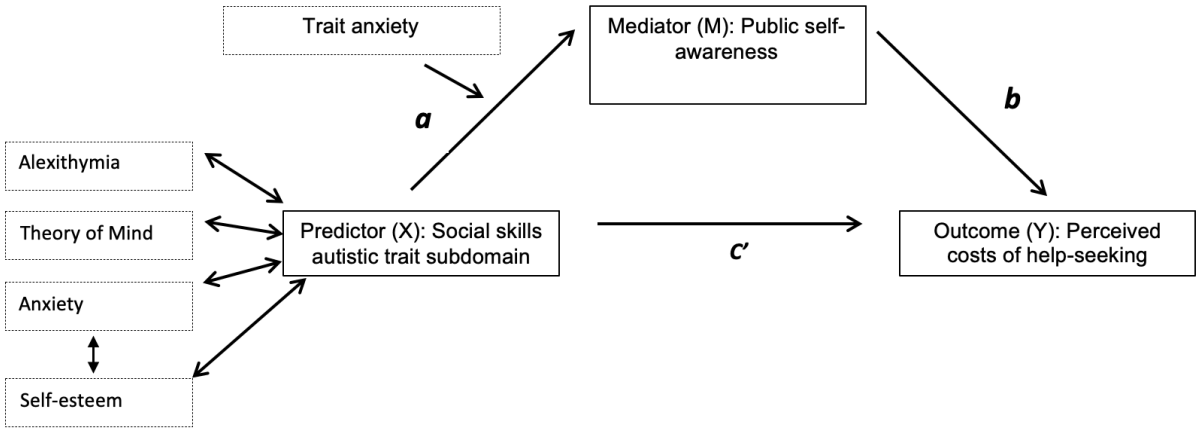

Figure 6

Theoretical Model for the Relationship Between the Social Skills Autistic Trait Subdomain and Public Self-Awareness as Mediated by Anxiety on the Perceived Costs of Help-Seeking.

Exploring the theoretical model in future research would build on findings from throughout the thesis. One of the key findings is that it seems necessary for the constructs being studied, autistic traits, self-awareness, and the mediating factor, to be from the same context (either social and refer to others or non-social and focus on the self). Exploring the association between the social skills subdomain and the perceived costs of help-seeking through public self-awareness would further our knowledge of autistic traits from a continuum approach, specifically whether increased public self-awareness has a relationship with the perceived costs of help-seeking, an outcome that has practical value in terms of educational success of students.

Understanding the relationship could have positive ramifications on the experiences of university students. First, if university staff are aware of difficulties associated with help-seeking, and assuming there is an effect on behaviour, then university practices can be developed so that there are alternative formats of support available. Providing alternative non-social formats acknowledges the effect of the social skills autistic trait subdomain and how the subdomain may be a barrier toward help-seeking. It is also consistent with existing literature which has identified that as well as it being important to build in time for questions, using alternative methods that use technology, e.g., discussion forums, can provide an opportunity to ask questions (Micari & Calkins, 2021). With the findings in the thesis suggesting university students in a non-clinical sample do not have difficulties with their self-awareness, a second benefit of exploring university experiences is that if students actively

consider their attitudes and beliefs then they may be able to identify more appropriate sources of help. In doing so there may be positive effects on some of the correlates of autistic traits. For instance, anxiety may be reduced and self-esteem increased, both of which are beneficial for overall well-being. As well as this, being aware of potential concerns about seeking help also enables a potential change at the university level. Identifying the relationship between public self-awareness and perceived costs suggests a concern of others, both peers and staff, therefore there could be more consideration of how members of staff respond to questions. For instance, ensuring that there is a welcoming attitude to questions, with Micari and Calkins (2021) identifying that staff enthusiastically encouraging questions promoted a positive outcome. A third benefit of understanding the relationship between autistic traits, self-awareness, and the perceived costs of help-seeking is that it provides a deeper understanding that autistic traits can affect university students without a diagnosis. A greater appreciation of autistic traits as a spectrum could encourage universities to offer the necessary support to students who need it. The non-diagnostic approach is consistent with the proposal by McLeod and Anderson (2022) that support should not be restricted to those with a formal autism diagnosis. Alongside the potential benefits for students, there are some specific contributions relating to the overarching aims of the thesis.

8.6 Conclusion

Altogether there were three overarching aims. First, to investigate the psychometric properties of the AQ. The second overarching aim was to understand the relationship between autistic traits and the self, specifically whether autistic traits are differentially related to the different aspects of self-awareness and metacognition. Third was to explore how knowledge of the self relates to attitudes and beliefs about seeking help from others.

By addressing the first overarching aim, a reliable model for assessing autistic traits in the sample was identified. Identifying the three-factor model as appropriate for the data set indicates that an alternative factor structure to the original five-factor model might be more appropriate for a non-clinical university population. Meanwhile, addressing the second and third aims has provided novel insights into the self in relation to autistic traits. Assessing the overall constructs of self-awareness and metacognition indicated a positive correlation, although when assessing them via their subdomains there was a difference between private and public, as private self-awareness did not correlate with cognitive confidence (lack of) whereas public did. The difference suggests the constructs should be explored separately.

When focusing on the relationship between autistic traits and self-awareness, although no direct relationship was found between autistic traits (aggregate score) and self-awareness (subdomains), identifying their indirect relationships provides a more nuanced understanding of these dynamics. A unique contribution of the research is the demonstration that specific subdomains of autistic traits differentially relate to different aspects of self-awareness being measured. In addition, the results highlight that for the social model, which identified a statistical mediation, each of the relationships involves constructs from the same context involving references to the self and others. It can therefore be inferred that the influence of a specific trait profile is contingent not only on the nature of the autistic trait and the mediating factor but also on their alignment within the same context. Reviewing these results holistically reveals that autistic traits are associated with an increase in self-awareness.

The findings have also contributed to our understanding of how self-awareness interacts with an outcome which has a crucial metacognitive component. Public self-awareness was associated with higher perceived costs of seeking help from others, suggesting that greater self-awareness could unintentionally result in difficulties for students. The findings support the idea that self-awareness relationships are context-dependent, in terms of being either social and referring to the self and others, or non-social and only referring to the self. Both public self-awareness and the perceived costs of help-seeking explicitly refer to others, whereas the other social constructs explored (social skills autistic trait subdomain, and anxiety) do not explicitly refer to others. Thus, when acknowledging the importance of context, in addition to considering whether the constructs are social or non-social, the results from the thesis lead to the recommendation of also assessing whether the constructs involve others or refer only to the self.

Overall, the findings from the thesis suggest that distinct subdomains of autistic traits are important for the relationship with both self-awareness and metacognition and autistic traits are related to how the self is viewed as a social entity in relation to others. Throughout the thesis, when assessing independent relationships, it is clear that the nature of the relationships are context-dependent and manifest differently in social (involving others) and non-social (referring only to the self) domains.

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List of Appendices

Appendix 1: Example Information Sheet

Canterbury Christ Church University

Understanding social behaviour: Examining social and communication ability in university students.

PARTICIPANT INFORMATION SHEET

A research study is being conducted at Canterbury Christ Church University (CCCU) by Kirstin Holsey. Supervised by Dr. Amanda Carr and Dr. Lance Slade.

Background

The previous parts to this research explored self-awareness of own behaviour and the potential effect social and communication ability has on how we understand and explain our own behaviour and the behaviour of others. The aim of this study is to investigate whether these constructs relate to help-seeking.

What will you be required to do?

Participants will be required to complete an online questionnaire measuring demographic information including student information and help seeking behaviour.

To participate in this research you must:

Be aged between 18 – 25 years (emerging adulthood age range).

Be in your first year at University.

Procedures

This is a follow up questionnaire to the previous task. It will follow a similar process to before, where you will read the statements and then indicate your response on the scale.

Feedback

No direct feedback will be provided. Upon request the findings (with anonymised data) will be available. No data will be identifiable.

Confidentiality

All data and personal information will be stored securely within CCCU premises in accordance with the GDPR, 2018, and the University's own data protection requirements. No unrelated or unnecessary personal data will be collected or stored.

The following categories of personal data will be processed: gender, age, course enrolled on, any learning difficulties and parents occupation. The personal information will be stored electronically and used to explore the effect of demographics. This data will not be identifiable in the research as it will be analysed collectively. This information will be stored securely online. Email addresses will also be securely stored on a separate password protected Excel sheet. This will also have your unique participant codes so that you can be contacted about lab bookings or if you wish to withdraw your data. All data can only be accessed by Kirstin Holsey, Amanda Carr, Lance Slade, Examiners and student researchers.

After completion of the study, all data collected will be made anonymous (i.e. all personal information associated with the data will be removed). Information will be held for 10 years. After this time, paper records will be shredded and electronic files will be destroyed by secure deletion (e.g. using Cipher in Windows).

Dissemination of results

The findings will be published as part of a Thesis. It is also likely to be presented at a Conference and submitted to publication.

Deciding whether to participate

If you have any questions or concerns about the nature, procedures or requirements for participation do not hesitate to contact me. Should you decide to participate, you will be free to withdraw at any time without having to give a reason.

Students will have no advantages or disadvantages regarding their academic course from their decision to participate or not to participate in the study.

Any questions?

Please contact Kirstin Holsey 01227 921281 or email kirstin.holsey@canterbury.ac.uk. You can also contact the supervisors by emailing amanda.carr@cantebrury.ac.uk / lance.slade@canterbury.ac.uk

Appendix 2: Example Consent Form

Canterbury Christ Church University

CONSENT FORM

Title of Project: Understanding social behaviour: Examining social and communication ability in university students.

Name of Researcher: Kirstin Holsey

Contact details:

Address:	North Holmes Road, Canterbury, Kent, CT1 1QU
Tel:	01227 921281
Email:	kirstin.holsey@canterbury.ac.uk

	Please initial box
1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.	
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.	
3. I understand that any personal information that I provide to the researchers will be kept strictly confidential	
4. I agree to take part in the above study.	
5. I agree to be contacted about any follow up studies that I can participate in.	
6. I understand that the unique code I created will be used to link my data from these studies.	

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Name of Person taking consent (if different from researcher)	Date	Signature
_____	_____	_____
Researcher	Date	Signature

Copies: 1 for participant and 1 for researcher

Appendix 3: Example Debrief

Canterbury Christ Church University

Understanding social behaviour: Examining social and communication ability in university students.

PARTICIPANT DEBRIEF SHEET

Thank you for participating in this study.

With the use of your Unique ID number, all of your data from the two timepoints will now be linked.

The main aims of this study were to:

- Explore how social and communication ability, and the known properties, relate to help-seeking.
- Explore how self-awareness relates to help seeking.

Within this study you completed a task relating to help seeking behaviour. The aim of this was to explore your attitudes towards help seeking and to investigate whether this relates to your social and communication ability and self-awareness.

If you would like additional information about this study, have any additional questions or wish to withdraw your data please contact Kirstin Holsey: kirstin.holsey@canterbury.ac.uk or a supervisor amanda.carr@canterbury.ac.uk / lance.slade@canterbury.ac.uk

If you do want to withdraw your data, please quote your participant ID number.

Once again, thank you for participating.

If this study has raised any personal issues please contact the student support and wellbeing advisors by emailing studentwellbeing@canterbury.ac.uk

Appendix 4: Structured Interview

1) Why did you choose this University? What factors influenced your choice?

2) In general, what did you expect University to be like? *

3) On a scale of 1 – 5, with 1 being none and 5 a lot - How much information did you have about what the University life would be like?

1 2 3 4 5

4) What did you expect classes and work to be like? *

5) On a scale of 1 – 5, with 1 being none and 5 a lot - How much information did you have about what classes would be like?

1 2 3 4 5

6) On a scale of 1 – 5, with 1 being none and 5 a lot - How much information did you have about what the Lecturers would be like?

1 2 3 4 5

7) What did you think University social life would be like? *

8) On a scale of 1 – 5, with 1 being none and 5 a lot - How much information did you have about what the University social life would be like?

1 2 3 4 5

9) What aspects of University were you looking forward to? *

10) What kind of things were you apprehensive about? *

11) How do you think the sense of who you are or what kind of person you are will change while you are at University? *

12) Thinking generally now. How do you feel in new social situations?

13) How would you rate your communication skills?

Poor Fair Good Very Good Excellent

Note. * The item is from an original measure by Pancer et al. (2020) which assessed expectations about university.

Items 12 and 13 were included to assess communication and social skills.

Appendix 5: Stimuli for the Non-Social Metacognitive Task

	Stimuli
Buffer words at the beginning	House, Fuse, Iron, Teeth, Rebel and Cart
Main pool of words	Palm, Desk, Bowl, Raid, Globe, Lime, Waist, Wing, Jelly, Bump, Baby, Green, Apple, Turn, Berry, Elbow, Seed, Salad, Stove, Pole, Deck, Tall, Youth, Tiger, Nest, Feast, Yard, Paint, Chest, Tomb, Swarm, Hound, Child, Ankle, Mine, Test, Alien, Meat, Vest, Easel, Ball, Owner, Knee, Flame, Hero, Widow, Penny and Worm
Buffer words at the end	Rifle, Scar, Coach, Stem, Ring and Manor

Appendix 6: Help-Seeking Measure

Two subdomains of the Mathematics Learning in the Classroom Questionnaire were used in the thesis, the benefits of help seeking and cost of help seeking, as reported in the work by Newman (1990).

How to fill out the questionnaire

Below are a list of statements. Please read each statement very carefully and rate how true the statement is for you. Rating ranges from (1) not at all true of me to (5) very true of me.
DO NOT MISS ANY STATEMENT OUT.

I think that asking questions helps me learn. *
1 2 3 4 5

I think that emailing questions helps me learn.
1 2 3 4 5

I think that reading additional materials helps me learn.
1 2 3 4 5

I feel smart when I ask a question. *
1 2 3 4 5

I feel smart when I email a question.
1 2 3 4 5

I feel smart when I read additional materials.
1 2 3 4 5

I think that asking the lecturer questions helps me learn. *
1 2 3 4 5

I think that emailing a lecturer questions helps me learn.
1 2 3 4 5

I think the lecturer might think I'm dumb when I ask a question. *
1 2 3 4 5

I think the lecturer might think I'm dumb when I email a question.
1 2 3 4 5

I think the lecturer will get angry with me when I ask a question. *
1 2 3 4 5

I think the lecturer will get angry with me when I email a question.
1 2 3 4 5

I feel scared about asking questions. *
1 2 3 4 5

I feel scared about emailing questions.
1 2 3 4 5

I feel shy about asking questions. *
1 2 3 4 5

I feel shy about emailing questions.
1 2 3 4 5

I feel like it's just too much of a bother to ask questions. *
1 2 3 4 5

I feel like it's just too much of a bother to email questions.
1 2 3 4 5

Note. * The item is from an original measure by Newman (1990). The wording has been slightly amended so that the items were relevant to this sample, so that maths was not referred to and instead of teachers there is reference to lecturers.
Additional items were added so that non-social ways of help-seeking were included alongside the social aspect of asking for help.