



PHD

Helping students on the autism spectrum transition to university

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Helping students on the autism spectrum transition to university

Jiedi Lei

A thesis submitted for the degree of Doctor of Philosophy

University of Bath

Department of Psychology

May 2020

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A handwritten signature in black ink, appearing to be 'Jiedi Lei', is centered at the bottom of the page. The signature is fluid and cursive, with the first name 'Jiedi' being more prominent than the last name 'Lei'.

Declaration of authorship

I am the author of this thesis, and the work described therein was carried out by myself personally, with the exception of Chapters Three, Four, Five, Six and Seven whereby the breakdown of work that was carried out by other researchers is as described below:

Formulation of ideas: Predominantly executed (95%)

Design of methodology: Predominantly executed (95%)

Experimental work: Predominantly executed (100%)

Presentation of data in journal format: Predominantly executed (95%)

Throughout my PhD, I received ongoing support from my supervisors regarding the research projects, hence the 95% scores for the formulation of ideas, design of methodology and presentation of data in journal format sections. I independently carried out all data collection regarding experimental work including recruitment, data collection and data analyses.

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A note on language

There is much debate around language use when describing autism. One UK-based study (Kenny et al., 2016) reported that members of the autism and autistic community have a preference for identity-first language (i.e., autistic person), whilst professionals prefer to use person-first language (i.e., person with autism). However, others have highlighted that the semantic choices when choosing language is far more ambiguous (Vivanti, 2020), and more neutral terms such as “on the autism spectrum” may be more widely accepted and elicit less polarising views as opposed to either identity or person-first language (Bury et al., 2020) . Given the ongoing debates, this thesis adopts a range of terminologies and language when describing autism throughout the chapters.

Another note is on the use of the term “stakeholders” throughout the thesis, which mostly refer to individuals who are involved in supporting autistic students to transition to university, such members of the university disability support team, faculty members and personal tutors.

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Abstract

Students transitioning to university face increasing academic, daily living, and social demands, and experience changes in both the structure and function of their social network. The ability to form new social ties and develop a new supportive social network at university may be related to students' social competency at the start of university. For autistic students, their social communication difficulties can limit their ability to form new social ties at university and affect their ability to access the support they need to address challenges across academic, daily living, and social aspects of university life. Many students also experience elevated levels of mental health difficulties such as greater social anxiety, which in turn can affect students' social confidence in building a new social network at university during the transition process. Beyond that of accessing support from others, transition to university also marks an important developmental milestone towards independent living and adulthood. Therefore, understanding to what extent students are self-determined at university to shape their own experiences can also help university stakeholders identify ways to support students to become more autonomous and competent in their daily lives, and develop more meaningful relationships at university.

This PhD thesis uses mixed methods to examine in both autistic and typically developing students: 1) structural and functional changes in students' social networks during transition to university through social network analysis; 2) students' perception of self-determination in shaping their own university experience.

Chapter One (Introduction) provides an introduction to the thesis through a review of Autism Spectrum Disorder (ASD) theories, and current understandings of the strengths and difficulties autistic students face when transitioning to university relative to typically developing students. An overview of current literature examining changes in social network structure (SNS; including both online and offline social contacts) and perceived social support (PSS), as well as self-determination at university offers insight into current research gaps and identifies and justifies the rationales behind research questions that this thesis will examine. Chapter Two provides a systematic review of

literature to examine current understanding of how changes in SNS and PSS can affect transition to university in first year undergraduate students.

Chapter Three empirically examines the development and piloting of a novel online tool that can assess changes in social network structure (SNS) and perceived social support (PSS) during transition to university in both autistic and typically developing students. Chapter Four is a cross-sectional study that investigates differences in SNS and PSS in a sample of autistic and typically developing first-year university students who are group matched on various demographic characteristics (e.g., ethnicity, sex, age, subject of study at university) and pre-university academic performance. Chapter Five is a longitudinal study that investigates how changes in SNS and PSS over the first year of university, as well as levels of autistic traits and social anxiety, can affect university transition outcomes for both autistic and typically developing students in their first year of university.

To better understand students' perceptions of their SNS, Chapter Six uses mixed methods to evaluate the development and delivery of a workshop to help autistic students transitioning to university understand the functional values of their social network structure. The workshop helps students to plan for potential changes in SNS and PSS during transition to university and gather student feedback regarding the use of social network maps to understand social transition changes.

Beyond understanding how perceived social support from others within one's social network can support students' transition to university, it is also important to gain insight into how students perceive themselves to be self-determined when shaping their university experience in order to successfully transition *into, through* and *out of* university. Chapter Seven uses qualitative methodology by conducting semi-structured interviews with both autistic and typically developing university students and recent graduates on their perceptions of their own self-determination when shaping their own experiences at university. Chapter Eight interprets and discusses the findings from all empirical chapters with reference to theory and practical implications for university stakeholders, as well as highlighting study limitations and future directions.

Chapter One

Transition to university for autistic students: Current understanding and future directions

Autism Spectrum Disorder (ASD) is a pervasive neurodevelopmental condition that affects one in 54 children (Maenner, 2020). ASD is characterised by having social communication difficulties, and restricted and repetitive behaviours and interests (American Psychiatric Association, 2013). In addition to the core challenges associated with ASD, between 11-84% of autistic children also experience co-occurring mental health difficulties, with up to 40% reporting having a co-occurring anxiety disorder such as specific phobia, and social anxiety disorder (Simonoff et al., 2008; van Steensel et al., 2011; White et al., 2009).

Throughout an autistic individual's lifetime, there is a continued level of high opportunity cost, with relatively fewer autistic young adults being able to transition to higher education systems, employment and independent living following graduation (Knapp et al., 2009; Lucas & James, 2018). It is estimated that 42% of autistic individuals have an IQ in the range of average to above average (IQ >85) (Maenner, 2020), and thus have the cognitive ability to enrol at a postsecondary institution for further education within six years of graduating from secondary school (Sanford et al., 2011). However, academic attainment and retention rates for autistic students are significantly lower compared to students from other disability groups and their typically developing (TD) peers (Gobbo & Shmulsky, 2014; Hendricks & Wehman, 2009; Lucas & James, 2018).

In the US, it is estimated that only 35% of autistic students completed their postsecondary education, which is lower than 38% of graduation rate for students with other disabilities, and 51% of TD peers (Gobbo & Shmulsky, 2014). Similarly, in the UK, fewer autistic students graduated from university with either a 2:1 or first class honours degree (62.8%) compared to students with other forms of disabilities (66%), and TD peers (68.1%) (Lucas & James, 2018). Furthermore, within six months of completing their degree, autistic students are more than twice (18.5%) as likely to be unemployed compared to students with other disabilities (7.2%), and almost four times as likely to be unemployed compared to their TD peers (5.1%) (AGCAS Disability Task Group, 2014). Taken together, the low retention rate during postsecondary education and poor employment rate for autistic

students transitioning into adulthood can significantly challenge their ability to live independently, and increase both lifetime care and opportunity cost, which is estimated to be at a staggering £920,000 for an autistic individual without intellectual disability (Buescher et al., 2014).

In recent years, there has been an increase in awareness and research to help better understand the challenges associated with transitioning to postsecondary education for autistic students, in order to provide better individualised support programmes that aid transition to higher education studies for autistic students (Jackson, Hart, & Volkmar, 2018). It is important to acknowledge that transitioning to university for the first-time can be challenging for any student. As students move away from their familiar social network and system of support to a novel environment, students not only need to establish a new social support network, but also face increasing academic demands, and learning new daily practical independent living skills (Compas et al., 1986; Fisher & Hood, 1987).

For autistic students, many of the challenges associated with transitioning to university may become magnified when considered alongside their core and additional mental health difficulties (Jackson, Hart, Brown, et al., 2018; Jackson, Hart, & Volkmar, 2018). In a pivotal systematic review by Gelbar, Smith, and Reichow (2014) found that among autistic students at university, up to 71% reported symptoms of anxiety, 53% reported loneliness, and 47% reported symptoms of depression, highlighting the poor state of mental health and wellbeing of many autistic students during their postsecondary education. Compared to their peers, autistic students often struggle in the complex university social setting due to their social communication differences and often co-occurring symptoms of social anxiety, and therefore may be less successful in developing a new social network at university and making friends (Adreon & Durocher, 2007; Dipeolu, 2014).

Many autistic individuals also have restricted interests and preference for routine that make them less adaptable to transitional changes when moving to a new environment, and experience hypersensitivity to light and noise on campus which can affect their ability to learn and overall quality of life (Dipeolu, 2014; Fleury et al., 2014; Mulder & Cashin, 2014; Sarrett, 2018). In addition, many autistic individuals experience executive functioning difficulties (such as planning, organisation, and working memory), and may have greater trouble in organising their daily practical living (such as time and finance management) compared to their peers (Barnhill, 2016). Autistic students also face

additional challenges such as choosing whether or not to disclose their diagnosis which can have a direct impact on their ability to access support, and may alter peer perceptions of their behavioural and social difficulties (Brosnan & Mills, 2016; Dipeolu, 2014; Fleury et al., 2014). Finally, it is important to acknowledge that there are some strengths associated with autism - such as autistic individuals' attention to detail and perseverance in their particular subject of interest can lead to greater academic achievements at university (Gobbo & Shmulsky, 2014; Jackson, Hart, Brown, et al., 2018). This uneven profile of potential academic strengths, together with social and daily practical living difficulties needs to be taken into consideration for autistic students when formulating their transition plans for attending university.

Despite the many challenges highlighted in literature for autistic students, it is important to acknowledge that the passage of transitioning to independence and young adulthood has long been thought to be a turbulent time regardless of autism diagnosis (Compas et al., 1986, 1986; Felner et al., 1983; Tinto, 1975). In addition, autistic traits form a continuous spectrum and there are many students at university who, although they might lack an official diagnosis of ASD, nonetheless show elevated levels of autistic traits and might share some similarities in the difficulties they experience when compared to those with a formal diagnosis of autism (White et al., 2016). Furthermore, beyond the social communication difficulties associated with autistic traits, level of social anxiety might also affect both autistic and TD students' social competency when navigating increasingly complex social environments at university, as the change in surroundings might lead to periods of heightened social anxiety and fear of negative evaluation by unfamiliar peers.

Therefore, taking into account that transitioning to university may be challenging for all students, though autistic students may present with additional vulnerabilities, it is crucial to ensure that students receive sufficient support from their social network in order to help overcome the different types of challenges they face, and subsequently improve rates of retention and graduation from postsecondary education. Compared to parents of TD students, parents of autistic children and young people often provide much more diverse and frequent support across social, academic, and practical daily living skills (Camarena & Sarigiani, 2009; Fleischer, 2012). Many autistic students also find that support provided by their family and relatives to be more helpful than that provided by

professionals at university (Geller & Greenberg, 2009; W. Mitchell & Beresford, 2014), as family members tend to have a better understanding of their difficulties and can provide more tailored support to meet the student's needs. In contrast, TD students often report a decrease in familial support, and an increase in support from peers for informational, academic and personal/emotional purposes (Hays & Oxley, 1986; MacLeod & Green, 2009). Identifying both changes in social network structure (SNS) and perceived social support (PSS) during transition to university may help stakeholders to better formulate a systemic support structure that best integrates different sources of social support from family, professional, and peers to ensure continuation of high-quality support for autistic students during transition to university.

Finally, compared to the large body of literature summarising difficulties autistic students experience when transitioning to university, little is known about the extent that autistic students are able to support themselves and act autonomously at university (Barnhill, 2016; Demetriou et al., 2018; Demetriou et al., 2019; Ozonoff et al., 1991). At the time of university transition, adolescents are beginning to develop a stronger sense of autonomy and independence, as well as developing self-driven problem-solving skills. Having a stronger sense of self-determination at university has been associated with better transition outcomes amongst students with learning disabilities and specific learning difficulties (Field et al., 2003; Getzel & Thoma, 2008; Ju et al., 2017; Petcu et al., 2017; Sarver, 2000). Self-determination refers to having a sense of agency when completing a task or goal-oriented action when accompanied by a sense of autonomy (i.e., the ability to self-regulate and self-initiate one's own actions); competence (i.e., having the right understanding, skills, and knowledge to achieve the desired outcome in line with one's goal); and relatedness (i.e., having a secure and satisfying social network) (Deci et al., 1991; Deci & Ryan, 1985; Ryan & Deci, 2000). In comparison to students with other disabilities, autistic students show poorer levels of self-determination (Chou et al., 2016). Improving autistic students' self-determination has been highlighted by Wehmeyer et al. (2010) as an important area for educators to target, and self-determination is positively associated with quality of life (White et al., 2018). Understanding the extent to which autistic students perceive themselves to be self-determined in shaping their own university experience can help stakeholders

identify potential barriers that can be targeted to help autistic students feel more autonomous, competent, and better connected during their university career.

This literature review has five aims. First, this review will provide an account of the dominant theories in the literature underlying our understanding of autism, and how they may help contextualise some of the university transition challenges associated with academic, daily practical living, and socialisation difficulties autistic students experience at university. Second, this review will examine potential shared vulnerabilities that autistic and TD students might have when socialising at university, especially in relation to theories underlying social anxiety. Third, this review will evaluate changes in both SNS and PSS faced by autistic students during transition to university, highlighting how different sources of social support may relate to university transition outcomes. Fourth, this review will examine our current understanding of self-determination in autism, especially in relation to university transition. Finally, gaps in the literature and the main aims of this thesis will be outlined.

1. Autism theories and challenges at university

The key theories described in this review will first address current understandings of the social difficulties associated with autism, before examining more general differences in cognitive style associated with autism that may lead to both strengths and weaknesses.

1.1 Theories underlying social communication differences in autism

There are three main theoretical accounts seeking to explain social communication differences in autism. The first account is the Mindblindness Theory (Baron-Cohen, 1997, 2000; Baron-Cohen et al., 1985; Lombardo & Baron-Cohen, 2011), which states that autistic individuals have Theory of Mind (ToM) difficulties. ToM is the ability for an individual to understand another person's mental states, such as desires, goals, and intentions, by detecting and utilising social and environmental cues in a given social interaction (Baron-Cohen, 1989), which can then be used to help monitor and predict other people's actions (Sabbagh, 2004). The development of ToM emerges in infancy, when infants are able to monitor, coordinate, and direct self and other people's attention to a common object of interest, which can lead to affect sharing (Charman, 2003; Mundy et al., 1994). In autistic children, there is often a developmental delay in joint attention and ToM skills, and this diminished ability to monitor both self (metacognition) and others' mental states can lead to more

pronounced social difficulties as children enter a more complex social scene during adolescence and adulthood (Howlin et al., 2000; Zager & Alpern, 2010).

However, the Mindblindness Theory has been criticised to only account for the cognitive aspect of empathy (Baron-Cohen, 2009; Singer, 2006). Empathy not only involves the recognition and understanding of other people's perspectives from a cognitive perspective (ToM), but also involves formulating an appropriate emotional response to other people's mental state and feelings, the latter is known as affective empathy (Kerr-Gaffney et al., 2019). The second and more recent Empathising-Systemising Theory of autism (Baron-Cohen, 2009) offers an integrated approach to consider both cognitive and affective empathy differences in autism. The relationship between cognitive and affective empathy in autism may be further complicated by a condition known as alexithymia which interferes with an individual's ability to recognise, describe, and interpret one's own emotions (E. Hill et al., 2004). Alexithymia is estimated to occur in ~10% of the TD population (Linden et al., 2014), and ~50% of the autistic population (Samson et al., 2012). Although there may be some construct overlap between cognitive empathy differences associated with alexithymia and autism, levels of autistic traits was found to be a better predictor of both cognitive, affective, and overall levels of empathy when compared to alexithymia (Shah et al., 2019). One recent study also revealed that compared to TD peers, the positive relationship between affective empathy and personal wellbeing is found only in the presence of greater cognitive empathy amongst autistic individuals (Bos & Stokes, 2019), further highlighting that social cognition differences affect more than simple social communication difficulties in autism.

In addition to understanding differences in cognitive and affective empathy in autism, the third theoretical account of autism which is heavily contested in the field is the Social Motivation Hypothesis (Chevallier et al., 2012), which assesses social behavioural differences by drawing upon biological and evolutionary perspectives. Given that some functional and structural neuroimaging findings which suggest that the neural circuit associated processing social stimuli, assigning emotional valence, and rewarding salience (i.e., orbitofrontal-striatum-amygdala) in autistic individuals differ from TD peers, such that social stimuli are found to be less emotionally salient and rewarding (Bachevalier & Loveland, 2006; Dawson et al., 2005), the Social Motivation Hypothesis

proposes that such biological differences result in a reduced desire and motivation to engage in social behaviours amongst autistic individuals. However, the inference of reduced social motivation from social behavioural differences has been challenged (Jaswal & Akhtar, 2019; Kapp et al., 2019), with some main critiques including that eye-gaze aversion from socially salient stimuli reflects heightened rather than reduced sensitivity to social stimuli resulting in discomfort (Markram & Markram, 2010; Tottenham et al., 2014). Research that have greater participatory involvement with the autistic community as well as using self-report and interview measures found that autistic individuals report qualitative differences in the type of relationships they maintain, such as more frequent relationships with other autistic individuals (Komeda, 2015; Strunz et al., 2017), rather than a lack of desire for close relationships. Taken together, it can be observed that the reasons underlying social communication and behavioural differences in autism are multi-faceted and are not limited to differences in social cognition.

Furthermore, it is important to acknowledge that any social experience is a dynamic and two-way interaction that is socially constructed based on a shared mutual understanding or empathy from both social partners (Milton, 2012). Therefore, whereas the different theories outlined above perceive social communication and empathy differences to reside solely amongst autistic individuals, they do not account for the fact that there may also be a lack of perceived empathy and understanding from non-autistic individuals when interpreting the behaviours, thoughts and intentions of autistic peers, which gives rise to the Double Empathy Problem (DEP) (Chown, 2014; Fletcher-Watson & Bird, 2020; Milton, 2012; Milton et al., 2018; Mitchell et al., 2019). Therefore, given that the goal of social communication is to establish a sense of shared and mutual understanding, examining potential factors from both social partners that can lead to misunderstandings during a social encounter is key. Fletcher-Watson and Bird (2020) highlighted that one factor that may contribute towards the misconception of poor empathy amongst autistic individuals by non-autistic peers is the difference in expressing an empathic response when reacting to emotional signals of others. In other words, autistic individuals' expressions may sometimes fall outside of what is perceived to be the "normal" and "typical" response, which in itself is a socially constructed concept dictated by societal norms and shaped by cultural differences. The lack of understanding from non-autistic peers when interpreting

the motivations and intentions behind the expressed emotion or response by autistic individuals can therefore result in misinterpretation in social communication (Fletcher-Watson & Bird, 2020; Milton, 2012; Milton et al., 2018).

It is therefore important to highlight that DEP can lead to unfavourable judgements of autistic people's behaviours and social communication skills by their non-autistic peers (Sasson et al., 2017; D. White et al., 2019). Such unfavourable judgements can lead to not only a less positive attitude towards autistic individuals, but also lower social motivation from non-autistic peers to socialise with autistic individuals. Interestingly, Sasson et al. (2017) noted that such perceptual biases held by non-autistic peers were no longer present when audio-visual information associated with autistic individual's social interaction was removed, suggesting that social presentation style may be a key factor driving such social communication differences, and distract from the content of what the autistic individual is trying to express. Therefore, finding ways to educate and raise non-autistic individuals' awareness of their own social biases to better understand their autistic peers is important to consider.

At the university level, although recent movements in neurodiversity and increased public awareness of autism have raised students' general level of knowledge about autism, the increase in knowledge was not associated with students' attitudes when interpreting autistic peers' behaviours (D. White et al., 2019). This suggests that such social perception biases may be entrenched in society, perhaps driven by more unconscious processes, and cannot be easily influenced by conscious knowledge of autism alone. In another study, Brosnan and Mills (2016) noted that typically developing students at university showed more positive affective responses when interpreting social behaviours in a vignette describing an autistic student who has disclosed their diagnosis, versus the same behaviours displayed by a student with no diagnosis being disclosed. Although the authors highlight that diagnosis disclosure may have a positive impact when interacting with peers, not all autistic students may feel comfortable to do so. Therefore, understanding the impact of social communication difficulties associated with autism for autistic students at university need to take into account the DEP, and acknowledge that the quality of quantity of social interactions experienced by autistic students can also be shaped by individual differences in empathy within TD peers and other

contextual factors (such as autism knowledge, social biases, and autism disclosure), rather than dependent solely on the autistic student's social skills.

1.2 Theories addressing broader differences and strengths in autism

In addition to the theoretical accounts underlying social communication differences considered above, another strand of difficulties commonly reported amongst autistic individuals are challenges associated with poor executive functioning (EF). EF is a broad construct that encompasses many cognitive abilities such as organisation, planning, working memory, self-monitoring, goal-setting, initiation, and flexibility (Demetriou et al., 2018; Demetriou et al., 2019; Ozonoff et al., 1991). Many EF abilities are governed by the prefrontal cortex, which shows a protracted developmental trajectory compared to more subcortical brain structures over the course of adolescence and young adulthood (Casey et al., 2008), resulting in an improvement across many EF abilities across development. EF abilities such as organisation and planning become increasingly more important as young people enter adulthood and start to live independently (Dijkhuis et al., 2020; Johnston et al., 2019), as many adaptive daily practical living skills such as managing one's time and finances, cooking, and seeking medical attention/self-care require an individual to be able to seek out and integrate different sources of information in order to formulate an effective plan to help achieve one's goals (Gilotty et al., 2002). It is important to note that although EF skills do not fully overlap and rely on one's IQ (Pugliese et al., 2015), EF difficulties can be more pronounced in autistic children with higher IQ, as the developmental gap between general cognitive capacity and adaptive living is much greater, and more difficulties across daily living skills become more noticeable as expectations for their skill acquisition is higher than for autistic children with lower IQ (Duncan & Bishop, 2015).

Aside from theories that account for areas of difficulties in autistic individuals, other theories underlying differences in cognitive styles also account for strengths in autism. As noted in the Dual Process Theory and Empathising-Systemising Theory, autistic students often demonstrate a more systematic way of thinking that is more logical, rational, and a more deliberate reasoning style compared to their TD students (Baron-Cohen Simon et al., 2009; Brosnan et al., 2016). In addition, autistic students also have a more detail-oriented attention focus (Happé, 1997), as noted in the Weak

Central Coherence Theory. Although detail-orientated cognition can sometimes lead to reduced ability to integrate different sources of information to help perceive the higher-level broader context (Frith, 2003), attention to detail along with a preference for logical and systematic thinking can often be advantageous in subjects in the fields of Science, Technology, Engineering, and Mathematics (STEM).

1.3 Understanding challenges and strengths at university through autism theories

The autism theories discussed so far provide context around understanding challenges associated with socialising, daily living, and academic areas of university life, as well as highlighting potential strengths that autistic students might have at university.

For socialisation, initiating and maintaining social interactions with social partners require individuals to have good ToM skills such as gauging the interests and mental states of one's social partner in the current moment, as well as bearing in mind the potential level knowledge of the social partner regarding the current subject of discussion, in order to tailor both the content and discourse of the interaction to keep one's social partner engaged (Zager & Alpern, 2010). Individuals need to be sensitive to changes in both subtle social and environmental cues through joint attention to facilitate evaluating other peoples' mental states, and the subtlety of many nonverbal social cues can be very challenging for autistic students to detect and utilise as they struggle with joint attention and ToM skills.

Joint attention and ToM differences therefore can result in many social challenges in university faced by autistic students. In one report, Gobbo and Shmulsky (2014) found that university faculty members noticed autistic students have trouble paying attention to nonverbal social cues that are crucial for maintaining a social interaction with one's peers and lecturers. This not only gave rise to both physical behaviours outside of the social norm (Longtin, 2014), but was also reflected within many students' rigid style of academic writing which failed to appropriately address the audience and hence received lower grades compared to their peers, therefore highlighting that ToM differences not only can lead to challenges in the social domain, but may affect academic performance.

In addition, individual differences in social motivation may also influence autistic students' social relationships at university. Many autistic students recognise the importance of making social

contacts at university with peers and lecturers, and social interactions such as group work sessions and seminars are often a required part of the university curriculum (Hees et al., 2015). However, autistic students often find navigating the social scene to be very exhausting. Jackson, Hart, Brown, et al. (2018) found that over 75% of autistic students reported struggles with social isolation and adapting to the social environment, despite many reporting having satisfactory relationships with close friends and romantic partners at university. For many autistic students, friendships are often formed around mutual interests and activities that they enjoy, and although friendships are described to be close and reciprocal by many autistic students (Zeedyk et al., 2016), few rely on friends for support at times of need (Wehman et al., 2014). Therefore, despite having a structural social network in place, the functional social support network is often missing (Bauminger & Kasari, 2000), which might contribute to feelings of isolation when autistic students seek support.

In contrast to Jackson, Hart, Brown, et al. (2018), Orsmond, Krauss, and Seltzer (2004) found that 50% of autistic adolescents and adults sampled did not have close friends, further highlighting the persistence of social impairments across development for autistic individuals. Although the authors conjecture that some autistic individuals might lack the motivation to seek out social interactions and have low sociability (Chevallier et al., 2012), it should be highlighted that between 53-75% of autistic students experience loneliness (Gelbar et al., 2014; Jackson, Hart, Brown, et al., 2018), thus highlighting that developing and maintaining friendships at university is a major challenge faced by many autistic students.

While ToM and social motivation differences may be intrinsic to autism, there are also external and contextual factors which may play a significant role in university transition outcome in the social domain, such as bullying. In a recent report that investigated changes in the nature of bullying across different developmental stages amongst autistic university students, DeNigris et al. (2018) found that autistic students experienced less severe bullying at university compared to school. The nature of bullying at university was found to be less physical and more verbal compared to early development, and autistic students who have been subjected to chronic bullying throughout their life showed both positive and negative outcomes, with some reporting being able to better support others who are subject to bullying, and others reported more mental health difficulties such as suicidal

ideations and lack of trust. One important finding was that autistic students at university did not report more bullying compared to their non-autistic peers, and therefore highlight that bullying may be a more general broader issue that all students at university face, rather than autistic students being targeted due to their condition.

In terms of daily living, compared to their TD peers, many autistic individuals experience difficulties with EF skills such as organisation, planning, and flexibility throughout their development (Geller & Greenberg, 2009; Hewitt, 2011), and often require a high level of external structure or routine established with the assistance from parents and other support workers in order to cope with daily living challenges. However, difficulties with EF skills become more pronounced as students begin to transition to independent living such as when starting university (Rosenthal et al., 2013), whereby skills such as being able to flexibly adapt to changes in routine, and organise and plan one's own activities are often essential for coping with daily living challenges (Hewitt, 2011). Amongst autistic individuals, EF difficulties are often associated with poor adaptive functioning, and account for one's ability to initiate a range of activities essential for independent living ranging from socialisation and communication skills such as initiating social contact with others, to daily practical living such as cooking, self-care, time and finance management (Pugliese et al., 2015; Sparrow et al., 2005).

The protracted development of and difficulties with EF skills are often evident from childhood for many autistic individuals, as parents and other caretakers often take on the role to construct highly structured activities and environments to compensate for difficulties in organisation and planning, and this might further reduce the number of opportunities that autistic children have for developing these skills. For example, when students leave home and transition to university, many students may struggle to organise and plan a new routine to help them cope with everyday life at university, and the less structured university timetable compared to secondary education might make a strict routine quite difficult to establish and follow and this lack of routine can be both stressful and anxiety-provoking (Geller & Greenberg, 2009; MacLeod & Green, 2009). Another example is related to finance management. Geller and Greenberg (2009) reported that parents of autistic children often avoid giving their children opportunities to manage money during childhood due to children's poor

organisation skills. As a consequence, many autistic students cannot practice managing small amounts of money on a daily basis, and therefore might encounter greater difficulties in managing finances when they transition to university. Other challenges such as time management can also interfere with one's academic potentials at university, as students often need to plan and organise their own schedules for meeting coursework deadlines, attending lectures, and revising for exams (Geller & Greenberg, 2009), which can be very challenging for autistic students to complete independently without external support (Longtin, 2014). Therefore, EF difficulties experienced by many autistic individuals accounts for additional problems outside of their autism symptom severity and IQ that might further compromise their quality of life and ability to live independently.

In contrast to many challenges in the social and daily living domain faced by autistic students at university, academic studies can be an area of relative strength (Anderson et al., 2018; Geller & Greenberg, 2009; Jackson, Hart, Brown, et al., 2018). University often provides autistic students with an opportunity to focus on their area of special interest, for which they are often very passionate about from a young age and display greater depth of knowledge and originality in thinking compared to their TD peers, both of which are both academic strengths (Geller & Greenberg, 2009). There is also evidence to support the potential increase in aptitude for studying STEM subjects as outlined by the detail-oriented attentional focus in Weak Central Coherence Theory, and the more systemising and logical cognitive style depicted by the Empathising-Systemising and Dual Process Theory. It has been reported that 34% of autistic students at university enrol in a STEM course, compared to only 23% of their TD peers (Shattuck et al., 2012). This higher specialisation in STEM degrees may be particularly attractive for many employers in the finance, engineering, and scientific industries to consider, and ensuring that autistic students at university can receive sufficient training they need to become highly skilled professionals in these disciplines might help to increase their employment rate following graduation (Shattuck et al., 2012).

However, it is important to note that despite their academic strengths, autistic students often encounter many other challenges that might interfere with their academic performance at university. For example, their social and communication difficulties, as well as co-occurring symptoms of social anxiety and low mood, might have a negative impact on their participation in many group-based

coursework related activities, which can often be a mandatory aspect of many universities' academic courses (Adreon & Durocher, 2007). In addition, poor time management skills related to EF difficulties might also reduce their ability to adhere to coursework deadlines and devise revision timetables when preparing for exams, and sensory hypersensitivity may also interfere with their ability to study both in lectures and independently at university (Hees et al., 2015). It is therefore particularly important for autistic students at university to receive sufficient academic support, which both caters for differences in their cognitive style, but also can recognise and utilise their strengths to help students realise their full academic potential.

1.4 Mental health difficulties at university

For many autistic students at university, co-occurring mental health difficulties can be very common, with the most prevalent being anxiety (71%) and depression (47%) (Gelbar et al., 2014), which is three to five times higher than the estimated 15.6% prevalence rate amongst their TD peers (Eisenberg et al., 2007). In a more recent report, Jackson, Hart, Brown, et al. (2018) also found alarmingly high rates of suicidal ideation amongst autistic students at university, with over 75% having had some form of suicidal ideation and behaviour in the past, and 14.6% having attempted suicide. This figure is over six times greater than the number of TD students at university (12.6%) who have experienced suicidal ideation (Wilcox et al., 2010). It is therefore important for stakeholders when formulating transition plans and systems of support for autistic students moving to university to not only factor in challenges associated with core ASD symptoms, but also to account for this increased vulnerability of experiencing co-occurring mental health difficulties at university for this group of students.

2. Understanding shared vulnerabilities at university

2.1 Autistic traits lie on a continuum

Although literature to date characterised many challenges associated with transitioning to university for autistic students, it is unclear to what extent such challenges may be unique to autistic students due to lack of a TD student comparison group. In addition, levels of autistic traits may be conceptualised to fall on a continuum in the non-clinical general population, such that there may be shared challenges between TD students who exhibit high levels of autistic traits and autistic students

(Jobe & White, 2007; Trevisan & Birmingham, 2016; White et al., 2011). One study in a sample of 667 undergraduate students in the US found that high levels of autistic traits were present amongst 0.7-1.9% of the student population, and that higher scores of autistic traits also correlated with greater levels of social anxiety, suggesting the co-occurrence of broader non-autism specific social communication difficulties (White et al., 2011, 2012).

Differentiation between different aspects of autistic traits and transition outcomes have also been found amongst TD students, with difficulties in pragmatic language shown to have the most widespread negative impact across students' social, academic, and personal-emotional adjustment, suggesting that poor social communication skills may affect students' ability to access social resources for both academic and non-academic support (Trevisan & Birmingham, 2016). In contrast, greater levels of insistence on sameness and reduced social motivation had more specific impact in personal-emotional and social adjustments (Trevisan & Birmingham, 2016), and were also associated with more long-term romantic relationships and fewer friendships in young adulthood (Jobe & White, 2007).

Individual differences in social motivation also have a different impact on the formation and maintenance of relationships at university. In a study that examined the degree of satisfaction with new roommate relationships amongst TD students transitioning to university, it was the relative and not the absolute level of social orientation and motivation between the different roommates that predicted quality of relationships formed over time, such that roommates who had the greatest discrepancy in their respective degrees of social motivation found the relationship to be least satisfactory (Faso et al., 2016). Therefore, it seems that although having greater social motivation may lead to a greater number of new social connections established towards the start of university, finding similarly minded people who may share social preferences and broader interests may be more important to consider when forming new meaningful relationships. In contrast, studies found that when taking into account overall levels of autistic traits, having higher social motivation no longer predicted the duration of existing friendships in TD university students (Jobe & White, 2007), suggesting that supporting students to address social cognition differences may be an important step in maintaining friendships over time.

Despite studies highlighting the potential impact that autistic traits may have on TD students' socialisation at university, several limitations should be considered. Firstly, it is unclear whether the current patterns of structural changes in social relationships at university over time for TD students are comparable to that of autistic students, as no studies included a direct autism comparison sample. Secondly, it is unclear to what extent differences in socialisation transition outcomes are uniquely associated with autistic trait related social communication difficulties, rather than co-occurring factors such as social anxiety. For example, one study which investigated potential construct overlap between self-report measures of autistic traits and social anxiety in a large sample of TD college students found that although there are overlaps in the measures of social motivation, anxiety, and avoidance behaviours, autistic traits was much more multi-faceted in terms of social communication difficulties captured, compared to a more focused social interaction and performance based difficulties assessed by a social anxiety measure (White et al., 2012). Higher levels of social anxiety might increase a young persons' vulnerabilities when engaged in reciprocal social interactions or when faced with potential peer evaluation, which may be especially relevant as students transition to the novel complex social scene at university. Therefore, it is important to not conflate symptoms of social anxiety with autistic trait/autism severity, and to gain an understanding of how each factor may differentially impact autistic and TD students' ability to transition to university.

2.2 Social anxiety also affects social communication skills

Social anxiety may present an added layer of vulnerability in addition to symptoms associated with autism and autistic traits, such as increasing social withdrawal and rigidity in social communication and behaviour. Social anxiety is characterised by having a marked anxiety and fear of negative evaluation (FNE) by others in social situations that can result in social avoidance behaviour (American Psychiatric Association, 2013). Cognitive models in TD individuals conceptualised social anxiety to begin with a negative mental representation of how one will be perceived by others in social situations (i.e., FNE) that leads to anticipatory worries and greater social withdrawal behaviours (Clark & Wells, 1995; Rapee & Heimberg, 1997). FNE can drive individuals to amplify and recall previous negative social encounters and ruminate over their behaviours after social interactions, and lead to maintenance of perceived negative self-performance in social situations, creating a negative

spiral that might lead to greater social withdrawal behaviours (Clark & Wells, 1995; Rapee & Heimberg, 1997).

The high co-occurrence between autism and social anxiety (found in up to 50% of autistic adults) (Maddox & White, 2015) has been documented by a large number of studies (Spain et al., 2018; van Steensel et al., 2011; White et al., 2009b). Many authors commented on the phenomenon of ‘diagnostic overshadowing’ where clinicians may conflate social communication difficulties that are related to social anxiety as part of autism, rather than reflecting a separate and co-occurring condition (Mason & Scior, 2004; Wood & Gadow, 2010). Wood and Gadow (2010) suggested a “true” comorbidity can only occur when the presentation of a secondary condition (such as social anxiety) alongside that of the primary developmental condition (such as autism) is phenotypically identical to that of TD peers. From a theoretical level, models proposed for social anxiety in autism bear differences compared to the cognitive model identified in TD peers. One such model is proposed by Bellini (2006), who hypothesised that the combination of hyperarousal and negative peer evaluation might result in greater social withdrawal and poorer self-regulation in social situations that result in heightened social anxiety (Bellini, 2006; Rubin & Burgess, 2001). Other risk factors for social anxiety in autism also include age, developmental and cognitive abilities, and social motivation, as autistic individuals who have greater insight into their social differences and a strong desire for high quality social relationships might be more prone to experience loneliness and have greater social-evaluative concerns (Bauminger et al., 2003; Bauminger & Kasari, 2000; Kuusikko et al., 2008; Sukhodolsky et al., 2008; White et al., 2012; White & Roberson-Nay, 2009). One recent study found that compared to younger autistic children (6-11 years), older children and adolescents (12-18 years) displayed greater social anxiety and fear of negative evaluation, further highlighting that greater social awareness across development paired with heightened social sensitivity during adolescence renders autistic youth more vulnerable to social anxiety as they get older (Varela et al., 2019).

Amongst autistic adolescents, elevated levels of social anxiety is mediated by greater self-reports of intolerance of uncertainty, sensory hypersensitivity, and alexithymia (poor recognition of bodily emotions and feelings; Brewer et al., 2016), all of which can further compromise an autistic young person’s ability to navigate increasingly more complex social situations in young adulthood

(Pickard et al., 2020), such as transitioning to university (Gobbo & Shmulsky, 2014). In contrast, more context-dependent individual differences in the pattern of cognitive, affective and behavioural appraisal of social situations have been observed for TD students transitioning to university, though students who showed greater FNE also displayed reduced social engagement (Campbell et al., 2016), and those with higher social anxiety over time were less satisfied with their university choice (Langston & Cantor, 1989; Strahan, 2003) and had poorer academic outcomes (Arjanggi & Kusumaningsih, 2016; Brook & Willoughby, 2015). Although both autistic and TD students may experience heightened social anxiety, it remains to be explored whether there may be similarities and differences in how social anxiety may affect each student group's transition to university experience.

3. Understanding social changes associated with university transition

3.1 Social Network structure (SNS) – Key metrics

Having outlined the myriad of academic, daily living, and socialisation challenges that autistic students encounter during transition to university, as well as potential shared vulnerabilities between autistic and TD students, it is important to identify not only what types of support are needed to optimise the transition process, but also to identify *who* should be involved in the support network to ensure that support is most easily accessible to students. One way to capture one's social relationships with other individuals is by characterising one's social network structure (SNS), by using social network analysis.

Social network analysis measures the diversity of one's social relationships via different metrics, with two key factors being network size and density (Scott, 2017). Network size is the number of network members that an individual is in contact with within their social network over a defined period of time. Social network size has long been known to play an important role in shaping the development of neocortex from an evolutionary perspective, where an increase in neocortex volume and gyrification is associated with larger social group sizes (Dunbar, 1998). Researchers have found that for humans, social network size can be as big as between 130 to 250 individuals (R. A. Hill & Dunbar, 2003), though the closer and more intimate inner circle which provides most functional support to individuals are often no larger than 10-15 individuals at any given time (Dunbar & Spoors, 1995). This implies that the relationship between the amount of supportive resources available to an

individual does not always have a linear relationship with social network size and may plateau when the size of the inner circle is at its maximum. Therefore, understanding how individuals may access support from members of their inner circle may shed light onto the relationship between the structural and functional components of one's social network.

Network density is the extent to which different members of the same social network have reciprocal interactions with each other. Network density is a dynamic construct which depends on the network composition across one's lifetime, and the relationship between this structural metric and one's access to functional support is also not always linear (Carstensen et al., 1999; English & Carstensen, 2014). For example, the Socioemotional Selectivity Theory suggests there are two main motivations behind the maintenance and pursuit of social network relationships, the first being the need to seek out new sources of information and opportunities and considered to be more important during adolescence and young adulthood as well as during times of transition in one's life, and the second being the need to maintain emotional wellbeing and a stable sense of self which gains importance in middle and late adulthood (English & Carstensen, 2014). Therefore, when information seeking is the primary drive for social interactions, having a network with multiple social groups that are independent of each other (i.e., low social network density) may be advantageous in terms of accessing a wider range of opportunities. However, the cost of maintaining such a diverse social network may be time consuming and compromise one's social emotional wellbeing, and hence having a smaller social network of close friends and family that are not only more similar to oneself, but who are also in frequent contact with each other (i.e., high social network density) may be particularly beneficial when maintaining emotional wellbeing becomes the primary drive for social contact (Carstensen, 2006; English & Carstensen, 2014). Therefore, like social network size, the relationship between social network density and functional support may also need to be interpreted within the context of multiple factors such as one's life stage (e.g., age, degree of stability), and may change over time.

There are two main approaches of capturing one's social network via creating a social network map. The first is sociomap, which focuses on understanding the dynamic interpersonal relationships between all the different individuals within a defined space or activity. The second is

ecomap, where an individual reports their own personal interactions with network members that they consider to be important and close to within their social world, and may therefore capture different network members across different contexts, places, and activities (Scott, 2017). Although sociomap may be particularly helpful for understanding the social dominance of one particular individual within a well-defined social group through examining whether they are at the centre or periphery of their social network, it is less helpful for characterising one's social world beyond that specific social group, such as across different contexts (e.g., family, school, extracurricular activities, employment etc) and multiple social groups. The latter is better captured by ecomaps and may be particularly important to consider during a transitional phase in one's lifetime, as an individual move away from their familiar social group and establishes new social network connections through different means.

Therefore, assessing changes in one's ecomap structure over time can help observers to: 1) identify key network members for an individual undergoing a life stage transition, and 2) characterise the functional importance of one's social network, such as the ease of information flow and support provided by different social network members across multiple settings (Scott, 2017). Given that students transitioning to university may begin to socialise and establish a social network with both university staff and peers through academic and non-academic means, whilst maintaining a degree of social connection with family and friends from before university, generating ecomaps to capture individual differences in how students' social networks may change over time both structurally and functionally can provide valuable insight into their social integration at university.

3.2 Changes in social network structure (SNS) during transition to university

The SNS is a dynamic structure that changes throughout one's development, especially during times of transition to a novel environment. For example, in typical development, during one's childhood, family members might be especially important as they provide personal/emotional care and academic support. However, adolescence and young adulthood is often associated with a decreasing reliance on familial support, and individuals begin to turn to friends for informational, social, and practical support (Lee & Goldstein, 2016; Yorke & Longden, 2007). In contrast, autistic students often struggle to form close relationships with peers since childhood, and the quality of friendships acknowledged by autistic students often lack the level of reciprocity and intimacy when

compared to the quality of friendship reported by their TD peers (Bauminger & Kasari, 2000).

Therefore, this potential discrepancy between peer network structure and functional support during adolescence can be a risk factor for increased vulnerability to feelings of loneliness and isolation amongst autistic students (Bauminger & Kasari, 2000).

The gap between structural and functional SNS can also become more problematic over the course of development for autistic students, as their peers may begin to pivot towards using their friends for more support and further build on reciprocity and intimacy, while autistic students in adolescence and young adulthood report having fewer same aged peers (Howlin et al., 2000; Orsmond et al., 2004). Compared to the dynamic range of social settings and interactions that a TD young person might experience with his/her friends, autistic students may socialise in much more limited settings such as in a pre-defined highly structured environment such as a club or society where the focus of the interaction is mostly about a common interest (Orsmond et al., 2004). More limited socialisation may be especially challenging during transition to university and constrain one's ability to establish new social network ties across various settings to expand one's SNS at university.

No studies to date have examined how changes in SNS might differ between autistic students and their TD peers during transition to university, and whether differences in network composition of friends and family members may be present, as well as characterise differences in social network density and relationship to flow of support during first year of university. Characterising developmental changes in SNS may help stakeholders understand the relative importance of family, friends, and other individuals (such as teachers, carers, and other professionals) for an autistic individual during times of transition and identify who may be the best sources of support to improve transition outcomes for autistic students.

3.3 Changes in Perceived Social Support (PSS) during transition to university

Another way to define the functional aspect of SNS is by characterising the degree of subjective feelings of affection towards and support from various social network members that an individual deems to be important, known as perceived social support (PSS) (Roohafza et al., 2014). Support is also a multidimensional construct that can range from practical and informational/academic support, to personal and emotional support (Cohen & Wills, 1985). Amongst TD students

transitioning to first year of university, greater PSS from parents, academic staff, and peers is associated with better transition outcomes and mental health (Azmitia et al., 2013; Friedlander et al., 2007; Swenson et al., 2008). However, changes in the types of support provided by family and peers occurred over time, as family provided less informational and emotional support, and peers provided more tangible and practical support as well as social/emotional support (Azmitia et al., 2013; Friedlander et al., 2007). When considered alongside changes in SNS during transition to university observed in TD students, there is a relative increase both in quantity of same-aged peers included in one's social network, but also an increase in seeking and providing support between friends compared to other social network members such as family and teaching professionals (Hays & Oxley, 1986).

In contrast, although no studies to date explicitly examined both changes in SNS and PSS amongst autistic students during transition to university, there is reason to believe that autistic students may have greater reliance on support from parents and family compared to their peers during the transition to university. Autistic students often perceive their parents to be a crucial member in helping them plan their transition to university, and report that parents are able to provide a wide variety of high quality support such as providing emotional and social guidance, help with information processing and advocating for academic support, as well as aiding many daily living tasks such as managing time and finances (Elias et al., 2017; Fleischer, 2012; W. Mitchell & Beresford, 2014). Parents and relatives also report significant concerns over both social and daily living challenges that the autistic young person might face during transition to university, and whether adequate support can be provided at university (Elias et al., 2017; Fleischer, 2012; Geller & Greenberg, 2009).

Parents often continue to act as the primary caregiver during university, as they provide on-going support across daily living tasks, and often perceive the need to provide this continued care as necessary to help the autistic student develop independent living skills (Morrison, 2009). Parents also often scaffold many casual socialising opportunities for autistic children and young people, which can include either organised family activities, as well as taking part in community activities with peers and neighbours (Orsmond et al., 2004). One report found that when taking into account autistic children's social communication impairment, the extent to which autistic children's mothers took part

in additional recreational activities was an independent predictor of children's own participation in recreational activities, suggesting that perhaps parental modelling and scaffolding social interactions might help support autistic individuals' socialisation (Orsmond et al., 2004). However, as autistic students transition to university, it may be difficult for parents to continue organising social activities with same-aged peers for autistic students, and hence provision of continued social support from university staff and peer mentoring might be more beneficial to support autistic students' social integration during transition to university (Adreon & Durocher, 2007).

Therefore, previous research highlights that when devising transition to university plans for autistic students, it is important to adopt a systemic perspective and value the types of support provided by parents and relatives both pre- and post- the transition process. In order to provide the most easily accessible support for autistic students across academic, social, and daily living domains, it is important to identify which social network members might be best at providing each type of support, and to continue monitoring students' subjective experience of the frequency and quality of PSS received from each social network member.

4. Self-determination and autism

As transition to university marks an important step towards independence and adulthood, it is important to understand to what extent autistic students perceive themselves to be autonomous and have the right skills and knowledge to access the resources they need and navigate an increasingly complex social world. When taking into consideration the social communication and EF difficulties that many autistic students experience, Wehmeyer et al. (2010) highlighted that autistic students might struggle with being able to flexibly set, pursue and achieve multiple concurrent goals, as well as having poorer problem-solving and interpersonal relationship skills compared to students with specific learning difficulties. Wehmeyer et al. (2010) thus outlined the need for educators to explicitly teach and encourage autistic students to develop skills such as self-regulation, flexibility, and setting realistic goals with a concrete plan to help them become more self-determined in their own lives. Educators and stakeholders should also help autistic students gain greater awareness of how to utilise their strengths and self-advocate to access the right resources they need to facilitate independent living. However, many parents still reported that their autistic young adult had poor self-

determination skills (such as self-management, decision-making, and problem-solving), despite agreeing that self-determination is essential for securing independent living in adulthood (Carter et al., 2013).

Adopting a quantitative approach that assessed self-determination using self-report questionnaires, recent studies found that compared to students with specific learning difficulties and learning disabilities, autistic middle and high school students reported poorer autonomy, self-regulation, and psychological empowerment (Chou et al., 2016). Although the authors hypothesised that such differences may be resulting from autistic students' social communication difficulties which might put them at a disadvantage in terms of forming secure and supportive social relationships compared to their peers, it is unclear to what extent autistic students perceive their social differences and sense of relatedness to others to underpin their sense of autonomy and competence. One recent study found that autistic students who reported better wellbeing at university developed more meaningful relationships and embraced new opportunities more positively compared to those with poorer wellbeing (Bailey et al., 2019), suggesting that establishing a sense of relatedness with others and autonomously pursuing new goals at university with sufficient competence underlies better transition outcomes, though levels of self-determination were not explicitly explored in this study. Given that greater autonomy, psychological empowerment, and self-realisation have all been identified as key self-determination constructs that are associated with better quality of life in autistic young adults (White et al., 2018), it is important for university stakeholders to explore first-hand perspectives of how autistic students perceive themselves to act in a self-determined way at university in order to shape their own experiences. Identifying facilitators and barriers of self-determination for autistic students at university can thus enable educators to tailor transition interventions to better help students develop and maintain self-determination skills throughout university and improve their wellbeing, as well as enable students to become more autonomous and competent when pursuing employment beyond their university studies.

5. Conclusion and future directions

In conclusion, transition to university can be an especially challenging time for autistic students, who experience many difficulties across social communication, executive function, sensory,

and co-occurring mental health issues. This literature review not only summarised the breadths of difficulties across social, academic, and daily living faced by autistic students at university, but also highlighted the interaction of some of these difficulties, for example how poor time management (daily living) and difficulties associated with group work (socialisation) can interfere with academic performance, further highlighting the importance to simultaneously provide adequate levels of support across all three domains to optimise students' transition experience.

When considering provision of support during transition to university, it is important for university stakeholders to adopt a systemic perspective and include parents' and relatives' views on challenges faced by autistic students when transitioning to university. Given the many difficulties associated with socialising and forming friendships with same-aged peers amongst autistic students, the continued provision of support from other adult caregivers such as family and university support staff may be essential to compensate for the reduced information and personal/emotional support that students might receive from peers in their social network. Future studies should seek to monitor both changes in the SNS, and also corresponding changes in the types, frequency, and quality of support provided by different social network members over the transition period, which can provide insight into the changes in both structural and functional social network during transition to university.

It is important to note that PSS is the *subjective* individual experience about the quality and types of support they receive from those that are considered to be *closest* to them (Roohafza et al., 2014). Exploring the relationships between the individuals who are in frequent contact with and perceived to be the closest to the student can help outline each student's core SNS. To capture this subjective sense of being supported by other network members during transition to university, and to construct the core social network structure of the student in question, future studies should seek to develop a research questionnaire that asks students to self-report both individuals that the student considers to be most important to them and are in contact with, as well as reporting the types, frequency, and quality of support provided by each network member across academic, daily living, and social domains.

In addition to understanding how students are utilising their social networks in a functional way to access the support they need, it is also important to examine to what extent autistic students

are able to self-initiate and act autonomously in terms of seeking external support, as well as develop one's own skills and competence to solve problems at university independently. Future studies can use a qualitative approach to explore first-hand perspectives of how autistic students perceive themselves to be effective agents in determining their own university experience compared to their TD peers. This information can help stakeholders identify both unique and shared facilitators and barriers to self-determination amongst university students with and without an autism diagnosis. Understanding shared and unique factors underlying self-determination will enable stakeholders to effectively develop interventions tailored to the needs of both autistic and TD university students to improve their sense of autonomy, competence, and relatedness during transition *into, through and out of* university, in order to facilitate greater independence as students embark on the journey towards adulthood.

However, the validity of using self-reports in autism research has been questioned (Mazefsky et al., 2011). For example, Ben Shalom et al. (2006) found that although both TD children and autistic children showed similar profiles of physiological responses to pictures of positive, neutral, and negative valence, unlike TD children, autistic children did not consciously report differences in their emotions aroused by the different images. The lack of conscious differentiation might be related to some autistic individuals' experiencing a co-occurring difficulty in emotional awareness known as alexithymia (Bird et al., 2010; Brewer et al., 2016). In a report that compared parental reports and autistic individuals' self-reports of their psychological symptoms to assess convergence of co-occurring mental health conditions, little correspondence was found between self- and parental reports (Mazefsky et al., 2011). Therefore, it is questionable whether autistic individuals are able to provide accurate and valid self-reports due to their difficulties in self-monitoring and emotion recognition.

It should be noted however that prior research on the use of self-reports in autism has mostly assessed validity based on whether self-reported symptoms can meet an objective clinical cut-off threshold that converges with either clinician or parental report. The use of subjective self-report for the purpose of meeting an objective clinical diagnosis often fails to acknowledge and explore the nature of individual differences in the symptoms reported and perceives the symptom profile much more in a binary sense of whether the summed symptom score surpasses cut-off threshold to meet

diagnostic criteria. This is very different to the use of self-report in the literature of transition to higher education for autistic students, where self-reports of individual differences in their transition experience are highly valued, as they offer first-hand insight into the diversity of strengths and challenges encountered by students at different types of academic institutions.

Capturing the diversity of students' transition to university experiences is important for broadening the stakeholders' perspectives on the different types of issues that need to be considered when planning transition programmes, and further highlight the need to tailor transition plans according to each individual's unique needs. Therefore, students' self-reports of SNS, PSS, and self-determination are not binary measures, but instead help to evaluate diversity of students' subjective perception of support received from each social network member they consider to be important to them, as well as self-initiated actions they have taken to shape their university experience. One systematic review summarising autistic students' transition to university experience highlighted the *lack* of research into first-hand subjective student reports of their experiences, as much of the existing research relies on speculation regarding challenges that autistic students might face based on theoretical models, rather than interviewing students first-hand to gather more empirically based evidence into the types of difficulties they consider to be most important during their transition experience (Gelbar et al., 2014). Therefore, future research should address the dearth in research of autistic students' first-hand experiences of their university transition experience and can focus on gathering students' self-reports on how changes in their SNS, PSS, and self-determination may affect transition outcomes across academic, daily living, and socialisation domains of university life.

6. Addressing future directions - thesis overview and research aims

This literature review summarised current understanding of challenges and strengths associated with autism that might affect an autistic student's experience when transitioning *into*, *through* and *out* of university. In order for university stakeholders to develop tailored support interventions supporting autistic students' transition to university, it is important to better understand and gather first-hand accounts of autistic students' experiences especially focusing on how they are able to navigate their social environment and access the support they need from others, as well as supporting themselves through higher education. Furthermore, although there are many highlighted

challenges in this review outlining why transitioning to university might be especially difficult for autistic students, it is important to also consider to what extent such challenges present unique or shared vulnerabilities for autistic students, when compared with TD peers.

Based on the research gaps identified above, this thesis has the following aims:

- 1) To examine current understandings and measurements for assessing university students' social network structure and perceived social support provided by others during the university transition experience.
- 2) To compare social network structures and perceived social support of autistic and TD students' during transition to first year of university.
- 3) To compare and contrast to what extent levels of autistic traits and social anxiety might affect changes in students' social network structure and perceived social support, as well as long-term transition outcomes during first year of university.
- 4) To understand the role of autistic students in planning and shaping their own university transition through:
 - a. Social network transition planning
 - b. Their level of self-determination

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Chapter Two

Do changes in social network structure and perceived social support affect transition to university in first year undergraduate students? A systematic review

Chapter Rationale

Social network analysis provides a meaningful framework to examine both structural and functional changes in a student's social world when transitioning to university. From a developmental perspective, university marks an important milestone as students begin to pursue an independent life outside of family, and they may increasingly rely on same aged peers or social network members outside of family for information access and other forms of support. To date, there have been no systematic review of longitudinal studies that have explored how structural and functional changes in students' social networks can influence transition outcomes in first year of university. The rationale for this systematic review was to evaluate from a methodological and theoretical perspective the strengths and limitations of existing tools used to capture and conceptualise changes in social network structure and perceived social support during transition to university, and highlight any gaps in knowledge when translating existing findings on social network changes from typically developing students to autistic students at university.

Abstract

Transitioning to university can be an anxiety-provoking and stressful time for many students. In addition to facing increasing demands in both academic and daily practical living skills, students also experience changes in their social network structure (SNS) and perceived social support (PSS) as they begin to integrate into university life. Understanding the factors that influence students' ability to adapt and establish a new social network and support structure at university, and how changes in SNS and PSS may affect university transition outcomes can help stakeholders plan more effective transition support frameworks. This systematic review evaluates how changes in both SNS and PSS during transition to university for first year students can be associated with transition outcome. Ten longitudinal studies with a total of 1,068 students met both inclusion and quality appraisal criteria. For SNS, students who lived on campus included more new acquaintances and fewer family members in their social network than students who lived at home. For PSS, higher PSS were associated with better transition outcomes, though differences in the types and quality of PSS provided by family, peers, and teachers/lecturers emerged during transition to university. Only one study simultaneously assessed both changes in SNS and PSS, highlighting the paucity of research in this area. Other factors identified to be associated with transition outcome included self-esteem, social identity, and loneliness. Both limitations and future research necessary to improve our understanding of how changes in SNS and PSS can affect university transition outcomes are discussed.

Keywords: students, university, transition, first-year, social network, social support

Do changes in social network structure and perceived social support affect transition to university in first year undergraduate students? A systematic review

Transitioning to university can be a challenging time associated with many issues surrounding academic adjustment and social integration, as well as the need to develop the daily practical living skills required for entering adulthood (Compas, Wagner, Slavin, & Vannatta, 1986; Felner, Farber, & Primavera, 1983). Much akin to the *rites of passage* described by Van Gennep (1960), students face changes in their societal membership status when moving to a new university environment, and must undergo stages of separation, transition, and incorporation to complete the adaptation to one's new societal role. Students entering their first year of undergraduate studies similarly experience changes in their social network and support structure when trying to adapt to the new and demanding role required by the shift to university life (Tinto, 1988).

Social network refers to the types of relationship and interactions that any individual might have with other people. Social network structure (SNS) can be assessed by a variety of different dimensions such as network size (i.e., number of individuals included in one's network), and network density (i.e., global level of connectedness between individuals found within one's social network) (Scott, 2017). Perceived social support (PSS) is defined as the subjective experience of feeling appreciated and loved by people that are important to the individual, within his/her social network (Roohafza et al., 2014). Different types of PSS can range from providing tangible and practical instrumental support, academic and informational support, to providing emotional and social support (Cohen & Wills, 1985).

In general, the diversity and richness of one's social network structure and perceived social support have been hypothesised to influence individuals' wellbeing via two mechanisms (Cohen & Wills, 1985). The main effects hypothesis suggests that social support has a more general positive impact on one's wellbeing (Kawachi & Berkman, 2001). On the other hand, the stress-buffering hypothesis suggests that high levels of social support can buffer stress only when types of support received match the types of stress experienced by the individual. Although the availability of social support may be a form of social capital resource that may be associated with one's SNS, the relationship is not always linear or directly proportional, as one's social network ties can sometimes

also be the source of stress as well as social support (Cohen & Hoberman, 1983). Furthermore, over the course of one's lifetime, developmental factors also play a major role in terms of shaping the interaction between one's SNS and types of PSS offered by different social network members, such that transitioning to adulthood is often associated with an increase in weighting placed on support from friends, and a decrease in weighting on support from family (Lee & Goldstein, 2016). Therefore, evaluating the dynamics of how changes in one's SNS and PSS across major developmental milestones and/or transition periods in one's lifetime may be especially informative to help identify potential risk factors for reduced wellbeing, as well as buffers which are protective in the context of stressful changes.

Separation from an established social network and previous sources of social support can be especially anxiety provoking and stressful for many students (Fisher & Hood, 1987). Establishing new and meaningful social relationships and sources of social support at university can help students to feel more socially integrated during the transition phase (Spady, 1967, 1970). The key role played by social integration in determining a student's transition outcome and attrition has been highlighted by many researchers (e.g. Tinto, 1975, 1988). Although by no means a linear relationship, establishing a new social network and successful social integration can influence students' commitment both to the institution and the goal of completing higher education. Conversely, poor social integration has been shown to be associated with increased voluntary withdrawal from university studies (Strom & Savage, 2014; Tinto, 1975). Building a new social network can ensure adequate flow of social capital and resources to provide social support for academic and non-academic purposes (Spady, 1970), and serve to buffer against the stress associated with university transition (Cohen & Wills, 1985; Lamothe et al., 1995). Establishing a new and supportive social network at university can also enable students to establish a new sense of social identity and align their values with that of the social norm at university (Spady, 1971), thus facilitating better integration into university life (Tinto, 1988). As students face changes in the quality of their relationship with both old and new social ties within their social network, the quality of functional support provided by different network members may also undergo significant changes (Cutrona, Cole, Colangelo, Assouline, & Russell, 1994). Identifying and making efficient use of available social capital to cater

for the changing demands of different aspects of university can be crucial in helping students better cope with stress during the transition phase, further improving university transition outcome (Lamothe et al., 1995).

For many typically developing students, studies have found that changes in SNS during university transition are associated with academic performance (Krasilnikov & Smirnova, 2017), feelings of loneliness, and social adjustment outcomes (Wohn & LaRose, 2014). Furthermore, the quality of PSS from family members, peers, and teachers also show differential patterns of association with level of adjustment in wellbeing, academic studies, social integration, and institutional attachment when transitioning to university (Azmitia, Syed, & Radmacher, 2013; Friedlander, Reid, Shupak, & Cribbie, 2007; Swenson, Nordstrom, & Hiester, 2008).

Individual differences in the ability to undergo successful social integration changes are also influenced by students' personal characteristics, level of social communication skills, and ability to adapt to a novel social situation (Demakis & McAdams, 1994; Okun & Weir, 1990; Tinto, 1975). The ease of establishing new social connections for first year students entering university might hinge upon the level of students' common interests and convergence of shared values with those of the existing student body (Spady, 1970). Personal characteristics such as one's self-esteem (Friedlander et al., 2007), and sense of social identity might influence one's ability to develop new network connections at university, and determine which social group one may want to be associated with, thus shaping changes in SNS. Factors such as gender and preferred coping strategy when faced with an unexpected or negative life event might also influence how one may draw upon his/her social network to mobilise social capital at times of need, and alter one's level of PSS (Kawachi & Berkman, 2001).

There may be individual differences in the developmental trajectory of SNS/PSS. For example, for students who experience social communication problems (Gelbar, Smith, & Reichow, 2014), mental health issues, and/or physical illness upon entry to university are more likely to require additional academic and social support than their typically developing peers, and changes in PSS may reflect the establishment of a new support network structure that may capture differences in quantity, quality, and sources of PSS received. Understanding how changes in SNS and PSS from different network members can relate to various student transition outcomes, as well as individual

characteristics that might influence one's ability to undergo successful social integration can be especially important for universities to better plan transition interventions and support services, in order to tailor support to ensure that students' needs are being met with the available resources.

There are a number of methodological considerations that should be highlighted when evaluating research which assess changes in SNS/PSS across first year university students. In order to effectively assess changes in SNS and PSS across first year of university, studies need to employ a longitudinal research design with a baseline measure either pre-arriving or at the beginning of the first term at university. However, longitudinal studies may experience low retention rate across multiple data collection time points (Robinson, Schmidt, & Teti, 2005), which can bias the study sample (e.g., students who might be more engaged with university life may be more likely to complete multiple research sessions), and evaluation of any differences in baseline demographic and participant characteristics between those participants who remain and those who drop out of the study needs to be conducted and carefully controlled for. Other confounding variables such as cohort effects (Robinson et al., 2005) for studying one single year group of university students need to be carefully considered, and generalisability of research findings to other higher education institutions should also be evaluated.

Given the importance of how changes in SNS and PSS can influence students' transition to university outcomes, the purpose of this systematic review is largely twofold. First, we will synthesise the available evidence to examine how changes in students' SNS, PSS, and their interaction may relate to transition outcome during the first year of university. Second, we will explore factors that may serve to moderate or mediate changes in SNS and PSS, which in turn influence transition to university outcome.

Method

Selection criteria

We included in our review observational studies that followed a longitudinal design to assess *changes in SNS and/or PSS during the university transition process*. A longitudinal design in this context must include a baseline time point either during the summer before starting first year of university, or at the start of the first university term during the first year of university, with at least

one follow-up time point during the first academic year of university to enable assessment of *changes* in SNS/PSS. We also included intervention studies that have a pre- and post- measure of changes in SNS/PSS, and transition outcome. For intervention studies, a detailed description of the intervention programme must be provided, and the intervention must be delivered in person rather than online.

Inclusion/Exclusion criteria

To be eligible for inclusion in the systematic review, studies had to fulfil the following inclusion criteria based on Population, Intervention, Comparison, Outcome, and Study Design (PICO) guidelines (Eden, Levit, Berg, & Morton, 2011): 1) Population: First-year university students aged 17-21 transitioning to undergraduate studies in a regular university for the first-time. No restrictions on location of institution were placed. Students must be domestic students, defined as attending university studies in the same country as that of their secondary studies. Studies including students studying at a foreign institution (i.e., studying in a country other than their home country) are excluded, as their interactions with family and friends from home may differ from that of domestic students in terms of contact frequency and format of communication; 2) Intervention: studies may include an intervention delivered in person aimed to improve students' ability to adapt to academic and social demands of university life; the details of the intervention need to be clearly stated in the study; 3) Comparison: studies may include students who are typically developing (defined as not experiencing, nor diagnosed with any severe psychiatric illness or chronic physical illness), or have Autism Spectrum Disorder (ASD), and/or specific learning disability / anxiety / depression, to enable comparison of differences in SNS and PSS across students with different social communication styles; 4) Outcomes of interest: studies must include at least one measure of university transition outcome, such as students' academic adjustment, social adjustment, personal-emotional adjustment, institutional attachment, mental/physical wellbeing, as well as academic records and/or attrition rates. Furthermore, studies must include at least one measure of either SNS (such as network size, density) and/or PSS (instrumental, emotional, social, informational support from family, peers, and other network members). No restraints were placed on measure used.

A detailed inclusion and exclusion criteria following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, Altman, & PRISMA

Group, 2009), and a protocol for the current systematic review can be found on PROSPERO (Lei, Reeves, & Russell, 2017).

Search methods

To identify articles published in English, we conducted a systematic search of electronic databases including PsycINFO, PsycARTICLES, PubMed, Web of Science Core Collection, KCI Korean Journal Database, Medline, SciELO, Cochrane, Science Direct, and EMBASE on 2nd August 2017 using the following search algorithm: (student* OR undergraduate* OR graduate*) AND (college* OR university stud* OR postsecondary) AND (transition* OR adjust* OR integrat*) AND (social network* OR network* OR support*) AND (first-year OR first year) AND (language = English). No time restraints on publication date were set. Bibliographies of selected full texts were screened for additional relevant references that were not located in the original electronic search.

Screening and quality appraisal

The first author screened all titles, abstracts, and full-texts, and a graduate student independently screened 10% of randomly selected abstracts and full-texts to screen out irrelevant articles using the inclusion/exclusion criteria. Both raters also independently completed quality appraisal for all selected full-texts based on Effective Public Health Practice Project (EPHPP) quality assessment guidelines (“Tools| EPHPP,” n.d.). Inter-rater reliability for abstract screening stage was 83% concordant, for full-text screening stage was 86% concordant, and for quality appraisal global rating was 89% concordant. When discrepancies arose between the two raters, supervision was sought from a senior faculty member, and agreement was reached. Only papers that have received a strong or medium global rating were included in the final qualitative synthesis.

Data extraction and coding

Data extraction from all selected articles included seven variables. Two variables related to participant demographics, including: 1) sample size, gender distribution, and mean age of participants, as well as ethnicity, living status, and degrees pursued; 2) country and type of institution attended. Two variables related to study design and measures: 1) study design included statistical analysis method and timeline of data collection; 2) measures used to assess SNS, PSS, transition outcomes, and other variables were noted. Three variables related to factors influencing transition outcome: 1)

changes in SNS, such as size, density, and network composition; 2) changes in PSS, including family, peers, other individuals, and any general perceived support structure changes; 3) other factors measured.

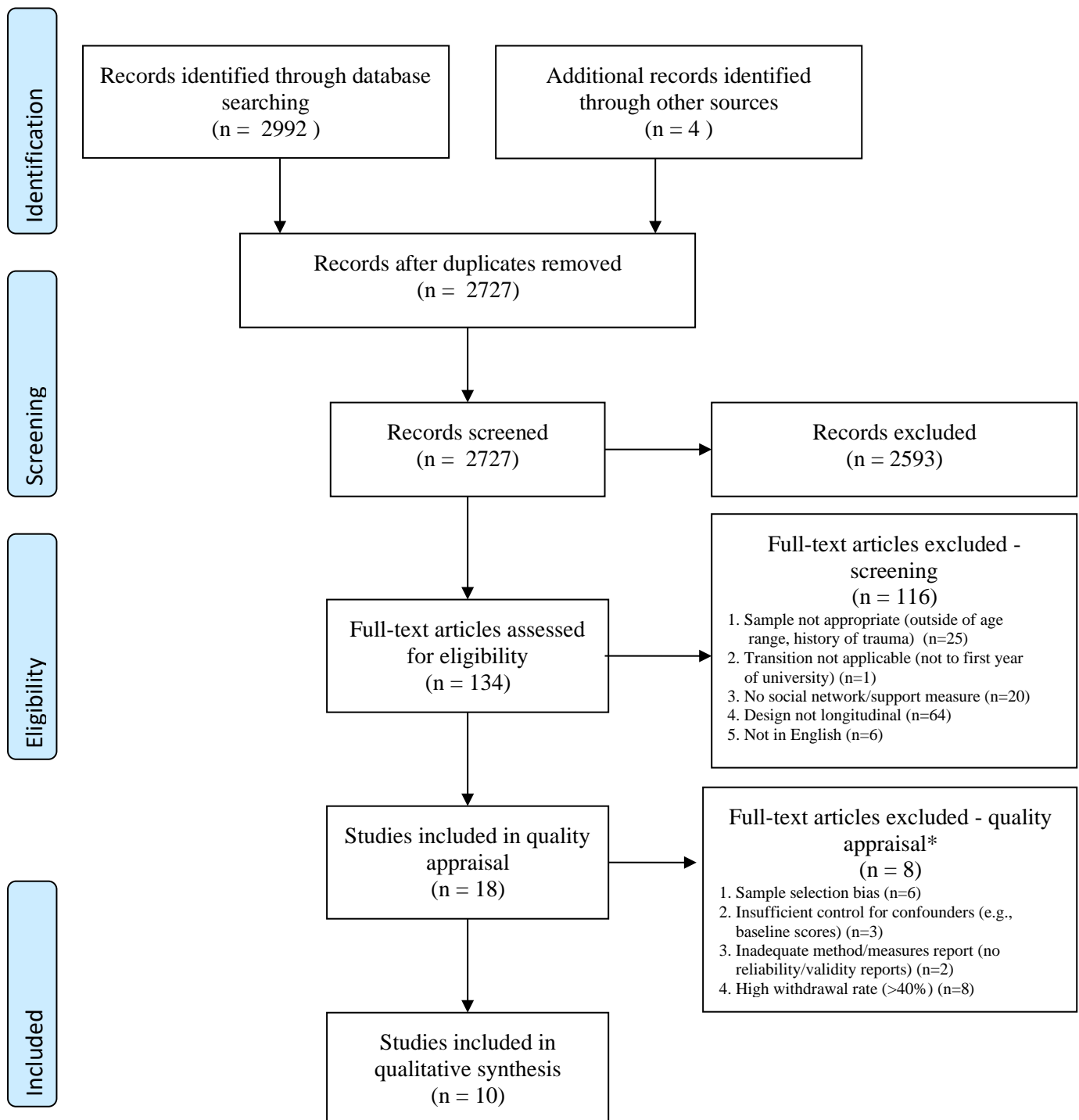
Results

Search results

Our initial electronic database search generated 2992 records. After removing 265 duplicates, a total of 2727 records remained for screening, with detailed reasons for exclusion shown in the PRISMA flow diagram (Figure 1). The majority of studies were excluded due to inappropriate sample characteristics (such as outside of age range, attending foreign institution, or have prior history of trauma), lack of appropriate outcome measures, and using a cross-sectional design. After initial title, abstract, and full-text screening, eighteen studies met all inclusion/exclusion criteria, and underwent quality appraisal using EPHPP. Eight studies received a weak global rating due to selection bias, not controlling for confounding variables (such as controlling for baseline characteristics when predicting transition outcomes and demographic factors such as gender), inadequate reporting of data collection methods and measures used, and high withdrawal rates (>40%), and were all excluded from qualitative synthesis. Of the remaining ten studies included in qualitative synthesis, two received a strong global rating, and eight received a medium global rating.

Article characteristics

Of the ten studies included in the qualitative synthesis, six were prospective observational studies, and four were intervention studies. Of the observational studies, five were published from 2000 onwards, and one was published in 1986 (Hays & Oxley, 1986). The majority of studies (67%) were based in higher education institutions in the United States of America (U.S.A), with the exception of one Canadian institution (Friedlander et al., 2007), and one Chinese institution (Tao, Dong, Pratt, Hunsberger, & Pancer, 2000). Most (83%) studies employed a quantitative analysis method, based on analysis of variance and/or multiple regression, and one study used a mixed-method analysis (Azmitia et al., 2013) (see Table 1).



*Studies may be excluded based on receiving weak rating for more than one of areas listed below.

Figure 1. PRISMA flowchart showing selection of studies for systematic review.

Table 1. *Summary of non-intervention studies investigating how changes in perceived social support may be associated with university transition outcomes.*

Study	Country, Institution type/size	Study Design (method, timeline)	Participant Demographics (N, age, ethnicity, living status, degree)	Measures (social network, perceived social support, transition outcome, other measures)	Results – Social support on transition outcomes (family, peers, other, general)	Results – Other factors on transition outcome
Azmitia et al. (2013)	USA, State	Mixed-methods: embedded correlation al mixed-method analysis T1: Fall T2: Winter T3: Spring	N = 167 (58% F); Age M = 18.2 Ethnicity: 35% Caucasian Living status: N/A Degrees: Social sciences, humanities, arts	SNS: N/A PSS: FFS Transition outcome: 1) Depression (CES-D) 2) Qualitative interview Other: 1) Identity synthesis (EPIS) 2) Self-esteem (Rosenberg self-esteem measure)	Family: support greater for students who maintained positive mental health ($d = -0.68$), and lower for students who continued to experience declining mental health ($d = 2.59$) Peers: support greater for students showing good improvements in mental health ($d = -0.31$), and lower for students showing decline in mental health ($d = 0.44$) Other: greater support from professors for students who maintained positive mental health ($d = -0.29$), and lower for students who continued to experience declining mental health ($d = 1.11$) General: N/A	Identity synthesis: poor identity synthesis was associated with poorer mental health ($d = -0.56$ to -0.38) and poorer adjustment
Friedlander et al. (2007)	Canada, Medium size	Quantitative: multiple regressions, bivariate correlations T1: Fall T2: Spring	N = 115 (61%F); Age M (SD) = 19.01 (0.55) Ethnicity: N/A Living status; 81% lived in residence, 90% away from home Degree: Psychology	SNS: N/A PSS: MSPSS (friends and family) Transition outcome: 1) General (SACQ) 2) Depression (BDI-II) Other: 1) Stress (PSS) 2) Self-esteem (SPPCS)	Family: greater support was associated with overall adjustment ($\beta = .16$) Peers: greater support was associated with adjustment in all areas except academic adjustment ($\beta = .19$ to $.20$) Other: N/A General: N/A	Stress: lower stress was associated with better adjustment in all domains ($\beta = -.66$ to $-.25$) Self-esteem: higher social self-esteem was associated with better social adjustment ($\beta = .43$), and better academic self-esteem was associated with better academic adjustment ($\beta = .26$),

Gall et al. (2000)	USA, Public	Quantitative: repeated measures MANOVA, stepwise regression T1 = Fall T2 = Fall (5-6 weeks after T1) T3 = Winter T4 = Spring	N = 68 (63%F); Age M = 19 Ethnicity: N/A Living status: 55.2% on campus, 16.4% at home, 28.5% in own flat Degree: Psychology	SNS: N/A PSS: SSQ Transition outcome: 1) Life satisfaction (LSQ) 2) Mental health (GBI) 3) Physical health (PHI) 4) Illness scale Other: 1) Life events (LEI) 2) Cognitive appraisal (CAQ) 3) Coping scale	Family: N/A Peers: N/A Other: N/A General: greater support network size and stability in support satisfaction was associated with better mental health ($\Delta r^2 = .039$ to $.040$), better physical health ($\Delta r^2 = .027$), and better life satisfaction ($\Delta r^2 = .03$ to $.18$)	Appraisal: greater negative appraisal of academic domain was associated with greater avoidance coping; lower negative appraisal was associated with better physical health ($\Delta r^2 = .02$) Coping style: 1) more active-behavioural coping in dating, academic, and living domain was associated with more illness ($\Delta r^2 = .02$ to $.07$), better life satisfaction ($\Delta r^2 = .06$), better mental health ($\Delta r^2 = .04$); 2) better active-cognitive coping in living domain was associated with more illness ($\Delta r^2 = .04$); 3) less avoidance coping in living, academic, and dating domain was associated with better mental health ($\Delta r^2 = .03$) and better life satisfaction ($\Delta r^2 = .04$).
Swenson et al. (2008)	USA, 1 state, 1 private	Quantitative: multiple regression analyses T1 = Fall T2 = late Fall	N = 271 (64%F); Age M (SD) = 18.08 (.27) Ethnicity: 87% Caucasian Living status: 73.7% live on campus, 3.8% near campus, 22.5% live at home Degree: English, History	SNS: N/A PSS: 1) Friendship quality (IFS) 2) Peer attachment (IPPA) 3) Relationship quality (QRI) Transition outcome: General (SACQ) Other: attachment style (RQ)	Family: N/A Peers: <i>High school best friend:</i> Friendship quality was positively associated with academic, social, personal/emotional adjustment, and institution attachment ($r^2 = .10$ to $.12$) <i>College best friend:</i> Friendship quality was positively associated with academic and social adjustment, and institutional attachment ($r^2 = .10$ to $.17$) Other: N/A General: N/A Conflict: more conflict was associated with poorer adjustment ($r^2 = -.17$ to $-.27$)	Attachment: attachment style was associated with social and emotional/personal adjustment, with secure attachment showing greater emotional/personal adjustment ($r^2 = .12$ to $.15$)

Tao et al. (2000)	China	Quantitative T1 = Fall T2 = late Fall	N = 358 (63% F) Age M (SD) = 18.7 (.93) Ethnicity: 100% Chinese Living status: 100% on campus Degree: N/A	SNS: N/A PSS: PSSS, RSSR Transition outcome: 1) General (SACQ) 2) Depression (CES-D) 3) Anxiety (STAI) Other: 1) Coping scale 2) Self-esteem (Rosenberg's self-esteem scale)	Family: parental support > peer/sibling/teacher support at T1 and T2 Peers: more support was associated with better positive coping, and less negative coping Other: at T1, teacher support > sibling/peer support. Better support was associated with less negative coping. General: all support reduced over time. More support was related to less negative feelings, less negative coping, lower depression/anxiety, more positive coping, more academic adjustment, more social adjustment, more attachment to institution, more personal emotional adjustment, better self-esteem,	N/A
Hays & Oxley (1986)	USA	Quantitative: MANOVA, canonical correlations T1 = Fall (week 1) T2 = Fall (week 4) T3 = Fall (week 8) T4 = Fall (week 12)	N = 89 (53%F); Age M (SD) = 18.98 (1.84) Ethnicity: N/A Living status: 62% lived at home (HOME), 38% lived on campus (DORM) Degree: N/A	SNS: up to 10 people whom participants have had contact with over the past 3 weeks and whose relationships were worthwhile PSS: ASSI Transition outcome: 1) Adaptation to College 2) Mental wellbeing (HSCL)	Family: provided high levels of all support, though over time showed less informational ((partial ϵ^2 = 0.22) and less emotional support (partial ϵ^2 = 0.16), and greater fun/relaxation (partial ϵ^2 = 0.19) Peers: support < family, stable over time, showed more conflict (partial ϵ^2 = 0.13) Other: N/A General: 1) greater intimacy was associated with greater emotional support and more fun/relaxation; 2) greater similarity was associated with more informational support, and fewer conflict 3) DORM > HOME: perceived more fun/relaxation support 4) Both DORM and HOME showed more fun, more task assistance, more conflict over time	N/A

Note. T = Time; SNS = Social Network Structure; PSS = Perceived Social Support; FFS = Family and Friends Scale; CES-D = Center for Epidemiological Studies-Depression scale; EPIS = Erikson Psychosocial inventory Scale; MSPSS = Multidimensional Scale of Perceived Social Support; Student Adaptation to College Questionnaire (SACQ); PSS = Perceived Stress Scale; BDI-II = Beck Depression Inventory (BDI-II); SPPCS = Self-Perception Profile for College Students; SSQ = Social Support Questionnaire; LSQ = Life Satisfaction Questionnaire; GBI = General Behaviour Inventory; PHI = Physical Health Inventory; LEI = Life Events Inventory; CAQ = Cognitive Appraisal Questionnaire; IFS = Intimate Friendship Scale; IPPA = Inventory of Peer Attachment; QRI = Quality of Relationships Inventory; RQ = Relationship Questionnaire; PSSS = Perceived Social Support Scale; RSSR = Resources of Social Support Rating; STAI = State-Trait Anxiety Inventory; ASSI = Arizona Social Support Inventory; SHSCL = Hopkins Symptom Checklist

Table 2. *Summary of intervention studies investigating how changes in perceived social support may be associated with university transition outcomes.*

Study	Country, Institution type/size	Study Design and Intervention Outline (method, timeline)	Participant Demographics (N, age, ethnicity, living status, degree)	Measures (social network, perceived social support, transition outcome, other measures)	Results – Social support on transition outcomes (family, peers, other, general)	Results – Other factors on transition outcome
Lamothe et al. (1995)	Canada	Quantitative: repeated measures AN(C)OVA T1 = Fall T2 = late Fall Intervention: 90 min weekly sessions for 6 weeks targeting social and academic issues	N = 55 (64%F) Age M = 18.6 years Ethnicity: N/A Living status: 3.6% lived at home, 10.9% lived off campus, and 85% lived on campus Degree: N/A	SNS: N/A PSS: SPS Transition outcome: SACQ	General: INT>CONT on (partial $\epsilon^2 = 0.12$): 1) perceived social support after intervention; 2) academic adjustment only Students found meeting new people and making friends, and open discussions about problems to be helpful.	N/A
Pratt et al. (2000)	Canada	Quantitative: repeated measures AN(C)OVA T1 = summer T2 = late Fall T3 = end of treatment (Spring) Intervention: 75-85 min weekly sessions for 8 weeks targeting social and academic issues	N = 96 (69%F); INT = 50, CONT = 46 Age M = 18.6 years Ethnicity: N/A Living status: 87% on campus Degree: N/A	SNS: N/A PSS: SPS Transition outcome: 1) General (SACQ) 2) Pre-college concerns (NCSCS) Other: 1) Loneliness (UCLA) 2) Perceived stress	General: INT > CONT in perceived social support (partial $\epsilon^2 = 0.04$) and showed better adjustment to university (partial $\epsilon^2 = 0.05$). Only women in INT showed fewer depressive symptoms (partial $\epsilon^2 = 0.09$). INT < CONT in number of classes missed.	Loneliness: greater loneliness in summer was associated with greater loneliness in Spring (partial $\epsilon^2 = 0.10$) Stress: higher stress in summer was associated with less support in Spring (partial $\epsilon^2 = 0.05$).
Mattanah et al. (2010)	USA, large size	Quantitative: repeated measures ANCOVA, bivariate correlations T1 = summer T2 = Fall T3 = Spring Intervention: 90 min weekly social support groups for 9 weeks targeting social and academic issues	N = 171 (70.2%F); INT = 65; CONT = 83 Age M = 17.7 (0.52) years Ethnicity: 67.9% Caucasian Living status: N/A Degree: N/A	SNS: N/A PSS: SPS Transition outcome: 1) General: SACQ 2) Pre-college concerns (NCSCS) Other: Loneliness (UCLA)	General: INT>CONT in perceived social support by spring ($d = 0.37$). Spring perceived social support was negatively associated with pre-college adjustment concerns.	Loneliness: INT<CONT by spring ($d = -0.53$)

Yomtov et al. (2017)	USA	<p>Quantitative: ANCOVA, paired sample t-tests</p> <p>T1 = Fall T2 = late Fall</p> <p>Intervention: Peer mentor scheme – mentors engaged mentees in getting to know each other, learning academic resources, and attending campus events.</p>	<p>INT: N = 162 (66%F), Age M = 18.1 years Ethnicity: 4.3% Caucasian, 70.4% Hispanic Living status: N/A Degree: Biology, Kinesiology, Psychology, 53.2% Undecided</p> <p>CONT: N = 142 (72.5%F), Age M = 18.1 years Ethnicity: 15.5% Caucasian, 56.3% Latino Living status: N/A Degree: Biology, Kinesiology, Psychology, 40.4% undecided</p>	<p>SNS: N/A</p> <p>PSS: 1) Emotional support 2) Academic support</p> <p>Transition outcome: 1) community integration 2) active in community 3) strong connection to university</p>	<p>General: INT>CONT in better university integration, more active in community, more positive connection to the university, better emotional support, better academic support (partial $\epsilon^2 = 0.02$ to 0.03)</p>	N/A
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Note. T = Time; SNS = Social Network Structure; PSS = Perceived Social Support; SPS = Social Provision Scale; SACQ = Student Adaptation to College Questionnaire; INT = Intervention; CONT = Control; NCSC =

Of the intervention studies, three were published from 2000 onwards, and one was published in 1995 (Lamothe et al., 1995). Institution-wise, 50% were U.S.A. based and 50% were based in Canada. All interventions were peer-mentor programmes, with the majority of studies (75%) describing weekly social support groups lasting between 75-90 min over 6-9 weeks targeting social and academic issues during the first year of university. One study employed an on-going peer mentor scheme where mentors organised three activities during the term to socialise with mentees, as well as providing on-going guidance and support during academic classes (Yomtov, Plunkett, Efrat, & Marin, 2017). All studies employed a quantitative analysis of variance method for analyses (see Table 2).

Participant characteristics

Table 1 provides participant demographics for students that took part in the six observational studies, including their mean age, ethnicity, living status, and degrees pursued. In total, 1,068 students took part (mean age 18.5 years, 61.4% female). Five studies reported on student living status: 83.8% of students lived away from home, and 80.1% of students lived on campus. Of the four studies that reported degrees pursued, all students were from social sciences and humanities faculties (Azmitia et al., 2013; Friedlander et al., 2007; Gall, Evans, & Bellerose, 2000; Swenson et al., 2008).

Table 2 provides participant demographics for students that took part in the four intervention studies. In total, 332 students took part in the intervention, and 271 took part as controls. Overall, students had a mean age of 18.1 years, and 68.9% were female. Of the two studies that reported living status, 86.3% of students lived on campus (Lamothe et al., 1995; Pratt, 2000). Only one study reported degrees pursued, where the majority had undetermined majors, and the rest came from biology/social science subjects (Yomtov et al., 2017).

Measures and methodology

For the observational studies, 50% of studies followed first year university students over the first term in fall with 2-4 measurement points (Hays & Oxley, 1986; Swenson et al., 2008; Tao et al., 2000), whilst the remaining 50% followed students across the first year of university, with multiple time points in fall, winter, and spring (Azmitia et al., 2013; Friedlander et al., 2007; Gall et al., 2000). With the exception of one study that utilised a mixed-method design (Azmitia et al., 2013), the majority of studies utilised a multiple regression or analysis of variance design. However,

inconsistencies in the timeline of study and variables included in the construction of multiple linear regression models make direct comparisons of effect size for results across the studies difficult.

For the intervention studies, 50% of studies conducted the intervention during the first term and followed students' progress over the first university term with two measurement points (Lamothe et al., 1995; Yomtov et al., 2017), and the remaining 50% of studies conducted treatment over both the fall and spring term, and included three measurement points over the first two terms of university (Mattanah et al., 2010; Pratt, 2000). All studies utilised analysis of variance and paired sample t-test to conduct statistical comparisons between the intervention and control group.

For PSS, the majority of observational studies used a diverse range of measures that assessed quality of support from friends and family, two studies also examined support from teachers (Azmitia et al., 2013; Tao et al., 2000), and one study only evaluated overall PSS and did not differentiate support received from different members of one's social network (Gall et al., 2000). Only one study (Hays & Oxley, 1986) specifically examined different types of support (e.g., informational, emotional, fun/relaxation etc.) received from different network members. In contrast, for the intervention studies, the majority of studies utilised a measure of PSS that assessed overall levels of support received across all network members. One study (Yomtov et al., 2017) specifically measured emotional and academic support, though each was only assessed using one self-reported question enquiring whether students felt they had someone to turn to for each type of support. Therefore, PSS measured by intervention studies did not differentiate between the types of support received from different social network members.

Only one study measured both changes in PSS and SNS (Hays & Oxley, 1986), and the remaining studies only included measures of PSS. For SNS, students were asked to state up to 10 people whom they have had contact with in the past 3 weeks and where they considered the relationship to be worthwhile to give an approximation of social network size. Students were also asked to state the social role of each network member (e.g., family or peer), and included measures of network composition changes over the first university term. However, this study utilised a broader measure of PSS that measured different types of support provided by family or peers overall, rather than support for specific challenges related to transition to university. Therefore, it is unclear to what

extent the changes in SNS and PSS affected students' ability to cope with additional challenges that arose during transition to university, such as increased independence in daily practical living, as well as greater academic demands compared to secondary school education.

For transition outcomes, a range of primary outcome measures were used to evaluate students' level of adaptation, mental and physical health, as well as life satisfaction. For the observational studies, 60% of studies utilised both mental and physical health measures as well as measures of academic attainment/social integration to evaluate transition outcomes. Overall, 80% of studies used a measure of mental and/or physical health as a primary outcome, ranging from specifically measuring symptoms of depression and anxiety (Azmitia et al., 2013; Friedlander et al., 2007; Tao et al., 2000), to overall levels of mental wellbeing (Gall et al., 2000; Hays & Oxley, 1986). 50% of studies utilised a general measure of student transition outcome known as the Student Adaptation to College Questionnaire (SACQ; Baker & Siryk, 1984) as the primary outcome measure. The SACQ assesses students' academic, personal-emotional, and social adjustment, as well as institutional attachment. One study also conducted a qualitative interview to assess students' transition experience (Azmitia et al., 2013). For observational studies, 75% of studies utilised the SACQ as a primary transition outcome measure, and 50% of studies also included a measure of pre-college concerns that students reported in the summer before starting university (Mattanah et al., 2010; Pratt, 2000), and one study investigated students' social integration and also attachment to university through a short online questionnaire (Yomtov et al., 2017).

Changes in PSS and transition outcomes

Overall, studies found that higher levels of PSS at time 1 and also increases in PSS over time were associated with better adjustment outcomes, better mental and physical health, as well as increased life satisfaction, and more positive coping (Gall et al., 2000; Tao et al., 2000). Over the first university term, students also reported experiencing increased levels of intimacy in their social relationships, which was associated with greater emotional support and providing a source of fun/relaxation (Hays & Oxley, 1986). Similarly, students reported those within their social network who are more similar to themselves provided greater informational support, and also experienced fewer conflicts (Hays & Oxley, 1986). Finally, although both students living at home and on campus

perceived increased levels of task assistance and conflict over time, those living on campus also reported more fun socialisations than students living at home, suggesting there may be some differences in social dynamics depending on living status during first year of university (Hays & Oxley, 1986).

Differences in the types of support provided across family, peers, and other individuals emerged. Studies found that students perceived family members to provide high levels of support (Hays & Oxley, 1986), which was associated with increased overall adjustment (Friedlander et al., 2007), and helped students to maintain positive mental health during transition to university (Azmitia et al., 2013). Over the course of the first university term, students perceived family members to provide less informational and emotional support, though chose to spend more fun/relaxation time together with the student (Swenson et al., 2008), suggesting students may experience changes in the type of social interactions they take part in with members of their family. Two studies examined PSS from professors at university, and found that students who maintained positive health throughout the first year reported higher levels of PSS from professors (Azmitia et al., 2013), and greater support was also associated with using less negative coping strategies (Tao et al., 2000).

Higher levels of PSS provided by peers were associated with better social and emotional adjustment, and greater institutional attachment, but not greater academic attainment (Friedlander et al., 2007). Peer support was also higher for students that showed improvements in mental health over the first year at university (Azmitia et al., 2013), and was associated with increased use of positive and reduced use of negative coping strategies (Tao et al., 2000). One study found that although students perceived peer support to be less than that of family support, and experienced an increase in number of conflicts with peers, peer support remained stable over the course of the first term, suggesting that peer support may have become more reliable over the academic year (Hays & Oxley, 1986).

Differential patterns of association with university adjustment also emerged depending on the reported quality of the relationship with one's high school best friend, compared to the relationship quality with one's best friend at college (Swenson et al., 2008). Over the first term during university, students who reported greater attachment to their high school best friend and rated their high school

best friend as more frank, spontaneous, and sharing more activities in common, demonstrated greater personal/emotional adjustment and institutional attachment. However, greater exclusivity with one's high school best friend was negatively associated with academic attainment and social adjustment, as well as institutional attachment suggesting that reduced opportunity to form new social ties at university may have more negative consequences in the long term (Swenson et al., 2008).

Of the four intervention studies, results showed that compared to controls, students who received peer mentoring perceived greater levels of social support (Lamothe et al., 1995; Mattanah et al., 2010; Pratt, 2000; Yomtov et al., 2017). Students who received peer mentoring or intervention also reported better academic attainment (Lamothe et al., 1995), missed fewer classes (Pratt, 2000), experienced fewer depressive symptoms (Pratt, 2000), felt better integrated into university and were more active in the university community (Yomtov et al., 2017), and felt less lonely (Mattanah et al., 2010).

Changes in SNS and transition outcomes

Only one study (Hays & Oxley, 1986) evaluated changes in SNS over the first term of university, comparing students who lived at home versus students who lived on campus. No difference in social network size was found, with both groups naming on average eight members in their social network. Students who lived on campus had a higher social network density compared to students who lived at home, sharing a greater percentage of mutual friends with those in their social network (around 25%). Higher network density was associated with greater emotional support, task assistance, as well as more fun, and higher frequency of interaction. For students who lived on campus, although the rate at which new acquaintances were made decreased over time, their SNS was mainly composed of students (84%) who shared a high level of intimacy and similarity with themselves, and on average did not include any family members. In comparison, students who lived at home reported few new acquaintances in their social networks throughout the first academic term, though included an increasing proportion of new peers over time who were more similar to themselves and included on average two family members. This study highlights some differences in the importance of living status on shaping changes experienced in SNS and PSS over the first year of university, with students who lived on campus receiving higher levels of PSS through new

acquaintances they have met at university, compared to students who lived at home who received PSS from both family, and friends from home as well as at university. However, one limitation is that all data were collected during the first term of university, and it was unclear whether differences identified between the two groups may have persisted over the first academic year.

Other factors associated with university transition outcomes

Studies also identified a number of factors beyond changes in SNS and PSS that were associated with university transition outcomes. Students who reported poorer overall adjustment at university defined by poor emotional support and wellbeing in a semi-structured interview also reported an inability to develop a sense of identity at university (Azmitia et al., 2013), higher levels of stress, and lower self-esteem (Friedlander et al., 2007). Relationships between mental health indices and various other factors were also noted. Specifically, poorer personal and emotional adjustment was associated with more severe symptoms of depression (Friedlander et al., 2007). Students who reported secure attachment with their parents prior to university transition demonstrated better emotional/personal adjustment at university (Swenson et al., 2008). Better mental health was associated with establishing a greater sense of self identity at university (Azmitia et al., 2013), and use of more active-behavioural coping and less avoidance coping in dating, living, and academic domains at university (Gall et al., 2000). Finally, students who reported being more lonely in the summer before starting university reported higher levels of loneliness in the spring of first year, suggesting that state loneliness may be somewhat influenced by trait loneliness, though the distinction was not drawn in this specific study (Pratt, 2000).

Discussion

In summary, there is very little research on how changes in SNS can influence university transition outcomes among first year university students, with only one study (Hays & Oxley, 1986) reporting that students who lived on campus included more new acquaintances from university and fewer family members in their social networks compared to students who lived at home, and a relationship between higher network density and gaining more emotional and information support was also identified. In contrast, the majority of studies reported significant changes occurred in the quality

of PSS that students received over the course of transitioning to first year of university, specifically in terms of the types of support received from different types of social network members.

It should be noted that although high levels of PSS received by students were associated with better transition outcomes, unique patterns of associations emerged, such that more support from parents was associated with overall adjustment (Azmitia et al., 2013; Friedlander et al., 2007), but greater support from peers were associated with better social and emotional adjustment, and attachment to institution (Azmitia et al., 2013; Friedlander et al., 2007). Identifying these unique associations can help stakeholders to better analyse how best to provide efficient support for students experiencing specific types of adjustment difficulties at university and help channel social resources appropriately to improve transition outcomes. However, better support from family, peers, and professors were associated with more positive mental and physical health, suggesting there are overarching benefits from having a greater flow of social capital and PSS to improve one's ability to adapt to university. It is also possible that an interaction effect exists, in that students with good levels of mental health are more likely to seek and make use of support structures while social withdrawal and motivational problems symptomatic of many mental health difficulties mean those students in need of support may be less likely to access help at times of transition.

Three major methodological limitations emerged from the studies summarised in this systematic review. First, there is a paucity of research that examined changes in both SNS and PSS in relation to university transition outcomes for first year university students, as only one out of ten studies examined changes in SNS (Hays & Oxley, 1986). Although this study captured social network size and composition (i.e., whether each social network member was a family member or peer), it did not explicitly evaluate the quantity and quality of different types of support provided by each network member to help students address challenges unique to their transition to university. Therefore, although many changes in PSS were identified, it is unclear whether support changes were related to the unique challenges faced by students during transition to university. Developing and utilising tools that enable the assessment of how simultaneous changes in both SNS and PSS for specific challenges faced by students transitioning to university (such as increased course workload/difficulty, living in shared accommodation, as well as range of daily living challenges such as cooking, doing laundry,

and managing time and finances) can help stakeholders better understand how to best utilise available social resources to meet student needs. Understanding the changes in academic, daily living, and social demands that students face can also help stakeholders better plan transition services and help improve students' transition outcomes.

Second, many studies were excluded due to a lack of baseline measure or using a cross-sectional research design, and of those that implemented a longitudinal research design, many studies had high withdrawal rates (>40%) across time-points. Therefore, a trade-off between number of data collection points/length of study and student retention rate needs to be carefully considered before commencing to evaluate changes in SNS/PSS observed during transition to university. Little follow-up of students who failed to complete questionnaires at later time points also cannot address whether these students may have potentially experienced significantly worse transition outcomes or have dropped out of university by the latter time-points. Gathering more information on why students may have failed to complete all study sessions can help determine whether withdrawing students' experiences significantly differ from those that remained in the study, and whether experiences of students who remained in the study are representative of first year university students overall.

Third, all studies, with the exception of Tao et al (2000) were conducted in North America, and the nature of degrees pursued amongst students were either unreported (n=4), or students were mostly from humanities and social sciences (n=6). Future studies should explore whether the changes observed can be generalised to students studying a wider range of degrees at university, or students from a broader cultural and ethnic background from outside of North America.

Two additional future directions are outlined. First, despite studies documenting changes in PSS and SNS that students experience over the first year of university studies, it is unclear from the current literature how factors such as social competency may affect the changes in one's SNS and PSS. No studies have included measures of factors that may impact upon social competency such as level of autistic traits or social anxiety. Such factors may place additional strain on students' ability to make new social ties or successfully adapt to changes in their social networks. Future studies should aim to better characterise how individual differences in personal characteristics influencing social

competency may affect changes in SNS and PSS, which can help identify new targets for interventions aimed to support students transitioning to university.

Second, all identified studies were conducted in typically developing students attending university for the first time. Although this systematic review did not include any specific search terms for other student groups such as students with Autism Spectrum Disorder (ASD) or specific learning disability such as dyslexia or dyspraxia, the liberal inclusion criteria and search terms surrounding “students” would have captured any studies that included either student group, though none emerged. Therefore, there was a genuine lack of studies on students with additional needs, such as students with specific learning disability, or developmental disorders such as ASD, who may experience different challenges at university with regards to academic and social integration issues, compared to typically developing students, as well as exhibit a differential pattern of social network and support structure. Nonetheless, additional mental health needs clearly emerged as relevant to transitional outcome and thus it is plausible that a range of individual vulnerabilities may be of significance.

One recently published systematic review that described experiences and support for students with ASD in higher education (Gelbar et al., 2014) also reported the scarcity of literature that focused on unique experiences that students with additional needs face during university. Although many studies made theoretical suggestions for stakeholders to consider when designing interventions to help autistic students to better integrate into university life, the lack of first-hand empirical evidence limits the ability for stakeholders to design evidence-based support students with additional needs. Characterising similarities and differences in the types of challenges faced by autistic students and/or students with specific learning disability can provide one important source of empirical evidence to help stakeholders develop more focused intervention that better caters for the needs of each student group during the university transition process, and tailor the current transition services to address these students’ additional needs.

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Post Chapter Two Commentary

This chapter provides an overview of the current literature in using a social network analysis framework to understand the structural and functional changes in students' social networks when transitioning to university. The paucity of longitudinal studies that simultaneously examined both changes in social network structure and perceived social support is clearly highlighted. Researchers lack an efficient tool that would capture individual differences in both the structural and functional changes in social networks over time, and the majority of measures of perceived social support do not break down support in terms of quantity and quality provided by individual network members. The lack of research involving students who are not typically developing also shows a poor understanding of how transition experiences might differ when taking into account neurodiversity into account and remains a future direction to be researched. An identified common university transition outcome measure is the *Student Adaptation to College Questionnaire*, which assesses a wide range of areas including academic, personal/emotional, socialisation adjustments, and attachment to institution.


In summary, the findings suggest that future studies should address: 1) development of an easy to use measure that would enable simultaneous measurement of social network structural components, and functional value based on perceived social support provided by each social network member; 2) understand individual differences between typically developing and autistic students' social network structure and perceived social support at point of entry to first year of university; 3) understand how simultaneous changes in social network structure and perceived social support over first year of university can affect transition outcomes in both typically developing and autistic students.

Chapter Three

Developing an online tool to measure social network structure and perceived social support amongst autistic students in higher education: A feasibility study

Chapter Rationale

The systematic review in Chapter Two highlighted the lack of an efficient measurement tool that can simultaneously assess one's social network structural components (e.g., network size, density, and relative composition of different types of social network members), as well as functional components such as one's perceived levels of support from different network members for a range of tasks. In the context of transitioning to university, students may begin to socialise across a broader range of contexts compared to school, such as via course related activities, housing, leisure activities and societies, part-time employment and other opportunities. In addition, by drawing upon the challenges that autistic students might face when transitioning to university described in Chapter One, such difficulties fell under one of three domains: Academic, Daily Living, and Socialisation. Therefore, developing a new tool that can succinctly summarise the relationships that are most meaningful to the student across multiple settings may also help capture those who are most likely to provide support to the student across different domains of life at university. The aim of Chapter Three is to conduct a feasibility study to pilot a new online tool named Social Network and Perceived Social Support (SNaPSS), aimed to capture individual differences in structural and functional components of social networks in both autistic and typically developing students transitioning to university.

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Copyright status (tick the appropriate statement)			
I hold the copyright for this material		<input checked="" type="checkbox"/>	Copyright is retained by the publisher, but I have been given permission to replicate the material here <input type="checkbox"/>
Candidate's contribution to the paper (provide details, and also indicate as a percentage)	The candidate contributed to / considerably contributed to / predominantly executed the... Formulation of ideas: Predominantly executed (95%) Design of methodology: Predominantly executed (95%) Experimental work: Predominantly executed (100%) Presentation of data in journal format: Predominantly executed (95%)		
Statement from Candidate	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature.		
Signed		Date	20/05/2020

Abstract

The academic, daily-living, and social challenges all students face during university transition can become magnified for many autistic students, who might struggle to adapt to changes in their social network structure (SNS) and perceived social support (PSS). This study assessed the development, feasibility, and convergent validity of a novel online tool (Social Network and Perceived Social Support, SNaPSS) designed to quantitatively and qualitatively evaluate SNS and PSS during university transition. The SNaPSS demonstrated good feasibility for completion amongst autistic students (Study 1, n=10, 17-19 years), and adequate convergent validity against other PSS, autism symptom severity, and social anxiety measures amongst autistic (n=28) and typically developing students (Study 2, n=112, 17-19 years). Broader implications of using the SNaPSS to measure SNS/PSS are discussed.

Keywords: Autism Spectrum Disorder, Social Network, Perceived Social Support, university, college, transition

Developing an online tool to measure social network structure and perceived social support amongst autistic students in higher education: A feasibility study

“No man is an island, entire of itself; every man is a piece of the continent, a part of the main...” (Donne, 1839, p.574). Indeed, for any individual, social networks function to provide practical and social support, both of which are critical for maintaining wellbeing (Dunbar & Spoors, 1995; Hill & Dunbar, 2003; Roberts & Dunbar, 2011; Siedlecki, Salthouse, Oishi, & Jeswani, 2014). Significant transition points in an individual’s life such as moving from one part of the education system to another, changing jobs, geographical location etc. are accompanied by an inevitable change in one’s social network and access to social support. Developing a new social network can be critical to successful transition and adaptation to a new set of life circumstances.

An important transition many young people experience is the move to post-secondary education (such as university or college), which often coincides with the first time of leaving home and leading an independent life (Fisher & Hood, 1987). Previous studies have found that for students transitioning to university, better perceived social support (PSS) was associated not only with better adjustment outcomes, but also better mental and physical health, greater life satisfaction and more positive coping (Gall, Evans, & Bellerose, 2000; Tao, Dong, Pratt, Hunsberger, & Pancer, 2000). Students also experience changes in the kinds of support they receive from different social network members. For example, high quality support from family (Hays & Oxley, 1986) was associated with better adjustment at university (Friedlander, Reid, Shupak, & Cribbie, 2007), though support was more in the form of fun/relaxation, rather than informational/emotional support (Swenson, Nordstrom, & Hiester, 2008). In contrast, peers provided more social and emotional support to students during transition (Friedlander et al., 2007), which helped to improve students’ mental health, and encouraged students to use more positive coping strategies (Tao et al., 2000). Therefore, social network structure (e.g., who is in the social network) and perceived social support are crucial for enabling successful transition to university for students. The focus of the present study is to identify the feasibility of

assessing these variables for autistic¹ students transitioning to university. Furthering our understanding of factors critical to successful social network transition can shape the provision of supportive interventions for stakeholders in education.

Social Network Analysis

Social network analysis (SNA) is the quantitative evaluation of both structural and functional components of the types of relationships an individual has with other people around him/her (Kreider et al., 2016; Scott, 2017). Some important structural social network components are size (i.e., how many people an individual may be in contact with); composition (i.e., the types of relationships an individual has with each member, such as family, friends, etc.); density (i.e., the extent to which individuals named within a network might know each other); and centrality (i.e., the location of an individual within his/her social network). Functional components of the social network comprise the extent to which an individual might receive or perceive support from different social network members. There are some correlations between structural and functional components of social networks. For example, during a stable phase of one's lifetime, having a high-density social network might increase the accessibility of information and resources through improved flow through different social network members. However, during a major life transition such as starting university or moving across countries, having a low-density social network might increase one's resilience to adapt to changes in environment, as the individual may be able to maintain some existing social contacts rather than lose access to the entire social network (Scott, 2017).

There are two main types of SNA, sociomap and ecomap. Sociomap (Correa & Ma, 2011) is usually measured within a pre-defined social space where it is assumed that all individuals have the potential to interact with each other and establish relationships (e.g., within a school classroom). All individuals are sampled and a summary combining all the reported relationship information is used to

¹ In a recently published article (Kenny et al., 2016), members of the autism community preferred to use identity-first language (i.e., autistic individual), whereas professionals preferred to use person-first language (i.e., individual with autism). Here we choose to use identity-first language, although we are aware that some might prefer to use person-first language.

generate a sociomap. In contrast, an ecomap (Ray & Street, 2005) focuses on a particular individual, and assesses the relationships that this individual considers to be important to him/her in their personal environment. Therefore, compared to a sociomap, an ecomap produces a much more individualised visualisation of one's personal social network across multiple domains (e.g., friends, family, work colleagues etc.), though it may be more subject to self-reporting bias. A particular strength of ecomap is that it can capture changes in one's social network during life transitions, when the sudden change in environment no longer provides a clearly defined space for sampling information to generate a sociomap.

Social network analysis in post-secondary education

The ability to establish a novel social network, especially with same-aged peers, becomes increasingly important over the course of development (Kamps, Potucek, Lopez, Kravits, & Kemmerer, 1997). Adolescents begin to rely more on friends and less on family for a wide variety of support including both informational/practical as well as personal/emotional support (Lee & Goldstein, 2016). This shift to increasing independence from family members is not always gradual and 'sudden' events such as a move out of home to access post-secondary level education accelerates the process. In such situations, higher levels of perceived social support are often associated with better transition outcomes in typically developing students (Azmitia, Syed, & Radmacher, 2013; Friedlander et al., 2007).

There have been few studies using measures that simultaneously capture both structural and functional dimensions of social networks specifically amongst students transitioning to university. One recent systematic review of the literature (Lei, Reeves, & Russell, in preparation) which followed PRISMA guidelines (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group, 2009) assessed how changes in both SNS and PSS during transition to first year of university might be associated with transition outcomes in students aged 17-21, using longitudinal research design. After title, abstract, and full text screening, as well as quality appraisal, the review identified a total of only ten studies that assessed either changes in SNS or PSS (or both) amongst first year university students. Only one of the ten studies was found that simultaneously measured both changes in SNS and PSS in first year university students (Hays & Oxley, 1986). Hays and Oxley (1986) asked participants to report up to

ten people that they had seen in the past 3 weeks, and then reported whether each individual had provided emotional, tangible, and fun support.

Although the authors were able to capture some structural and functional aspects of students' social networks, the types of support were more general (e.g., "providing comfort/support during a personal issue"), rather than specifically focusing on the challenges faced by students transitioning to university. The functional support measured also did not take into account differences in perceived quantity and quality of each type of support provided, making it difficult to identify whether individual differences in transition outcomes might be associated with perceived quantity and/or quality of support in any specific area. Therefore, developing a tool that can not only capture both the structural and functional aspects of students' social networks, but also capture support domains most relevant to challenges faced by students transitioning to university, and differentiate between perceived quantity and quality of support can enable university stakeholders to better understand *who* is best at providing *which* types of support during the transition process.

Autism, and social network analysis

Autism Spectrum Disorder (ASD, hereafter autism) is a neurodevelopmental disorder characterized by differences in social communication and a pattern of restrictive and repetitive behaviour, interests and activities (American Psychiatric Association, 2013). Autism affects 1 in 59 children (CDC, 2018). Autism affects an individual across the lifespan and research findings suggest that although many autistic people report a desire for social relationships, they reported reduced numbers of social relationships and more adverse social events such as peer victimization than other groups (Jackson, Hart, Brown, & Volkmar, 2018). During early and middle-childhood, a structured educational system and parental support can be influential in scaffolding the development of social networks (Kreider et al., 2016). However, difficulties associated with social transition for many autistic students emerge from a young age, as a recent systematic review (Nuske et al., 2019) that examined 27 studies on school transitions for 443 autistic students found that they experienced high levels of anxiety, as well as greater mental health needs, sensory, behavioural, and academic challenges when transitioning to a new school. Autistic students reported greater social pressure post-transition, and found forming new friendships especially anxiety provoking in light of their social

communication difficulties, and some reported experiences of bullying and isolation (Nuske et al., 2019).

In previous research analysing social networks of both autistic and typically developing (TD) children in mainstream classrooms (Anderson, Locke, Kretzmann, & Kasari, 2016; Chamberlain, Kasari, & Rotheram-Fuller, 2007; Locke, Ishijima, Kasari, & London, 2010; Locke, Kasari, Rotheram-Fuller, Kretzmann, & Jacobs, 2013; Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010), researchers have frequently used the “Friendship Survey” – which asks each child in a classroom to freely recall names of children who like or dislike to hang out with each other. The information collected can be used to generate a sociomap consisting of friendship clusters within the class and be used to measure network centrality of any specific child within the classroom to reveal the extent of inclusion. Although this method can successfully capture the social networks within a single classroom setting it cannot adequately capture the inherent changes in social network as students make the transition to university where socialization becomes more complex, with less focus on classroom based interaction and greater diversity of extra-curricular social forums. Therefore, it may not be feasible to gather information from *all* social network members to generate accurate sociomaps to reflect changes in social network across time at university, but an ecomap may be more appropriate.

Autism and post-secondary education

Transition into adolescence and early adulthood can present challenges for all young people and might be especially challenging for autistic students to navigate. Although almost half (46%) of autistic individuals have average or above average IQ (CDC, 2018), and have the intellectual potential to enrol in postsecondary education (Sanford et al 2011), enrolment in post-secondary education amongst autistic students is relatively poor. In the U.S., it is estimated that only around 35% of autistic students complete their post-secondary education, which is lower than 38% graduation rate for students with other disabilities, and 51% of typically developing peers (Gobbo & Shmulsky, 2014). Similarly in the UK, fewer autistic students graduated from university with a 2:1 or first class honours degree (62.8%) compared to students with other forms of disabilities (66%), and typically developing peers (68.1%) (Lucas & James, 2018).

Although the number of autistic students enrolling in postsecondary education have increased in recent years, mental wellbeing amongst these students on campus is relatively poor (Jackson, Hart, Brown, et al., 2018; Jackson, Hart, & Volkmar, 2018), with between 47-71% of autistic students experiencing high levels of anxiety, loneliness, and symptoms of depression (Gelbar, Smith, & Reichow, 2014). In particular, participation in social activities, especially with same-aged peers, can often be especially poor amongst autistic young adults compared to young people with other forms of special education needs (Orsmond, Shattuck, Cooper, Sterzing, & Anderson, 2013). Reduced participation in social activities was particularly evident amongst autistic young people with poorer conversation skills and functional ability, and the absence or poor quality friendships can lead to greater feelings of social isolation amongst autistic students (Orsmond et al., 2013).

This high occurrence of loneliness suggests that the ability to successfully establish a new social network at university and seek out appropriate sources of social support can be especially challenging for autistic young people (Adreon & Durocher, 2007), and highlights that better quality and more tailored support to meet individuals' needs for this vulnerable student population at university is much needed, especially to monitor students' interactions with same-aged peers, which may help to buffer against feelings of loneliness and isolation. Understanding the changes in social network structure (SNS) and perceived social support (PSS) during transition to university might offer insight into students' ability to successfully adapt to the novel environment, given that high levels of perceived social support is often associated with better transition outcomes (Azmitia, Syed, & Radmacher, 2013; Friedlander et al., 2007).

For many autistic students at university, family members (especially parents) often continue to provide high levels of support across a range of academic, daily living, and socialization areas (Elias, Muskett, & White, 2017; Fleischer, 2012; Mitchell & Beresford, 2014). Continued high levels of support from family might therefore compensate for potentially lower levels of perceived social support from same-aged peers at university, reflecting differences in both SNS and PSS between autistic students and their TD peers at university. To date, no studies have yet explicitly evaluated autistic students' perception of their PSS from different social network members. Gaining a better understanding of both the structural and functional social support network of autistic students can help

stakeholders adopt a more systemic approach when planning transition supports for autistic students, and to better integrate different resources such as family, peers, and university staff to optimize the support structure for autistic students at university.

Development of Social Network and Perceived Social Support (SNaPSS) tool

The SNaPSS is developed to capture both key structural components of one's social network (size, composition, and density) (Scott, 2017), as well as the functional PSS provided by each network member within one's social network. The rationale behind the SNaPSS is to develop an easy-to-use online tool that can help students visualize a holistic view of their perceived social world, as well as help relevant stakeholders to effectively gather information about the quantity and quality of social relationships that each student perceives to be the most important to them. The SNaPSS is based on ecomap methods and was developed to evaluate structural and functional aspects of social network i.e. Social Network Size (SNS) and Perceived Social Support (PSS) for students making the transition to university. SNaPSS aims to capture: 1) a wide range of social network structures consisting of network members that students consider to be important to them; 2) perceived frequency and quality of social support provided by all social network members across a wide range of academic, daily living, and socialization areas related to challenges that students might face during transition to university.

SNS measure development

In order to adopt an ecomap approach to evaluate SNS and PSS, the SNaPSS first gathered information about each network member (alter) within an individual's (ego) social network, such as basic demographic information (e.g., name, sex, relationship to ego), as well as the relationship between each network member with other network members (alter-alter relationship). The former gives an approximation of the individual's social network size and network composition, whilst the latter provides a measure of network density. Next, individuals reported the types, frequency, and quality of support they perceived to have been provided by each network member named, which provides various measures of PSS that can be broken down either by types of support received (e.g., academic, daily living, and socialization), or by types of network members who have provided the support (e.g., family, friends, and other network members).

Given that for each network member named, there is a wealth of information collected based on that individual (demographics, alter-alter relationships, PSS), the length of the questionnaire using an ecomap approach can quickly accumulate and become too long and not feasible for students to complete. Therefore, a balance needs to be struck between the number of network members that students can include within their social network, and the number of questions answered per network member.

Prior research have suggested that although human networks can range from 130 to 250 individuals (Hill & Dunbar, 2003), the closer and more intimate inner circle which provides most functional support and who are in regular contact to individuals stands at around 10-15 individuals (Dunbar & Spoors, 1995). Given that SNS is also a dynamic construct that can change over time, measurements of SNS also need to define a specific period of time for participants to recall their SNS. In a previous study that evaluated SNS in college students in the US, Hays and Oxley (1986) asked students to report up to 10 network members that they considered to be close to them and have been in contact with for the past 3 weeks. However, the two potential limitations are that 1) 10 network members is smaller than the upper limit of intimate social circles found by prior research (Dunbar & Spoors, 1995), thus potentially limiting the ability of students with larger social networks to accurately report their inner social circle; 2) 3 weeks is a relatively short time window to measure the establishment of new social network ties during a major life transition such as going to university, especially when used in longitudinal designs to reflect changes in SNS over time.

The current SNaPSS overcomes these limitations by asking each participant to name up to 20 individuals with whom they have been in contact with over the past three months, and whose relationships were considered to be particularly important and worthwhile to the participant, giving an approximation of social network size. The choice of 20 network members is greater than the average upper limit of number of network members included in the intimate circle (Dunbar & Spoors, 1995) to try to minimize ceiling effects. The duration of three months was chosen as it provides a significant time frame for students to establish and develop new social ties, and approximately corresponds to the duration of an academic term at university. The use of academic term as a time frame for recalling changes in SNS is particularly important for longitudinal studies that might investigate changes in

SNS across first year university transition. A longer time frame can help capture significant changes in SNS that might occur over an academic term, as students might participate in different social events, clubs and societies throughout the academic year.

PSS measure development

Preliminary items focusing on PSS for the SNaPSS were developed based on prior literature to capture areas where students in transition might require support, as well as areas that might be especially challenging for autistic students. Autistic students attending university often face challenges in a wide range of social, daily living, and academic areas (Adreon & Durocher, 2007). For socialization, autistic students often experience difficulties in perspective taking and gauging the interest of their audience when communicating with others (Baron-Cohen, 1989; Baron-Cohen, Leslie, & Frith, 1985; Zager & Alpern, 2010), and can often miss out on or misinterpret nonverbal social cues during a social interaction. Communication with purely social intent can also be lacking in autistic people e.g. engaging in ‘small talk’ as a tool for social reciprocity. In addition, some autistic people have restricted and circumscribed interests that can limit their ability to engage in conversations across a varied range of topics that may lie outside of their interests and can further interfere with their social interactions with other people. Such social communication deficits can reduce autistic students’ ability to socialize with peers across a variety of contexts, ranging from living in shared accommodation, to completing coursework that requires working in groups (Hees, Moyson, & Roeyers, 2015).

Many autistic students also experience difficulties in many executive functioning (EF) processes such as planning and organization (Ozonoff, Pennington, & Rogers, 1991). In a recent meta-analysis that assessed the extent of impairments across different EF subdomains in autistic people, Demetriou et al. (2018) found a moderate effect size for impairments across all EF subdomains, highlighting the nature of global EF deficits observed across development in autistic people. EF deficits can further impair one’s ability to live independently, given that many daily tasks require one to seek out relevant information, synthesize a plan, and follow through the plan in a series of steps in order to achieve the final goal (Gilotty, Kenworthy, Sirian, Black, & Wagner, 2002). EF deficits can therefore affect a wide range of daily living skills such as managing one’s finances,

cooking, and doing laundry, as well as academic demands such as meeting coursework deadlines and managing one's time (Hewitt, 2011; Pugliese et al., 2015; Rosenthal et al., 2013; Sparrow, Ballard, Cicchetti, Harris, & Doll, 2005).

Based on prior literature, a list of 15 preliminary areas of support (5 academic, 5 daily living, and 5 socialization) were developed (Table 1), and piloted during part one of the current study to assess face validity of these items in relation to concerns and worries that autistic students have when transitioning to university.

Table 1.

Areas of support across academic, daily living, and socialization domains that are included in Social Network and Perceived Social Support (SNaPSS) measure.

Academic	Daily Living	Socialization
1. Course workload	1. Changes in my routine	1. Living in shared accommodation
2. Course difficulty	2. Cooking	2. Getting on with people I live with
3. Meeting course deadlines	3. House chores (laundry, cleaning/tidying/organising room)	3. Fitting in
4. Doing group work	4. Manage/budget my finances	4. Being bullied/feeling isolated
5. Time management and routine	5. Self-care/seeking medical advice	5. Socializing with other students/making friends

The current study

The current study develops and assesses the feasibility of a novel online tool, Social Network and Perceived Social Support (SNaPSS). This study is conducted in two parts. The first part of the study considered issues of feasibility of administration, ease of completion and measurement of individual differences in both SNS and PSS in a small group of autistic students. The second part of the study used a larger sample of TD and autistic students who were about to transition to university and evaluated convergent validity between the SNaPSS and other measures of PSS, anxiety, and levels of autistic-like traits.

Therefore, the overall aim of the study is to develop, test the feasibility, and assess convergent validity of a novel online tool designed to measure both SNS and PSS amongst autistic and TD students transitioning to higher education. The research questions examined were as follows for Part 1 and Part 2 of the study:

- 1) Is the SNaPSS a feasible tool for autistic students to complete online? (Part 1)
- 2) Can the SNaPSS effectively capture individual differences in SNS and PSS? (Part 1)
- 3) Does the SNaPSS show convergent validity with current measures of PSS, autistic traits, and social anxiety? (Part 2)

Methodology

Both parts of the study were approved by the University's departmental ethics committee and is in line with the Declaration of Helsinki as revised in 2000. All participants provided written informed consent prior to participating in the research study.

Part 1

Participants. For part one of the study assessing feasibility of SNaPSS and face validity of preliminary items, participants included ten students (two female; eight male) between the ages of 17-19 years old who took part in an Autism Summer School programme that supported autistic students to transition to university (Table 2). All participants who enrolled at the Autism Summer School had received a prior diagnosis of Autism, Asperger's, or Autism Spectrum Disorder from a trained clinical professional. Prior to arriving at the Autism Summer School, parents also completed the Social Communication Questionnaire (SCQ; Rutter, Bailey, & Lord, 2003) to further inform diagnosis and autism symptom severity.

Measures.

Social Network and Perceived Social Support Tool (SNaPSS). The SNaPSS is a novel online self-report tool developed by the first author to assess both social network structure (SNS) and perceived social support (PSS) amongst students transitioning to university. The tool is divided into three sections. First, participants reported perceived frequency of distress (stress, anxiety, and depressed/low mood) across a total of fifteen academic, daily living, and socialization areas (Table 1). Participants rated frequency of distress (stress, anxiety, feelings of low mood) on a 5-point scale

ranging from 0 (never) to 4 (6 or more times a week). For each area endorsed as being associated with distress, participants rated both whether they perceived there were people they could turn to for support (i.e., support availability), as well as how supported they felt (i.e., support quality). Participants rated both support availability and support quality on a 5-point scale ranging from 0 (never) to 4 (always).

Second, for SNS, each participant named up to 20 individuals with whom they have been in contact with over the past three months, and whose relationships were considered to be particularly important and worthwhile to the participant, giving an approximation of social network size. Participants then reported the type of relationship (e.g., family, friends, other individuals such as teacher/lecturer, support/social worker etc.), the degree of similarity, the frequency, and modes of contact between self and each individual named. Participants also reported whether to the best of their knowledge, any two individuals named knew of and were in contact with each other, giving an indication of the social network density, scored between 0 (low) -1 (high), with high density reflecting that most individuals within a social network know of each other. Size and density of social networks can also be represented visually using a social network map (ecomap).

Finally, for PSS, participants reported the types of support provided by each social network member across the academic, daily living, and socialization areas (Table 1) over the past three months. Of the types of support endorsed by each social network member, participants then reported: 1) the frequency of perceived support on a five-point scale (1 = once/twice in total; 5 = six or more times/week); 2) the quality of perceived support on a five-point Likert scale (1 = not at all supported; 5 = very much supported). For each category of social network members (i.e., Family, Friends, and Others – including teachers/lecturers/tutors, social/support worker, other), perceived frequency and quality of support was calculated as the average value of those members who endorsed at least one type of academic, daily living, or socialization support. Network members who did not provide any types of support were scored as 0 for both perceived frequency and quality of support. Therefore, total perceived frequency and quality of support are scored between 0-15, with 0-5 within each of academic, daily living, and socialization domain.

Social Communication Questionnaire – Lifetime (SCQ, Rutter et al., 2003). The SCQ Lifetime is a parent-report 40-item questionnaire that assesses whether the individual has displayed symptoms associated with ASD, such as social communication difficulties, throughout their lifetime. Each item is scored using a dichotomous 0 (never been present) to 1 (have been present) scale. A total score above 15 indicates that the individual is likely to have Autism Spectrum Disorder (sensitivity = .68, specificity = .41) (Hanson, Sullivan, Thurm, Ware, & Lord, 2002), and may require further testing to assess diagnosis. The SCQ has good internal consistency (Cronbach's alpha = .67-.90 for the subscales and total score), and has good convergent validity (Pearson's correlation = .55-.59 for the subscales) with the Autism Diagnostic Interview – Revised (a gold standard autism diagnostic tool) (Berument, Rutter, Lord, Pickles, & Bailey, 1999).

Study design. For part one of the study, all students participating in the Autism Summer School were invited to take part in the current study. The Autism Summer School is a programme held at the University of Bath aimed to inform autistic students about university life, and support university transition (Lei, Calley, Brosnan, Ashwin, & Russell, 2018). Parents of all participants completed the SCQ as part of the pre-summer school arrival questionnaire pack. On the first day of the summer school during 2017, all students were invited by the first author to take part in the pilot study, after having received a presentation from the first author on social changes during transition to university. The aims of the pilot study were clearly explained to students prior to participation, including that their participation was voluntary, and their decision to take part in the study (or not) will not affect their participation in the summer school programme. A total of eleven students volunteered to enroll in the study. Written informed consent was obtained from all students prior to participation. One student failed to complete the session and withdrew from the study due to experiencing high levels of social anxiety during his time at the Autism Summer School. The remaining ten students completed the novel online tool via Qualtrics and were asked for verbal and written feedback on their thoughts about the format, language, and appropriateness of the support areas included in the tool as a measure of SNS and PSS after they have completed the SNaPSS.

Part 2

Participants. For part two of the study assessing convergent validity of SNaPSS with other measures of PSS, social anxiety, and autistic traits, a larger sample of 112 TD students (20 male; 92 female) and 28 autistic students (14 male; 14 female) who were about to transition to university were recruited separately as part of a longitudinal study that assesses changes in SNS and PSS during first year of university. Convergent validity is assessed between the measures taken at baseline (i.e., during the first two weeks of first term at first-year of university), including the Multidimensional Scale for Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988), Social Anxiety Scale for Adolescents (La Greca, Ingles, Lai, & Marzo, 2015), and Autism Quotient-28 (Hoekstra et al., 2011).

Measures.

Social Network and Perceived Social Support Tool (SNaPSS). The SNaPSS (as described in Part 1) used for part 2 of the study was a slightly revised version based on students' feedback from part 1 feasibility study. The adaptations are described in greater length in the results from feasibility study, and also in discussion. First, a question about whether or not students have taken a gap year² was added. Second, feelings of stress, anxiety, and low mood were combined into a single "distress" rating using the same scoring system.

Multidimensional Scale for Perceived Social Support (MSPSS, Zimet, Dahlem, Zimet, & Farley, 1988). The MSPSS is a 12-item self-report measure of perceived social support from family, friends, and significant other. The items are listed as statements surrounding more general provision of support and especially emotional support. Example statements include "I get the emotional help and support I need from my family" (Family), "I have friends with whom I can share my joys and sorrows." (Friends). Each item is rated on a 7-point Likert scale (1 = very strongly disagree, 7 = very strongly agree). The MSPSS has good internal consistency (Cronbach's alpha = .85-.97 for the subscales and total score).

² In the UK, a gap year is an optional year out of education between finishing secondary education and starting post-secondary education.

Autism Quotient – 28 (AQ-28, Hoekstra et al., 2011). AQ-28 is an abridged version of the full 50-item Autism Quotient scale, with a list of statements which refer to social behaviors related to autistic traits, such as “I prefer to do things the same way over and over again”, with each item rated on a four-point Likert scale (1 = Definitely Agree, 4 = Definitely Disagree). The abridged scale has good internal consistency (Cronbach’s alpha = .77-.86), and high predictive validity, with scores >65 having a sensitivity of .97 and specificity of .82.

Social Anxiety Scale for Adolescents (SAS-A, La Greca, Ingles, Lai, & Marzo, 2015). SAS-A is a 22 item self-report measure of social anxiety in adolescents, with 3 subscales that assess 1) fear of negative evaluation (FNE; 8 items); 2) social avoidance and distress in social situations (SAD-NEW; 6 items); and 3) generalized social avoidance and distress (SAD-G; 4 items). SAS-A has high internal consistency (Cronbach’s alpha .77 – .92), good concurrent validity with measures of social phobia, good discriminant validity, and good test-retest reliability.

Study design. For the second part of the study, first year university students were recruited for a larger longitudinal study examining changes in social networks via advertisements on campus such as posters, social media, and information given at lectures at a medium sized university in the UK during the first two weeks of the university term in September/October. Typically developing (TD) and autistic students in their first term at University were recruited. Autistic students must have been given a diagnosis of ASD by a clinical professional, and TD students are defined as not having any other concurrent mental, physical, or other health conditions at the time of enrolment. Participants were provided with study information via Qualtrics, and then completed consent forms and all questionnaires online via Qualtrics within the first two weeks of university, as part of the baseline data collection for the longitudinal study. A total of 112 TD students and 28 autistic students were recruited to take part in the larger longitudinal study, which asked students to complete a collection of questionnaires assessing how changes in students’ SNS/PSS (as assessed by SNaPSS) might influence their university transition outcomes. The larger longitudinal study asked students to complete questionnaires during September (Time point 1), December (Time point 2), and March (Time point 3) of first year of university. For part two of the current study, only the cross-sectional data collected during time point 1 (September of first year of university) were used for the purpose of assessing

convergent validity. Data collection for the longitudinal study was still ongoing and incomplete at time of submission for the current study.

Data analyses

All data analyses were completed using SPSS version 24 (*IBM SPSS Statistics*, 2016), and Gephi2 (Bastian, Heymann, & Jacomy, 2009) was used to calculate both social network density, and for generating individual ecomaps for social network structure.

For part one of the feasibility study, we first assessed participants' verbal and written feedback on feasibility of the online tool, and any suggestions they had on the language, format, and delivery of SNaPSS. Where appropriate, adaptations were made to SNaPSS based on participants' feedback. Second, we explored the range of scores reported by participants on the frequency of distress across academic, daily living, and socialization areas, as well as in perceived availability and quality of support during times of distress across each area. We used the non-parametric Friedman test as an alternative to one-way repeated measures ANOVA, due to the small sample size (N=10) in the current study, and Wilcoxon sign ranked test for post-hoc analyses. We used Bonferroni to correct for multiple comparisons. Third, using Gephi2, we explored whether the questions on social network structure can elicit participants to disclose a wide range of SNS size and density. We then evaluated whether participants' social communication impairments would be associated with their social network structure, and we conducted a Pearson's correlation between participants' SCQ total score, SNS size and density, as well as social network composition. Finally, we assessed whether differences emerged in frequency and quality of support provided by family, friends, and other social network members by conducting the non-parametric Friedman test. We used Bonferroni to correct for multiple comparisons.

For part two of the study, we assessed concurrent validity by conducting Pearson's correlation between SNaPSS' PSS scores for family and friends with the family and friends subscale of the MSPSS in both TD and autistic students. To assess the relationship between SNS and social competency factors such as level of social anxiety and autistic traits, we also conducted Pearson's correlation between social network size, density, composition, and SAS-A and AQ-28 total scores.

Results Part 1: Assessing feasibility of SNaPSS

Feasibility and use of language

Participant demographics for part 1 of the study can be found in Table 2. With the exception of one participant who withdrew from the study due to experiencing high levels of social anxiety during the Autism Summer School, the remaining ten participants all successfully completed the online tool within 12 to 47 minutes ($M = 28.22$; $SD = 9.20$). Overall, participants found the questionnaire to be clear in its format and use of language, and the questions were relevant and appropriate. Participants' feedback on how to improve the questionnaire included three main areas. First, four participants commented on combining the questions on stress, anxiety, and depressed/low mood into a single question that asked about general perceived distress related to each area. Participants felt that the distinction between stress and anxiety in particular was not very clear, and that by combining the questions into a single distress question can both shorten the duration of the questionnaire and make it less repetitive. Second, two participants commented that having to name at least 5 individuals and up to 20 maximum might be potentially too many for some people, and that a period of three months is a long timeframe for them to recall social interactions. However, students commented that the poor recall might be due to the nature of having been on summer holidays for the past 3 months at the time of questionnaire completion, and it might be easier to recall social interactions during more structured term time. Finally, one participant commented on having an option about having taken a gap year, as she did not require any academic support in the past year due to not being in full time education.

Table 2.

Study Part 1: Participant demographics for feasibility study (N = 10).

	Mean (SD)	Range
Age (years)	17.90 (0.74)	17 – 19
Social Communication (SCQ Total) ¹	21.20 (5.87)	14 – 33
Social Network Size ²	11.20 (6.49)	5 – 20
Family (n)	3.80 (1.93)	2 – 7
Friends (n)	5.90 (5.09)	0 – 13
Other (n)	1.50 (1.78)	0 – 4
Social Network Density ³	0.55 (0.28)	0.88 – 0.05
Perceived Distress Frequency ⁴		
Academic	4.20 (2.55)	0.2 – 9.20
Daily Living	2.5 (2.12)	0.4 – 6.60
Social	3.31 (3.16)	0.2 – 11.40
Perceived Overall Support Availability ⁵		
Academic	6.78 (3.05)	1 – 12
Daily Living	5.51 (2.85)	2 – 12
Social	5.22 (2.04)	2 – 8.05
Perceived Overall Support Quality ⁶		
Academic	5.49 (2.57)	1 - 9
Daily Living	4.34 (2.38)	1 – 9
Social	3.95 (1.95)	1 – 7.80
Support Frequency from Social Network ⁷		
Family	6.59 (3.02)	2 – 11
Friends	2.04 (2.03)	0 – 5.25
Other	1.84 (2.65)	0 – 6.67
Support Quality from Social Network ⁸		
Family	8.70 (3.98)	3 – 14
Friends	3.73 (3.70)	0 – 9.5
Other	3.00 (4.38)	0 – 11.33

Note. SCQ = Social Communication Questionnaire; ¹ SCQ is scored between 0-39, cut-off is 15; ²

Social network size is scored between 0-20; ³ Social network density is scored between 0-1;

⁴Perceived distress frequency is scored between 0-12; ⁵Perceived overall support availability is scored

between 0-12; ⁶Perceived overall support quality is scored between 0-12; ⁷ Support frequency is

scored between 0-15; ⁸ Support Quality is scored between 0-15.

Perceived distress across academic, daily living, and socialization

Perceived distress (stress, anxiety, and depressed/low mood) across academic, daily living, and socialization areas varied greatly amongst participants, as well as the perceived availability and quality of support for those who endorsed distress are reported in Table 2. Using Friedman's test, no significant differences were observed for perceived frequency of distress ($X^2(2) = 4.00, p = .14$),

perceived availability of support ($X^2(2) = 5.42, p = .07$), or perceived quality of support ($X^2(2) = 4.79, p = .09$) across academic, daily living, or socialization areas.

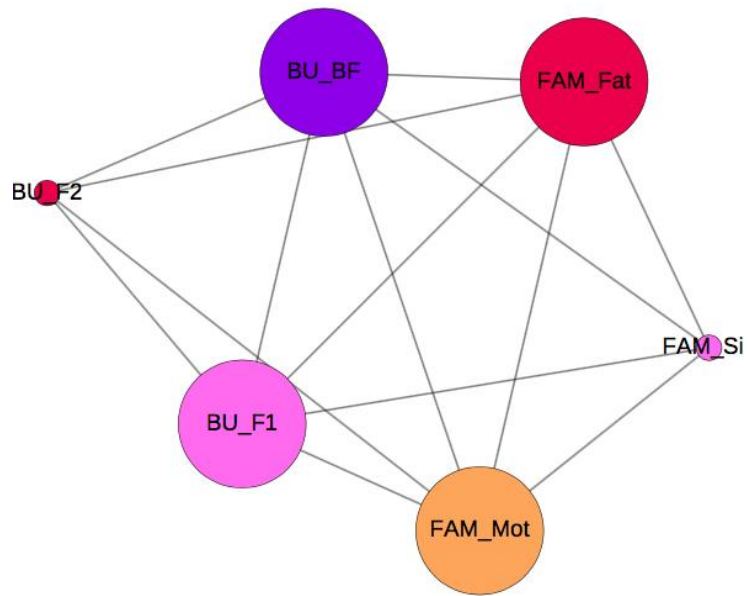
Social network structure

Participants reported a wide range of social network sizes and density (Table 2), highlighting a high degree of individual differences in SNS amongst autistic students. Figure 1 illustrates some examples of social networks of various sizes and density. Severity of social communication difficulties was not significantly associated with social network size ($r = .13, p = .73$), nor social network density ($r = -.43, p = .22$). Higher level of social communication difficulties was associated with lower percentage of friends ($r = -.69, p < .05$), and higher percentage of other individuals ($r = .76, p < .05$) in their social network.

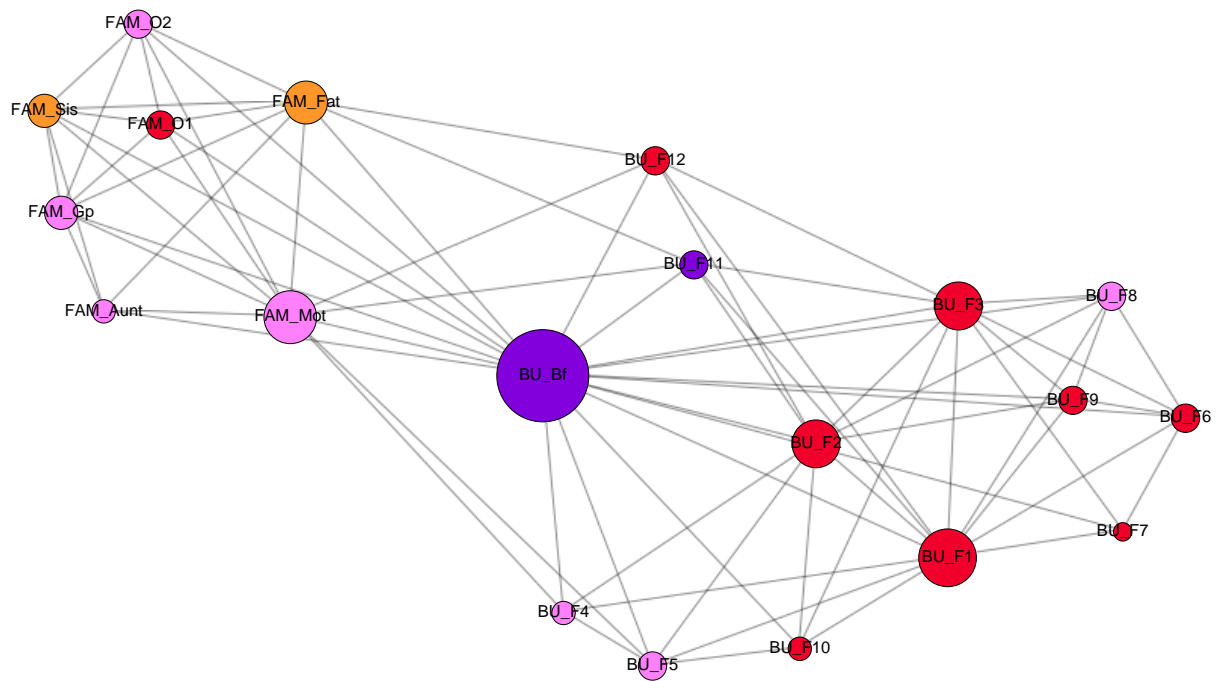
Perceived social support from social network

Using Friedman's test, significant differences were observed for perceived support frequency ($X^2(2) = 12.06, p < .01$) and quality ($X^2(2) = 8.22, p < .05$) across different social network members. Post-hoc analyses were conducted using Wilcoxon sign ranked test, with Bonferroni used to correct for multiple comparisons. For perceived frequency of support, participants reported higher frequency of support from family compared to friends ($Z = -2.67, p < .01$), and others ($Z = -2.70, p < .01$), though no differences were found between friends and others ($Z = -.17, p = .87$). For perceived quality of support, participants reported higher quality support from family compared to friends ($Z = -2.60, p < .01$), and others ($Z = -2.51, p < .015$), though no differences were found between friends and others ($Z = -.31, p = .75$).

a)



b)



c)

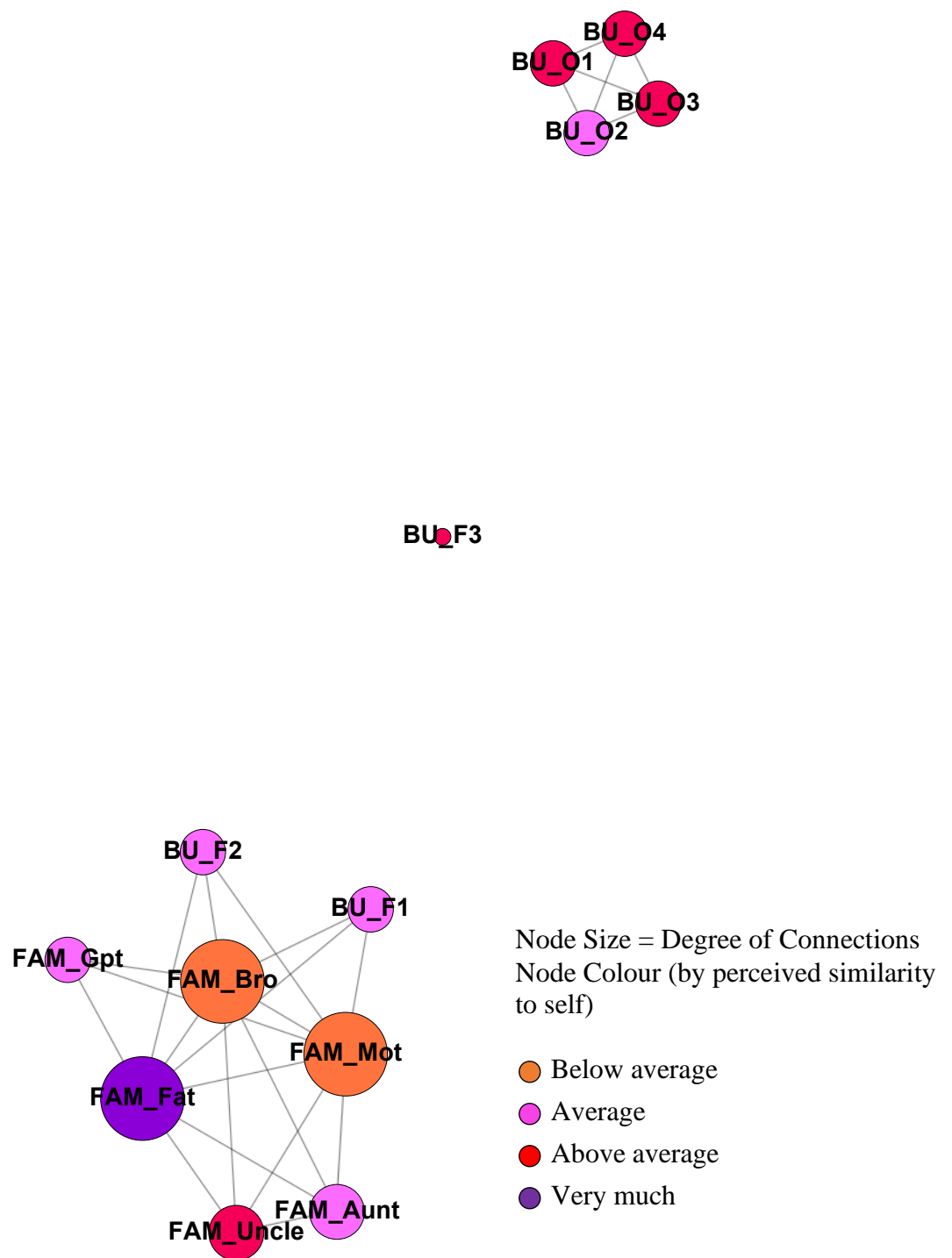


Figure 1. Examples of social network structure of participants from part 1 feasibility study (n = 10): a) Small network size (5), high network density (0.933); b) Big network size (20), medium network density (0.40); c) Big network size (13), low network density (0.321). FAM = Family; Mot = Mother; Fat = Father; Gpt = Grandparent; Sis = Sister; BU = Before university; F = Friend; O = Other; BF = Boyfriend.

Results Part 2: Convergent validity of SNaPSS

Participant demographics for part 2 of the study are shown in Table 3.

Table 3.

Study Part 2: Participant demographics for convergent validity study.

	TD (n = 112)		ASD (n = 28)	
	Mean (SD)	Range	Mean (SD)	Range
Age (years)	18.23 (0.46)	17 – 19	18.32 (0.48)	18 – 19
AQ – 28 Total ¹	61.65 (9.48)	36 – 86	83.07 (10.59)	59 – 104
SAS-A Total ²	56.82 (12.21)	33 – 85	70.21 (12.61)	46 – 89
MSPSS Total	5.73 (1.15)	1 – 7	5.06 (0.99)	3 – 7
Family	5.77 (1.32)	1 – 7	5.13 (1.26)	3 – 7
Friends	5.71 (1.26)	1 – 7	4.81 (1.33)	1 – 7
Social Network Size ³	11.50 (4.93)	2 – 20	8.25 (4.83)	0 – 20
Family (%)	36.14 (17.74)	0 – 100	36.18 (23.49)	0 – 80
Friends (%)	58.15 (18.91)	0 – 100	44.68 (28.72)	0 – 100
Other (%)	3.09 (6.71)	0 – 33	9.41 (19.13)	0 – 81
Social Network Density ⁴	0.35 (0.20)	0 – 1	0.34 (0.21)	0 – 0.91
Perceived Distress Frequency ⁵				
Academic	5.29 (3.35)	0 – 18	8.39 (4.57)	0 – 16
Daily living	5.72 (3.20)	0 – 13	8.46 (5.31)	1 – 18
Social	6.49 (4.86)	0 – 19	9.53 (6.10)	0 – 20
Support Frequency from Network ⁶				
Family	6.02 (3.20)	0 – 13	5.13 (4.30)	0 – 15
Friends	5.25 (3.32)	0 – 15	2.93 (3.46)	0 – 13
Other	0.34 (0.96)	0 – 5	0.76 (1.66)	0 – 7
Support Quality from Network ⁷				
Family	9.28 (4.19)	0 – 15	6.84 (4.94)	0 – 15
Friends	8.06 (0.43)	0 – 15	4.68 (5.01)	0 – 13
Other	0.74 (2.08)	0 – 10	1.70 (3.55)	0 – 15

Note. ¹AQ-28 = Autism Quotient – 28, is scored between 28 and 112, cut-off is 65; ²SAS-A = Social

Anxiety Scale for Adolescents, scored between 18 and 90, cut-off is 50; MSPSS = Multidimensional

Scale of Perceived Social Support; ³Social network size is scored between 0-20; ⁴Social network

density is scored between 0-1; ⁵Perceived distress frequency is scored between 0-20; ⁶Support

frequency is scored between 0-15; ⁷Support Quality is scored between 0-15.

Perceived distress frequency

To assess convergent validity between perceived distress frequency and social anxiety amongst TD and autistic students, we conducted Pearson's correlations between levels of social anxiety (SAS-A total raw score) and perceived distress frequency in academic, daily living, and social areas (Table 4). Higher social anxiety in both TD and autistic students were significantly associated with having higher levels of perceived distress across academic, daily living, and social areas.

Table 4.

Convergent validity between perceived distress across academic, daily living, and social areas measured by SNaPSS and level of social anxiety, shown by Pearson's correlation coefficient.

	TD			ASD		
	Academic	Daily Living	Social	Academic	Daily living	Social
SAS-A Total	.366***	.374***	.516***	.412*	.485**	.556**
Academic	-	.396***	.312**	-	.514**	.317
Daily living	-	-	.457***	-	-	.764***
Social	-	-	-	-	-	-

Note. SNaPSS = Social Network and Perceived Social Support; SAS-A = Social Anxiety Scale for Adolescents. * $p < .05$, ** $p < .01$, *** $p < .001$.

Social Network Structure

To assess convergent validity between SNS (SNaPSS) and autistic-like traits amongst TD and autistic students, we conducted Pearson's correlations between levels of autistic-like traits (AQ-28 total), and participants' social network size, density, and network composition (Table 5). Amongst TD students, a smaller social network size was associated with having higher levels of autistic-like traits ($r = -.20, p < .05$). Neither network density nor composition were significantly associated with levels of autistic-like traits. In contrast, we did not observe any significant correlations between any SNS dimensions and level of autistic-like traits amongst autistic students.

Table 5.

Convergent validity between social network structure measured by SNaPSS, and level of autistic traits, shown by Pearson's correlation coefficient.

	Size	Density	% FAM	% FRI	% OTH
TD (n=112)					
AQ-28	-.199*	.034	.137	-.164	.181
Size	-	.302**	-.469***	.464***	.007
Density	-	-	.576***	-.415***	-.174
% FAM	-	-	-	-.906***	-.042
% FRI	-	-	-	-	-.283**
ASD (n=28)					
AQ-28	.047	-.098	.181	-.229	-.020
Size	-	-.069	-.182	.448*	.010
Density	-	-	.362	-.160	-.029
% FAM	-	-	-	-.401*	-.227
% FRI	-	-	-	-	-.469*

Note. SNaPSS = Social Network and Perceived Social Support; AQ-28 = Autism Quotient -28; SAS-

A = Social Anxiety Scale for Adolescents; FAM = Family; FRI = Friends; OTH = Other. * $p < .05$, ** $p < .01$, *** $p < .001$.

Perceived Social Support

To assess convergent validity between measurements of PSS by SNaPSS and MSPSS (Table 6), we conducted Pearson's correlations between the perceived frequency and quality of overall support provided by family and friends as measured by SNaPSS, with the family and friends subscale scores of MSPSS. Amongst TD students, we observed good convergent validity, and also adequate discriminant validity. We found that the family subscale from MSPSS only showed significant correlations with the perceived quality and quantity of support from family members as measured by SNaPSS ($r = .29$ to $.40$, $p < .01$), but not with PSS scores from friends, showing both good convergent and discriminant validity. In contrast, the friends subscale of MSPSS showed significant correlations with the perceived quality and quantity of support from friends as measured by SNaPSS ($r = .19$ to $.21$, $p < .05$), suggesting good convergent validity. However, the friends' subscale from MSPSS also showed significant correlation with perceived quality of support from family as measured by SNaPSS ($r = .23$, $p < .05$), suggesting some overlap in PSS from family and friends.

Amongst autistic students, we did not observe any significant correlations between the perceived quantity and quality of family support (SNaPSS) and overall family support (MSPSS). For support from friends, we observed significant correlation between the perceived quality of support from friends (SNaPSS) and overall support from friends (MSPSS) ($r = .45, p < .05$), though not in the perceived quantity of support.

Table 6.

Convergent validity between perceived social support measured by SNaPSS and MSPSS, shown by Pearson's correlation coefficient.

	MSPSS FRI	FAM Qty	FAM Qlty	FRI Qty	FRI Qlty
TD (n=112)					
MSPSS FAM	.737***	.288***	.397**	.048	.010
MSPSS FRI	-	.137	.227*	.213*	.190*
FAM Qty	-	-	.800***	.255**	.157
FAM Qlty	-	-	-	.248**	.241**
FRI Qty	-	-	-	-	.834***
ASD (n = 28)					
MSPSS FAM	.108	.230	.287	-.313	-.243
MSPSS FRI	-	.054	.083	.355	.453*
FAM Qty	-	-	.907***	.026	-.057
FAM Qlty	-	-	-	.044	.045
FRI Qty	-	-	-	-	.878***

Note. SNaPSS = Social Network and Perceived Social Support; MSPSS = Multidimensional Scale of

Perceived Social Support; FAM = Family; FRI = Friends; Qty = Quantity; Qlty = Quality. * $p < .05$;

** $p < .01$; *** $p < .001$.

Discussion

The current study sought to examine the feasibility and psychometric properties of a novel online tool (the Social Network analysis Perceived Social Support - SNaPSS) designed to measure structural and functional components of social networks among autistic as well as TD students making the transition to university. Firstly, autistic students were able to complete the tool. Their feedback indicated that the tool was clear in its format, use of language, and relevance of items to the different areas related to academic, daily living, and socialization in relation to transition to university, thus indicating the SNaPSS showed good face validity. Based on participants' verbal and written feedback, two changes were made to the questions included in the questionnaire. First, a question about whether the student has taken a gap year before entering university was added.

Second, questions that separately assessed students' perceived anxiety, stress, and depressed/low mood were combined into a single question that asked about general distress (e.g., anxiety, stress, and depressed/low mood) across academic, daily living, and socialization areas. Combining into a single question will help to reduce both the repetitiveness of the tool, and also help shorten completion time for future research.

Secondly, the tool effectively captured diverse accounts of social networks in terms of structural and functional aspects across this group of autistic students, which can be both quantified and visualized graphically using ecomaps. The graphical representations of networks based on students' self-reports clearly demonstrate the range of complexity and also individual differences in the network composition when broken down by family, friends, and other network members. Using graphical representations to capture changes in social network structure may be especially helpful to summarize and reflect on the dynamic social environment that the student is embedded in at university. Identifying changes in network structure in relation to both size and density may help outline the strengths of social relationships within a social network, and to differentiate between individuals that may be more pivotal or more peripheral in both sustaining connections within the social network structure, and also for providing social support.

Taken together the findings from both SNS and PSS, participants in the feasibility study were able to utilize the novel online tool to help generate an overview of both the structural and functional social network that they perceive to be important to them, and have found the tool to be able to successfully capture a wide range of academic, daily living, and socialization issues during transition to university.

Furthermore, the convergent validity study also gave rise to three key findings. First, both autistic and TD students showed a high positive correlation between social anxiety and perceived distress frequency across academic, daily living, and social domains on the SNaPSS. The breadth of influence that social anxiety had on students' perceived distress beyond that of the social domain highlights the importance of socialization underlying all aspects of university life. The current findings may not be too surprising in the context of previous research findings, which have shown that students who perceived higher levels of social and emotional support from peers at university

experienced better transition outcomes overall at university, and also better mental health (Swenson et al., 2008). Therefore, having the confidence to socialize with others and make new friends at university might not only help alleviate some of the socialization distress, but also help an individual access broader support in academic and daily living areas, thus supporting a better overall transition. It might therefore be helpful for all students, regardless of having autism, to receive some support to recognize, manage, and overcome social anxiety at the start of the academic year, which might in turn help elicit more widespread positive changes in other non-social aspects of the students' lives.

Second, for SNS, whereas social network size was associated with level of autistic-like traits in TD students, the same pattern was not observed for autistic students. One potential explanation may be that given the AQ offers a broader account of both behavioral and social traits associated with autism, it was more sensitive to detect a broader range of autistic-like traits in the TD student group, and thus the greater variations in AQ scores may have been more sensitive to variations in SNS size. In contrast, the range of AQ scores was much narrower in the small autistic sample, and the smaller individual variance may have reduced statistical power to detect the differences in social network size. Future studies can further evaluate the relationship between autism symptom severity and SNS by using a larger sample of autistic students, and measure autism symptom severity using a variety of clinician, parent, and self-reports to further capture individual variances in autism severity.

Third, the degree of support provided by family and friends as measured by the SNaPSS demonstrated good convergent validity with the MSPSS, another well-validated measure of perceived social support. Some differences were observed in the properties of SNaPSS in this respect between TD and autistic students. There was good convergence between the measures across family and friends' support as reported by TD students, but only in the friend domain for autistic students. One potential factor that could have caused this discrepancy is that the traditional measures of PSS such as MSPSS place a stronger emphasis on availability of emotional support, rather than more practical aspects of support such as information seeking/daily living (an emphasis of the SNaPSS). Therefore, it may be that for TD students, there is some degree of conflation between reporting the practical and emotional side of PSS from family and friends. TD students may be more likely to turn to the same social contacts both instrumental and emotional support, and instrumental support provided by others

may also be perceived to carry some emotional salience. In contrast, this conflation between reporting practical instrumental support and emotional support may be less common amongst autistic students in their self-report. Differences in convergence between SNaPSS and MSPSS for autistic and TD students may therefore be partially due to differences in reporting style. Using a larger sample of autistic students in the future and focusing on the differences in factual recall of instrumental versus emotional support between autistic and TD students can help further assess factors underlying the differences in convergent validity observed in the current study.

It is important to note that the SNaPSS is developed as a self-report measure, though the use of self-reports in autistic population is often a topic of debate, as some autistic individuals might experience difficulties in introspection as well as emotion recognition, which might influence their ability to consciously report their own experiences (Ben Shalom et al., 2006; Bird et al., 2010; Mazefsky, Kao, & Oswald, 2011). Some research studies have also found little convergence between autistic individuals' self-reports of psychological symptoms when compared to parental or clinician report, further challenging whether self-reports are equally valid and accurate in autism research (Mazefsky et al., 2011).

However, one recent systematic review investigating the transition experience of autistic students to university found that the majority of research on recommendations for transition plans and interventions have been theoretically based, with few studies concentrating on the autistic students' subjective experience of the transition process (Gelbar et al., 2014). The authors highlighted the importance for future research to directly assess the subjective experiences of autistic students at university, and to utilize self-reports of first-hand experiences to better inform evidence-based practice for helping autistic students transitioning to university (Gelbar et al., 2014).

The transitional changes in both SNS and PSS is a subjective and unique experience for each individual, and the current novel online tool SNaPSS therefore provides a structured way for autistic students to report their own personal perception of both their structural and functional social network that they consider to be most important to them. This is especially important as the young person grows older and faces transitional changes such as going to university, as the social changes they are experiencing are unique to that young person, and there may not be a single "other" person who is

able to give a holistic perspective as to what the social world of that young person is like across multiple contexts (e.g., home, school, university, work etc). For example, a family member may only be able to report on how frequently the young person is in contact with family members only, but may be unable to accurately comment on the people that the young person is in contact with at university, or at his/her job. Such limited scope for any single “other” network member to report on the young person’s social world might only provide a very skewed or inaccurate representation of the overall social network of the young person in question. Furthermore, given that the SNaPSS focuses on the young person’s *perception* of their personal SNS and PSS, it may be difficult for others to accurately report on what they believe to be what the young person perceives their social world to be, and which people the young person considers to be closest to him/her. Although an other-user version of SNaPSS may enable a specific network member perceived to be closed to the younger person to provide validation for a single domain of an individual’s social network and perception of support provided by that domain only (such as family, school, university, or work etc), this would be of limited utility in respect of the measurement tool as a whole to capture an individual’s holistic social world. Therefore, although the use of self-report may suffer from reporting bias as a limitation, in the case of transitioning to university or adulthood, the nature of using self-report for the purpose of SNaPSS is both necessary and essential.

Providing insight into autistic students’ perception of support from various social network members can be particularly informative for university stakeholders to adopt a more holistic and systemic perspective when formulating transition plans. The current tool (SNaPSS) can therefore help stakeholders monitor how best to integrate different social resources such as family, peers, and university staff to ensure both a continuation of support during transition to university, and that each type of social network member can provide more specialized and efficient support to meet students’ needs.

Limitations

It is also important to consider some limitations of the current study. Although the current study found good feasibility and face validity of the SNaPSS as a novel tool to measure SNS and PSS amongst autistic students, convergent validity for PSS and SNS is somewhat inconsistent across TD

and autistic students. Future research can use a larger sample of autistic students to further assess whether there are differences in reporting emotional and instrumental PSS between autistic and TD students, as well as conducting further analysis into the types of social communication deficits experienced by autistic students that have the most significant impact on their SNS when compared to TD students.

Furthermore, the current feasibility and convergent validity studies are both cross-sectional and only used a small sample (n=10, 28 respectively) of autistic students either prior to, or at the start of their transition to university. This is a limitation for two main reasons. First, it is unclear whether the SNaPSS may be sensitive to detect changes in SNS and PSS over time, as students transition through their first year of university life. A more longitudinal design that uses the SNaPSS to monitor student transition over time may help assess SNaPSS's sensitivity to change, which is important as a tool that assesses the dynamic social network and perceived social support structure. Second, despite the clear diagnostic criteria set out for autism in the DSM-5, it is a highly heterogeneous condition, especially in terms of sex-related differences in behavioral presentation (Dean, Harwood, & Kasari, 2017), as well as many co-occurring mental and physical health issues experienced by many autistic individuals. Therefore, the generalizability of current findings based on a small sample of autistic students is rather limited, and future studies should seek to replicate current findings using a larger and more diverse sample of autistic students at university.

Future Research

Future studies should seek to adopt a longitudinal design over the first year of university life to help monitor *changes* in both SNS and PSS during the transition process. This would better assess whether changes in either SNS and/or PSS observed may be associated with university transition outcomes in either student group. Characterizing differences in how changes in SNS and PSS can influence transition outcomes can help university stakeholders design more tailored interventions to better support each student group during their university transition, further enhancing students' university experience.

The current SNaPSS is a novel online tool that uses ecomap structure to capture both quantitatively and qualitatively the unique SNS and PSS from network members that an individual

perceives to be close to them. Although the current format of SNaPSS focuses on students' social relationships throughout the transition to traditional college attendance, the measure could also be adapted for autistic students who are making the transition to post-secondary education delivered via distance learning or online attendance. This would involve asking students to consider online and offline social contacts separately when completing the social network structure section of the SNaPSS, participants can then explicitly state which social network members they have concluded are online only, offline only, or both. This would enable the construction of different types of ecomaps depending on the researcher's interest based on format of or medium used for social interactions.

Next, although the current SNaPSS tool focuses on using a self-report tool to highlight an individual's perception of their *personal* social world, one potential future direction is to evaluate whether the development of an other-user version of SNaPSS may be more useful for use with younger population (such as autistic school-age children) or with individuals with intellectual disability, who might be unable to accurately generate self-report of their overall social network, and need to rely on adults who are working closely with them to help report their social network structure and perceived social support.

Beyond the focus for examining areas associated with transition to university per se, the tool can be adapted for use with other populations, and examine other areas of support both during other important life transitions, such as school, employment, and aging, but also may be helpful as a way to routinely monitor an individual's closest social world. The structure and format of questions included in the SNaPSS can serve as a framework for measuring SNS and PSS more broadly, and future research can adapt the tool for use beyond the current university student population and assess the broader face validity of the SNaPSS across multiple settings.

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Post Chapter Three Commentary

Following on from limited research tools that simultaneously assess changes in both structural and functional components of one's social network identified from the systematic review in Chapter Two, Chapter Three aimed to develop, pilot, and assess the feasibility of a novel tool to examine individual differences in Social Network and Perceived Social Support (SNaPSS) for students transitioning to university.

The findings from Chapter Three indicate that SNaPSS is a feasible tool that is easy to understand and complete by both autistic and typically developing students. SNaPSS provided good face and convergent validity when compared against other measures of support, autistic traits, and social anxiety. Given that data from the autism and typically developing group were analysed separately, and that the autism sample was largely pre-university transition and were younger compared to the typically developing students being first-year university students, caution must be taken when inferring any potential between-group differences. In other words, the current study only allowed potential exploration of the relationship between social network structure, perceived social support, social anxiety and autistic traits within each student group, rather than between group comparisons. In order to make meaningful between-group comparisons, it is important to take into consideration any potential baseline characteristics and demographic factors that might influence students' structural and functional social network, when measures are taken for both groups of students at the same point in time during the transition to university process. Chapter Four adopted the approach of group-matched design to explore potential between-group differences in autistic and typically developing students' social networks during the first two weeks of transitioning to first year of university.


Chapter Four

Differences in anxieties and social networks in a group matched sample of autistic and typically developing students transitioning to university

Chapter Rationale

Following on from Chapter Three which established Social Network and Perceived Social Support (SNaPSS) as a feasible tool to simultaneously measure both structural and functional components of social networks during transition to university with good face and convergent validity, Chapter Four seeks to explore potential between-group differences in autistic and typically developing students' social networks during the first two weeks of transitioning to first year of university using a cross-sectional group-matched study design. Although previous research shown in Chapter One highlighted that transitioning to university can be a particularly challenging time for autistic students, it is unclear to what extent such worries and anxieties surrounding transition to university may be experienced by all students equally, compared to affecting autistic students more specifically.

Autistic students are thought to have greater social communication difficulties and mental health difficulties, such as anxiety compared to their typically developing peers at university (Adreon & Durocher, 2007; Jackson, Hart, Brown, et al., 2018), which may in turn have negative impact on their social network structure and ability to access the right types of support they need through their social network members when transitioning to university. However, such transition difficulties may not be unique to autistic students, but also shared amongst typically developing students who may score more highly on autistic traits and/or experience high levels of social anxiety. Chapter Four aimed to better understand to what extent differences in students' perception of their transition to university experience, the structure and function of students' social network when transitioning to university are related to having an autism diagnosis *per se*, or when levels of autistic traits and/or social anxiety are perceived to fall on a continuous spectrum.

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I hold the copyright for this material		<input checked="" type="checkbox"/>	Copyright is retained by the publisher, but I have been given permission to replicate the material here <input type="checkbox"/>
Candidate's contribution to the paper (provide details, and also indicate as a percentage)	The candidate contributed to / considerably contributed to / predominantly executed the... Formulation of ideas: Predominantly executed (95%) Design of methodology: Predominantly executed (95%) Experimental work: Predominantly executed (100%) Presentation of data in journal format: Predominantly executed (95%)		
Statement from Candidate	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature.		
Signed		Date	20/05/2020

Lay Abstract

Transitioning to university can be anxiety-provoking for all students. The academic, daily living, and social difficulties can become magnified for autistic students when considered alongside the social difficulties associated with autism, as well as higher levels of co-occurring social anxiety. Although previous studies report poor transition outcomes and retention rates for autistic students, it is unclear whether: 1) the academic, daily living, and socialisation difficulties reported are unique to autistic students; 2) whether there are differences in students' social networks at university, as well as their perceived level of support provided by network members; and 3) to what extent these difficulties may be accounted for by social anxiety found in both autistic and typically developing students when transitioning to university. This study compared a group of autistic students transitioning to university against a group of typically developing (TD) students who are similar in age, sex, academic performance prior to starting university, and subject of study at university. Autistic students were found to be more socially anxious, and more worried about different aspects of university life. Autistic students had a statistically smaller social network compared to TD students, though both groups perceived similar levels of support from their social networks. Higher levels of social anxiety common to both groups, rather than autistic traits, was associated with greater distress in daily living and socialisation at university. University stakeholders may consider providing more psychoeducation and support around social anxiety for both autistic and TD students transitioning to university, to improve transition outcomes for all students.

Keywords: Autism Spectrum Disorder, Social Network, Perceived Social Support, university, college, social anxiety

Abstract

Transitioning to university can be anxiety-provoking for all students. The relationship between social anxiety, autistic traits, and students' social network structure, and perceived support is poorly understood. The current study used a group matched design where autistic students ($n = 28$) and typically developing (TD) students ($n = 28$) were matched on sex, age (17-19 years), ethnicity, pre-university academic performance, and degree subject at university. Autistic students reported greater transition to university worries, and a smaller social network size compared to TD students, though perceived similar levels of support from their social networks. Higher levels of social anxiety common to both groups, and not autistic traits, was associated with greater distress in daily living and socialisation at university. Broader clinical and practical implications of findings are discussed.

Keywords: Autism Spectrum Disorder, Social Network, Perceived Social Support, university, college, social anxiety

Differences in anxieties and social networks in a group matched sample of autistic and typically developing students transitioning to university

Transitioning to university can be a challenging time for all students, as they face increased academic demands, the need to develop relationships in a more complex social scene, and learning to live independently away from home (Compas et al., 1986; Fisher & Hood, 1987; Lei et al., 2018). The retention rate, academic achievement, and graduation prospects following university for many autistic³ students can be especially poor when compared to their typically developing (TD) peers, as well as students with other forms of disability (Gobbo & Shmulsky, 2013; Lucas & James, 2018; Sanford et al., 2011). Transitioning to university can also have a negative impact on autistic students' mental wellbeing (Jackson, Hart, Brown, et al., 2018; Jackson, Hart, & Volkmar, 2018), with many experiencing symptoms of anxiety (71%), depression (47%), feelings of loneliness (53%) (Gelbar et al., 2014), as well as greater worries associated with the social, academic, and daily living aspects of university life (Lambe et al., 2018; Lei et al., 2018).

However, previous studies focusing on autistic students transitioning to university often did not include a well-matched TD control group. It is difficult to conclude to what extent the challenges reported by autistic students are uniquely and specifically related to their levels of autism, rather than other factors. For example, students studying different degree subjects might experience different academic pressures, and their ability to cope may be related to their academic ability prior to entering higher education, regardless of whether or not they have an autism diagnosis. Similarly, autistic and TD students who experience high levels of social anxiety might find it especially challenging to make new social network connections and access social resources at university, suggesting there may be other common underlying factors that might contribute towards one's perception of university experience beyond having an autism diagnosis. Understanding the similarities and differences in the

³ A study conducted by Kenny et al. (2016) exploring what terminology and language are used to described autism found that stakeholders and members of the autistic and autism community preferred to use identity-first language (i.e., autistic individual), rather than person-first language (i.e., individual with autism). This paper will use identity-first language as preferred by the autistic and autism community when referring to autistic students and young people.

relationship between autistic traits, social anxiety, and students' worries and their social networks amongst autistic and TD students might thus help stakeholders to better understand the unique vulnerabilities present in each group, and to better tailor transition to university support addressing students' needs.

Social Network and Perceived Social Support at University

Social support from family and friends can buffer against some of the stresses associated with the transition and social adaptation to university life, and lead to better wellbeing (Hirsch & Barton, 2011; Verger et al., 2009). An efficient way to capture one's access to support from people is via social network analysis (Scott, 2017). Social network analysis examines both the structural and functional components of one's social network. Social Network Structure (SNS) includes a range of quantifiable metrics such as size (how many people an individual is in contact with and consider close to them), density (to what extent do different network members know and are in contact with each other), and network composition (relative percentage of family, friends, and other network members). In contrast, the functional component of social networks measures an individual's ability to access different types of tangible, informational, practical, as well as personal emotional support from different network members, and the perceived availability of support available to them (i.e., perceived social support (PSS)) (Cohen & Wills, 1985; Roohafza et al., 2014).

For TD students transitioning to first year of university, previous studies have found that higher levels of PSS from parents, professors and academic staff, and peers are associated with both better university transition outcomes and mental health (Azmitia et al., 2013; Friedlander et al., 2007; Swenson et al., 2008). The types of support provided by family and friends was also reported to change over time, as family members provided more informational and emotional support to students, and peers provided more tangible, practical, and social support (Azmitia et al., 2013; Friedlander et al., 2007). TD students also reported an increase in the number of same aged peers within their social network who provided greater support compared to family members, and professors/lecturers during transition (Hays & Oxley, 1986).

There has been little research into the nature and impact of changes in SNS and PSS amongst autistic students during transition to university. Although many autistic students recognise the

importance and necessity of establishing social relationships at university, particularly for academic studies such as in the context of working on group projects (Van Hees et al., 2015), over 75% of autistic students struggle to adapt to the new social environment (Jackson, Hart, Brown, et al., 2018). Whereas TD students begin to rely on their peers for greater functional support over the course of development (Lee & Goldstein, 2016), autistic students are often less likely to seek support from others, especially same aged peers, and also report perceiving lower levels of social support overall (Lasgaard et al., 2010). Many autistic students often continue to perceive their parents as the main source of support at university, ranging from providing social and emotional guidance, to advocating for academic support and helping with many daily living tasks (Elias et al., 2019; Fleischer, 2012; Mitchell & Beresford, 2014). A recent small case study involving ten autistic students in higher education also found that autistic students rated their professors to provide greater instrumental support compared to their family and friends, and were perceived to be important in supporting their academic success at university (LeGary, 2017). However, to date, there is a lack of direct comparisons between a well-matched group of TD and autistic students to help identify similarities and differences in both their SNS and PSS during transition to university.

Social Anxiety at University

Despite clear delineation of Autism Spectrum Disorder (ASD) as being characterised by having social communication difficulties, and a restricted and repetitive pattern of interests, activities and behaviours (American Psychiatric Association, 2013), autism is a highly heterogeneous condition. Recent systematic reviews and meta-analyses have found that amongst autistic adults, the prevalence for current and lifetime co-occurrence of anxiety disorders ranges between 27% to 42% (Hollocks et al., 2019), and social anxiety disorder is one of the most frequently reported anxiety disorders in this population (Lugo-Marín et al., 2019). One study (White et al., 2012) found that both social anxiety and autism symptom severity have some construct overlap, and both can manifest as avoidance of social situations and social withdrawal, however the underlying mechanisms are distinct. Social anxiety is distinguished by social evaluative concerns and interaction-based anxiety whereas social cognition in autism is characterised by differences in respect of making inferences about the mental states of others, particularly in dynamic and complex social interactions. Therefore, the high rates of

co-occurring social anxiety amongst autistic students might place additional stress on students' ability to adapt to the social environment at university. Poor social adaptation can also have a negative impact on students' academic studies and daily living experience at university, as autistic students often find group tasks very distressing and difficult to navigate, therefore adding further distress to their academic studies (LeGary, 2017).

Similarly, research has shown that the prevalence rate of social anxiety in TD university students (19-23%) (Beidel, Turner, Stanley, & Dancu, 1989; Strahan & Conger, 1998; Strahan, 2003) is also higher than that found in the general adolescent population (5-15%) (Ollendick & Hirshfeld-Becker, 2002), thus suggesting that high rates of social anxiety might be commonly seen in both TD and autistic students at university. Higher rates of social anxiety in TD students has also been associated with poorer academic adjustment, and some researchers have suggested one underlying mechanism may be failure to seek support when students experience high levels of social anxiety at university (Arjanggi & Kusumaningsih, 2016; Brook & Willoughby, 2015; Zukerman et al., 2019). Therefore, beyond the need to directly compare and contrast between perceived worries associated with transitioning to university, SNS, and PSS amongst both autistic and TD students, there is a need to consider to what extent these differences may be associated with symptoms of social anxiety, beyond that of an autism diagnosis.

The Current Study

The current study used a group matched control design, matching TD and autistic students on a range of demographic variables that include measures of their pre-university academic performance, as well as chosen degree subject, to enable a more direct comparison to be drawn between TD and autistic students who have the same academic ability and facing similar levels of academic and social demands as they transition to university life. The current study had three objectives:

1. Investigate any differences between TD and autistic students in the types of worries and perceived distress when faced with different aspects of university life, such as academic, daily living, and socialisation challenges.
2. Investigate any differences in SNS and PSS between TD and autistic students during their transition to university.

3. Investigate similarities and differences in how levels of autistic traits and social anxiety may account for any differences between TD and autistic students in SNS, PSS, and worries about university (as identified in objectives 1 and 2).

Methodology

Participants

All participants in the current study were first-year university students recruited for a larger longitudinal study investigating changes in SNS and PSS and university transition outcomes. See Table 1 for student demographic information. Recruitment channels included advertisements on campus, social media, and during induction lectures during the first week of starting university. All students were aged between 17-19 years and completed all measures online via Qualtrics during the first two weeks of starting first semester of first year at university. Students were entered into a prize draw of two £50 Amazon gift card upon completing the questionnaire session. The online measures asked students to disclose if they had an autism diagnosis from a clinical professional, or any other developmental condition, physical or mental health conditions. All 28 autistic students confirmed an autism diagnosis made by a clinical professional (i.e., not self-diagnosed) prior to joining the study. Students confirmed the disclosure of their autism diagnosis with the university disability team, through whom students access a range of support on campus, by showing official diagnostic letters from clinical professionals. The mean score on the Autism Quotient-28 (AQ-28) for the autistic students was 83.07, and with an exception of two students who scored 59 and 64, all students' scores met the suggested clinical cut-off score of 65 (Hoekstra et al., 2011). Six autistic students (21%) also reported having at least one other co-occurring condition. Autism diagnostic information and co-occurring conditions are reported in Table 1.

Table 1

Student demographic information.

	TD (n = 28)		ASD (n = 28)	
	M (SD)	Range	M (SD)	Range
Age (years)	18.39 (0.50)	18 – 19	18.32 (0.48)	18 – 19
Sex (n; M:F)	15; 13	-	14; 14	-
Autism Diagnosis Info	-	-	(n)	(%)
Asperger's	-	-	17	60.71
ASD	-	-	10	35.71
PDD-NOS	-	-	1	3.57
Co-Occurring Condition	-	-	(n)	(%)
Anxiety	-	-	3	10.71
Depression	-	-	3	10.71
ADHD	-	-	1	3.57
Sensory processing disorder	-	-	1	3.57
Dyspraxia	-	-	1	3.57
Ethnicity	(n)	(%)	(n)	(%)
White	22	78.60	26	92.90
Asian	3	10.80	2	7.10
Black	1	3.60	-	-
Mixed/Other	2	7.10	-	-
Degree/Faculty	(n)	(%)	(n)	(%)
Science	14	50	11	39.30
Technology	-	-	2	7.10
Engineering	1	3.6	1	3.60
Mathematics	1	3.6	1	3.60
Humanities/Arts	4	14.3	6	21.40
Social Sciences	8	28.6	7	25.00
A-Level avg ¹	4.39 (0.66)	3 – 6	4.36 (0.92)	2.5 – 6
AQ-28 Total ²	64.54 (9.50)*	43 – 86	83.07 (10.59)*	59 – 104
SAS-A Total ³	57.71 (13.28)*	33 - 94	70.21 (12.61)*	46 – 89

Notes. TD = Typically Developing; ASD = Autism Spectrum Disorder; PDD-NOS = Pervasive

Developmental Disorder – Not Otherwise Specified; ADHD = Attention Deficit Hyperactivity

Disorder; AQ-28 = Autism Quotient -28; SAS-A = Social Anxiety Scale for Adolescents; * $p < .01$.

¹A-Level grades range from A* (6) to E (1), so average grade is between A and B. ² Autism Quotient-

28 scale has a recommended cut-off of 65, above which additional diagnostic support is

recommended. ³ Social Anxiety Scale for Adolescents has a clinical cut-off of 50.

For TD students, all students included in the TD group did not report any current or former diagnosis of mental, physical, or developmental medical conditions. For each autistic student, a TD student who was best matched on age, sex, ethnicity, pre-university academic achievements (average A-Level grade), and degree of study at university was selected from a larger pool of students as a direct comparison. For TD students, the mean AQ-28 score was 64.54, which is somewhat higher than the previously reported control samples of 56-59.73 (Hoekstra et al., 2011). The current sample had more TD students who studied science, engineering, and mathematics (57.2%), and their higher AQ-28 scores are concordant with previous findings showing that higher AQ scores are found in those who pursue studies in STEM subjects (Ruzich et al., 2015). Overall, 28 autistic and 28 TD students were included in the current study.

Ethical approval

The study was approved by the University's departmental ethics committee and is in line with the Declaration of Helsinki as revised in 2000. All participants provided written informed consent prior to participating in the research study.

Measures

Demographics. All participants completed a basic demographic questionnaire, which enquired the students' age, biological sex, ethnicity, pre-university qualification (A-Level⁴ or equivalent), and degree subject studied at university.

Transition to University Questionnaire (TUQ; Lambe et al., 2018). TUQ is a 26-item self-report questionnaire that focuses on a range of concerns and worries that students face when transitioning to university. Each statement is rated on a 5-point Likert scale, with students rating whether they 'strongly agree (5)' to 'strongly disagree (1)' with the statement. Worries that received a

⁴ In the UK, students select 3-5 subjects to study for the last 2 years of high school education (aged 16-18 years), known as A-Levels. Students complete exams for each chosen subject at the end of the 2 years of high school education, prior to graduation. Universities make either conditional offers to students based on their expected A-Level results, or unconditional offers if A-Level results are already achieved and are satisfactory for entry standard. The conditional offers will clearly state the specific grades that students will need to achieve in their A-Level subjects in order to guarantee entry to that university for a specific degree of study. Therefore, students studying the same degree across different universities tend to have studied similar subjects at A-Level as per degree requirement, though the actual grade requirements for those subjects might vary depending on the academic ranking of the university.

score of >3 (neither agree nor disagree) are considered to be endorsed by the student as a concern associated with transitioning to university. Both total and subscale scores of the TUQ (Lei et al., 2018) are assessed in the current study, with higher scores indicating greater level of worries associated with transitioning to university. See Supplementary Material for more details on measure development.

Social Network and Perceived Social Support (SNaPSS; Lei, Ashwin, Brosnan, & Russell, 2019). The SNaPSS is a novel online tool that measures students' SNS (network size, density, and composition), as well as perceived distress frequency, and PSS from their network members across a range of academic, daily living, and socialisation areas. Each area contains a list of five items that are derived from literature describing the types of challenges that autistic students face when transitioning to university (Adreon & Durocher, 2007; Anderson et al., 2017). Detailed description of the SNaPSS development and validation can be found in Lei et al. (2019), and Supplementary Material.

Autism Quotient-28 (AQ-28; Hoekstra et al., 2011). The AQ-28 is an abridged version of the full self-report measure Autism Quotient (50 items). The AQ-28 contains 28 statements that refer to various social and behaviours associated with autistic traits. Each statement is rated on a four-point Likert scale from 1 (Definitely Agree) to 4 (Definitely Disagree). The AQ-28 is scored between 28 and 72, and a cut-off score of 65 is the threshold above which further assistance with seeking ASD diagnosis is recommended. The cut-off score has good sensitivity (.97) and specificity (.82). The AQ-28 also has good internal consistency (Cronbach's $\alpha = .77-.86$). The AQ-28 is used in the current study to provide a comparable measure of level of autistic traits/autism symptom severity across both TD and autistic students.

Social Anxiety Scale for Adolescents (SAS-A; La Greca, Ingles, Lai, & Marzo, 2015). The SAS-A is a 22 item (18 items plus 4 filler items) self-report measure of symptoms of social anxiety amongst adolescents. The SAS-A is broken down into three subscales that assess fear of negative evaluation (8 items), social avoidance and distress in social situations (6 items), and generalised social avoidance and distress (4 items), and is scored between 18 and 90. SAS-A has good internal consistency (Cronbach's $\alpha = .77-.92$), good concurrent validity with other social phobia

measures, good discriminant validity, and good test-re-test reliability. A score at or above 50 is used for identifying clinically significant levels of social anxiety in both male and female adolescents.

Data Analyses

All analyses were conducted using SPSS version 25 (*IBM SPSS Statistics*, 2016), and SNS analyses are conducted using Gephi 2 (Bastian et al., 2009). Where appropriate, Bonferroni was used to correct for multiple comparisons, and post-hoc power calculations were conducted using G*Power. We conducted data analyses in six steps to examine the following differences between TD and autistic students:

- 1) Independent samples T-test tested for differences in age, pre-university qualifications, SAS-A and AQ-28 total scores, and chi-squared test examined differences in sex, ethnicity, and subject degree studied. We expected there to be no significant group differences on demographic factors due to careful group matching, except that autistic students will have a higher level of autistic traits on AQ-28.
- 2) Independent samples T-tests tested for differences in worries associated with transitioning to university (TUQ).
- 3) A 2 (diagnostic group) \times 3 (area) mixed factorial ANOVA tested for differences in perceived distress frequency across academic, daily living, and socialisation areas (SNaPSS).
- 4) For SNS (SNaPSS): independent samples T-tests first tested for differences in both network size and density. Next, a 2 (diagnostic group) \times 3 (network member category) mixed factorial ANOVA assessed differences in network composition (i.e., relative percentages of family, friends, and other network members).
- 5) For PSS (SNaPSS): two separate 2 (diagnostic group) \times 3 (network member category) mixed factorial ANOVAs assessed for differences in both perceived frequency and quality of overall support provided by family, friends, and other network members.
- 6) Exploratory Pearson's correlations evaluated the extent to which level of autistic traits and/or social anxiety may be associated with differences observed in TUQ, perceived frequency of distress, SNS, or PSS. Only factors that showed statistically significant difference between TD and autistic students from steps two to five were included in step six.

Given the relatively small sample size, we also calculated effect sizes in addition to statistical significance for tests performed, which helped inform the interpretation of results. Effect sizes were interpreted based on Cohen (1988) and noted below. For Cohen's d , the values of 0.2, 0.5, and 0.8 are interpreted as small, medium, and large sizes respectively (Cohen, 1988). For Cohen's f , the values of 0.1, 0.25, and 0.4 are interpreted as small, medium, and large effect sizes respectively. For Chi-Squared tests, either ϕ or Cramer's V are calculated for effect size and interpreted below.

Results

Participant Demographics

Participant demographics are shown in Table 1. Consistent with group-matching approach, no significant differences were found in age ($t(54) = .55, p = .585$, Cohen's $d = 0.14$), sex ($\chi^2(1) = .07, p = .789, \phi = 0.04$ (medium)), pre-university qualifications (average A-Level results) ($t(54) = .16, p = .87$, Cohen's $d = .04$), ethnicity ($\chi^2(8) = 8.35, p = .40$, Cramer's $V = 0.39$ (medium)), nor degree pursued at university ($\chi^2(6) = 4.43, p = .619$, Cramer's $V = 0.28$ (medium)) were found across TD and autistic students, showing that the two samples were carefully matched across all demographic variables. Compared to autistic students, TD students had both lower levels of autistic traits ($t(54) = -6.90, p < .001$, Cohen's $d = 1.84$), and lower levels of social anxiety ($t(54) = -3.61, p < .001$, Cohen's $d = 0.97$).

Transition to University Worries (TUQ)

Differences in TUQ scores are shown in Table 2. Compared to TD students, autistic students endorsed a greater number of worries associated with transitioning to university, as well as higher total worry score ($p < .001$ for both). When examining the individual subscale scores of the TUQ, autistic students reported greater worries regarding social aspects of university life when compared to TD students, including both the micro and macro social world, as well as leaving home ($p < .01$). Effect sizes as shown by Cohen's d are medium to large.

Table 2.

Students' worries associated with transitioning to university.

	TD (n = 28) M (SD)	ASD (n = 28) M (SD)	TD vs. ASD <i>t</i> (54)	<i>p</i> value	Cohen's <i>d</i>	Power
Total Worry Score¹	86.14 (11.15)	102.11 (13.45)	-4.83	<.001*	1.29	1.00
Number of worries endorsed²	13.11 (4.69)	18.39 (4.33)	-4.38	<.001*	1.17	0.99
1. Micro Social World	3.38 (0.88)	4.37 (0.68)	-.470	<.001*	1.26	1.00
2. Support	3.46 (0.62)	3.86 (0.64)	-2.22	.031	0.63	0.64
3. Macro Social World	3.13 (0.64)	3.76 (0.89)	-3.03	.004*	0.81	0.85
4. Leaving home	3.20 (0.64)	3.80 (0.67)	-3.43	.001*	0.92	0.92
5. Academic challenges	3.73 (0.81)	4.14 (0.85)	-1.88	.066	0.49	0.44
6. Daily living challenges	3.06 (0.82)	3.63 (0.81)	-2.62	.011	0.70	0.73
7. Time management	3.64 (0.89)	4.29 (0.96)	-2.60	.012	0.70	0.73

Notes. TD = Typically Developing; ASD = Autism Spectrum Disorder; * $p < .007$ (Bonferroni adjusted alpha level). ¹Total worry score is the sum score of all worry ratings listed in the Transition to University Questionnaire, scored between 25 and 125. ²Number of worries endorsed is the total number of worries where participants rated agree or strongly agree with, scored between 0 and 25.

Perceived Frequency of Distress

The mean, standard deviation, and range of scores on perceived frequency of distress across academic, daily living, and socialisation areas as rated by both TD and autistic students are shown in Table 3. A main effect of diagnostic group was observed ($F(1, 54) = 12.74$, Partial eta squared = 0.19, $p = .001$, power = 0.95, Cohen's $f = 0.48$). Post-hoc pairwise comparison analysis found that autistic students perceived higher frequency of distress overall than TD students ($p = .001$; 95% CI [1.61, 5.75], Cohen's $d = 0.95$). No main effect was observed for area of distress ($F(2, 108) = 1.10$, Partial eta squared = 0.02, $p = .337$, power = 0.95, Cohen's $f = 0.53$), nor area \times group ($F(2, 108) = 0.15$, Partial eta squared = 0.03, $p = 0.861$, power = 0.95, Cohen's $f = 0.18$).

Table 3

Students' perceived distress frequency across academic, daily living, and socialisation areas, and social network structure.

	TD (n = 28)		ASD (n = 28)	
	M (SD)	Range	M (SD)	Range
<i>Perceived Distress Freq¹</i>				
Academic	4.82 (3.71)	0 – 13	8.39 (4.57)	0 – 16
Daily living	5.07 (3.31)	0 – 12	8.46 (5.31)	0 – 18
Socialisation	5.46 (4.93)	0 - 18	9.54 (6.10)	0 - 20
<i>Social Network Structure</i>				
Network Size²	12.79 (5.57)	5 – 20	8.25 (4.83)	0 – 20
Network Density³	0.36 (0.18)	0.11 – 1	0.35 (0.21)	0 – 0.91
% Family	37.96 (20.59)	0 – 100	36.18 (23.49)	0 – 80
% Friends	58.38 (19.40)	0 – 100	44.68 (28.72)	0 – 100
% Other	2.11 (4.89)	0 – 15.38	9.41 (19.13)	0 – 81.82

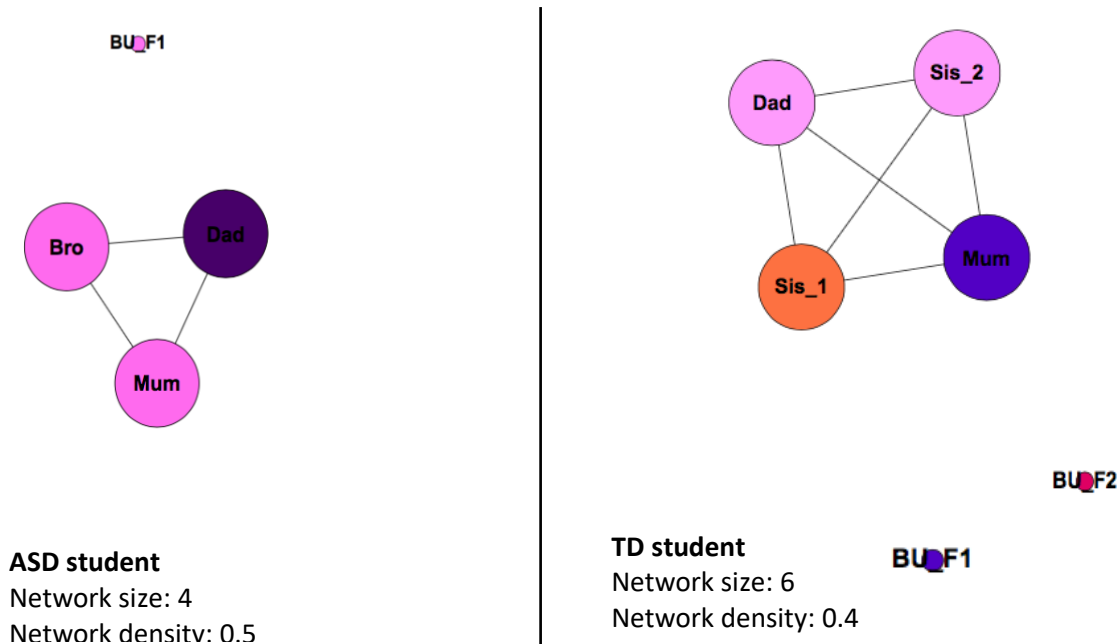
Note. TD = Typically Developing; ASD = Autism Spectrum Disorder. ¹Perceived distress frequency are rated between 0-20 for each of the three domains (academic, daily living, socialisation). ²Network size ranges from 0-20. ³ Network density ranges from 0-1. All measures are taken from Social Network and Perceived Social Support (SNaPSS).

Social Network Structure

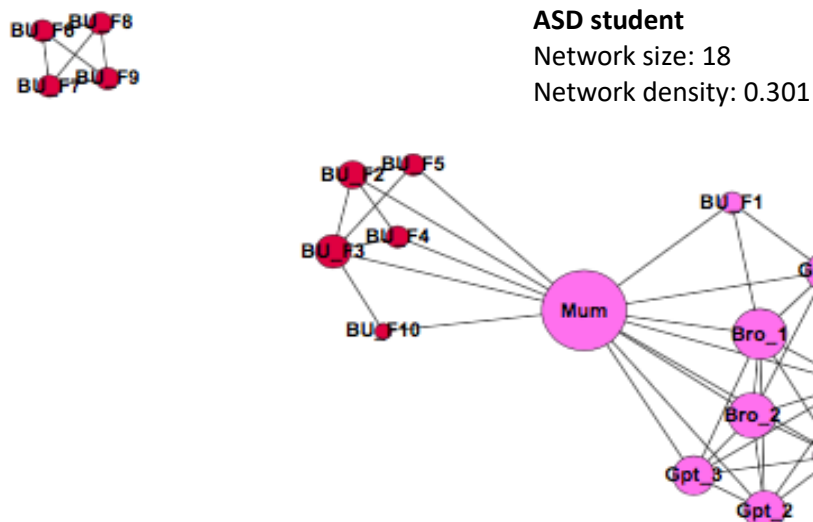
TD and autistic students both reported a wide range of SNS and some examples are shown in Table 3 and Figure 1. Compared to autistic students, TD students had a significantly bigger social network size ($t(54) = 3.26$, 95% CI [1.74, 7.33], $p = .002$, Cohen's $d = 0.87$), though no differences in social network density were found ($t(54) = 0.31$, 95% CI [1.74, 7.33], $p = .755$, Cohen's $d = 0.05$). For network composition, a main effect of network member type was found ($F(2, 108) = 52.55$, Partial eta squared = 0.49, $p < .001$, power = 0.96, Cohen's $f = 0.98$). Post-hoc pairwise comparisons found that across both TD and autistic students, social networks consisted of a greater percentage of friends than both family members ($p = .03$, 95% CI [1.08, 27.83], Cohen's $d = 0.62$), and other network members ($p < .001$, 95% CI [35.00, 56.54], Cohen's $d = 2.29$). "Other" network members include teacher/lecturer, tutor, support worker, or any other members the student considers to be close to and have been in contact with over the past 3 months but are not a family member or personal friend. Social networks also consisted of a greater percentage of family members than other network

members ($p = 0.03$, 95% CI [22.01, 40.62], Cohen's $d = 1.69$). In contrast, no main effect of diagnostic group on SNS was found ($F(1, 54) = 2.67$, Partial eta squared = 0.05, $p = .108$, power = 0.95, Cohen's $f = 0.23$), nor network member \times diagnostic group ($F(2, 108) = 2.66$, Partial eta squared = 0.05, $p = .074$, power = 0.95, Cohen's $f = 0.23$), suggesting that the relative composition of social networks did not differ across both student groups.

a) Small social networks



b) Large social networks



TD student
 Network size: 20
 Network density: 0.463

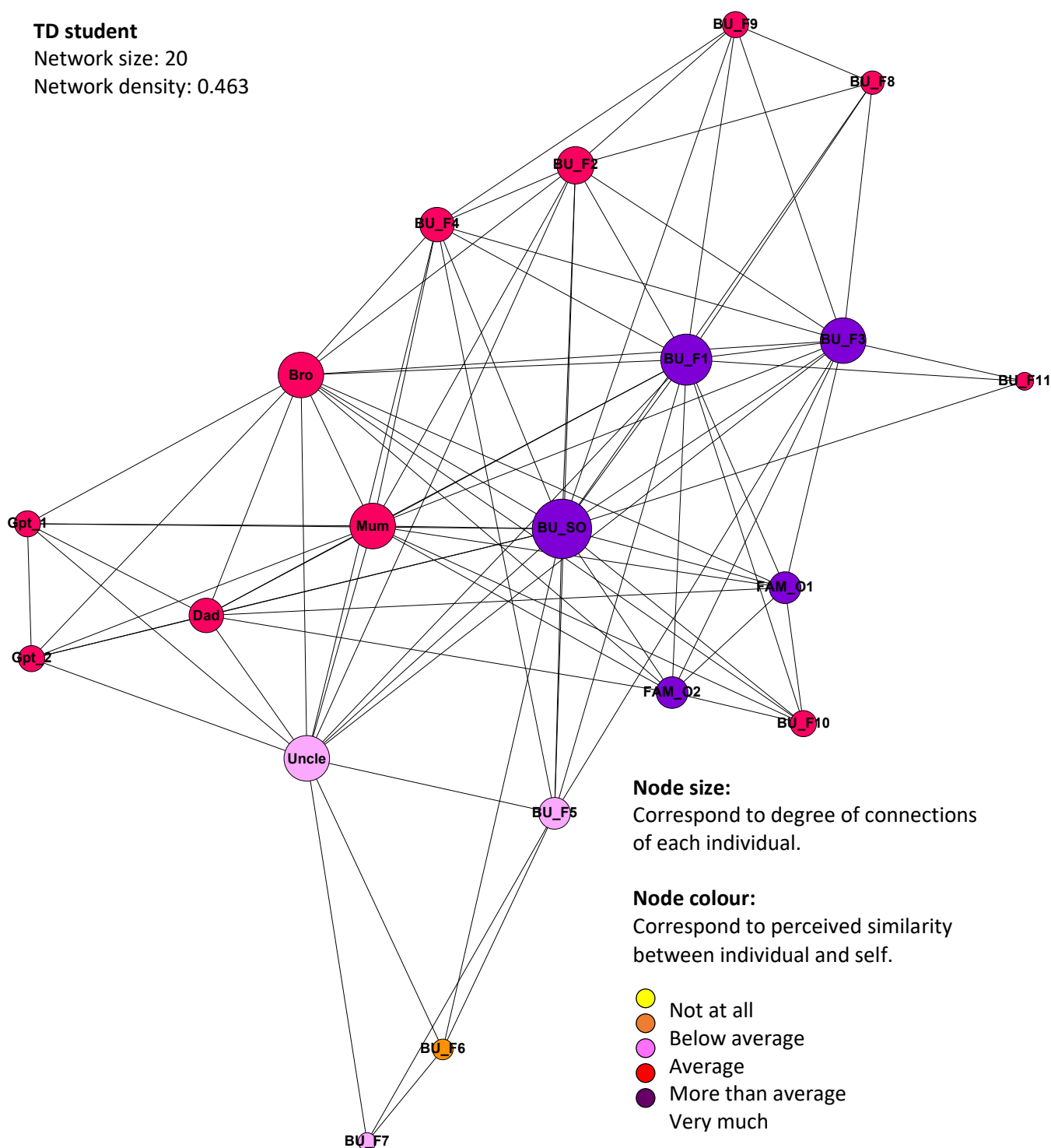


Figure 1. Sample of small and large social networks from TD and ASD students captured by SNaPSS.

Note. BU = Before University; SU = Since University; Bro = Brother; Sis = Sister; Gpt = Grandparent; F = Friend; O = Other; SO = Significant Other.

Perceived Social Support

Measures of perceived social support are shown in Table 4. For overall levels of support frequency, a main effect of network member was found ($F(2, 108) = 33.96$, Partial eta squared = 0.39 , $p < .001$, power = 0.95 , Cohen's $f = 0.80$). Post-hoc pairwise comparisons found that across both TD and autistic students, family members were perceived to have provided more frequent overall support than both friends ($p = .009$, 95% CI $[0.40, 3.60]$, Cohen's $d = 0.56$), and other network members ($p < .001$, 95% CI $[3.18, 5.99]$, Cohen's $d = 1.53$). Friends were also perceived to have provided more frequent support than other network members ($p < .001$, 95% CI $[1.50, 3.66]$, Cohen's $d = 1.02$). No main effect of diagnostic group on PSS quantity was found ($F(1,54) = 0.34$, Partial eta squared = 0.01 , $p = .564$, power = 0.95 , Cohen's $f = 0.10$), nor a network member \times diagnostic group interaction ($F(2, 108) = 0.27$, Partial eta squared = 0.01 , $p = .763$, power = 0.95 , Cohen's $f = 0.61$).

For overall levels of support quality, a main effect of network member was found ($F(2, 108) = 33.49$, Partial eta squared = 0.38 , $p < .001$, power = 0.95 , Cohen's $f = 0.78$). Post-hoc pairwise comparisons found that across both TD and autistic students, both family members ($p < .001$, 95% CI $[4.31, 8.04]$, Cohen's $d = 1.48$) and friends ($p < .001$, 95% CI $[2.37, 5.87]$, Cohen's $d = 0.97$) were perceived to have provided better quality support than other network members. No main effect of diagnostic group on PSS quality was found ($F(1,54) = 1.51$, Partial eta squared = 0.03 , $p = .224$, power = 0.95 , Cohen's $f = 0.18$), nor a network member \times diagnostic group interaction ($F(2, 108) = 1.34$, Partial eta squared = 0.02 , $p = .265$, power = 0.95 , Cohen's $f = 0.14$).

Table 4

Students' perceived social support from family, friends, and other network members across academic, daily living, and socialisation areas.

a) Support frequency

	TD (n = 28)		ASD (n = 28)	
	M (SD)	Range	M (SD)	Range
Family				
Academic	1.41 (1.48)	0 – 5	0.93 (1.63)	0 – 5
Daily living	2.43 (1.36)	0 – 5	2.61 (1.71)	0 – 5
Socialisation	1.60 (1.47)	0 – 4	1.59 (1.75)	0 – 5
Total	5.44 (3.50)	0 – 11.5	5.13 (4.30)	0 – 15
Friends				
Academic	0.96 (1.06)	0 – 3	0.91 (1.48)	0 – 5
Daily living	1.09 (1.07)	0 – 3	0.66 (1.09)	0 – 4.4
Socialisation	1.58 (1.41)	0 – 4.8	1.36 (1.51)	0 – 5
Total	3.63 (2.98)	0 – 10.55	2.93 (3.46)	0 – 13.3
Other				
Academic	1.43 (0.52)	0 – 2	0.30 (0.74)	0 – 3
Daily living	0.29 (0.76)	0 – 3	0.33 (0.69)	0 – 2.33
Socialisation	0.21 (0.69)	0 – 3	0.13 (0.46)	0 – 2
Total	0.64 (1.50)	0 – 6	0.76 (1.66)	0 – 7

b) Support quality

	TD (n = 28)		ASD (n = 28)	
	M (SD)	Range	M (SD)	Range
Family				
Academic	2.35 (2.08)	0 – 5	1.25 (1.97)	0 – 5
Daily living	3.46 (1.75)	0 – 5	3.45 (2.02)	0 – 5
Socialisation	2.63 (2.08)	0 – 5	2.15 (2.19)	0 – 5
Total	8.44 (4.87)	0 – 15	6.84 (4.94)	0 – 15
Friends				
Academic	2.06 (2.08)	0 – 5	1.36 (1.78)	0 – 4.5
Daily living	2.11 (1.97)	0 – 5	1.43 (2.02)	0 – 5
Socialisation	2.32 (1.91)	0 – 5	1.89 (1.94)	0 – 5
Total	6.50 (5.04)	0 – 13.5	4.68 (5.01)	0 – 13.3
Other				
Academic	0.32 (1.19)	0 – 5	0.64 (1.56)	0 – 5
Daily living	0.55 (1.45)	0 – 5	0.79 (1.61)	0 – 5
Socialisation	0.36 (1.06)	0 – 4	0.27 (1.04)	0 – 5
Total	1.23 (2.98)	0 – 11	1.70 (3.55)	0 – 15

Note. TD = Typically Developing; ASD = Autism Spectrum Disorder. Both support frequency and quality are rated from 0 – 5 for each domain of support (academic, daily living, and socialisation),

with a total score ranging from 0-15, as measured by Social Network and Perceived Social Support (SNaPSS).

Autistic Traits and Social Anxiety

Given that significant differences in worries associated with social aspects of university, perceived distress frequency, and also social network size emerged between TD and autistic students, we conducted exploratory Pearson's correlations to assess the association between these identified factors and levels of autistic traits and social anxiety (see Table 5). For both TD and autistic students, worries associated with transitioning to university showed a strong positive correlation with level of social anxiety ($r = .48$ to $.65$, p values $< .01$). In contrast, worries associated with university were only positively associated with higher levels of autistic traits reported in autistic students ($r = 0.48$ to 0.67 , p values $< .01$), but not in TD students. However, worries associated with leaving home were not significantly associated with either level of autistic traits or social anxiety for both TD and autistic students.

A positive correlation between level of social anxiety and perceived frequency of distress across both daily living and socialisation areas were observed for both TD and autistic students ($r = .49$ to $.62$, $p < .017$). In contrast, level of autistic traits was only positively associated with perceived frequency of distress in daily living for TD students ($r = .56$, $p < .017$), and in socialisation for autistic students ($r = .49$, $p < .017$). Perceived frequency of distress in academic areas was not associated with either level of autistic traits or social anxiety in either student group.

Finally, both higher levels of autistic traits and social anxiety was associated with a smaller social network size in TD students ($r = -.39$, $-.43$ respectively, p values $< .05$), though neither factors affected social network size in autistic students. All Pearson's correlation coefficients have medium ($r > 0.30$) to large ($r > 0.50$) effect sizes.

Table 5.

Association (Pearson's r) between level of autistic traits, social anxiety, and group differences in:

a) Worries associated with transition to university

	AQ-28 Total		SAS-A Total	
	TD	ASD	TD	ASD
TUQ Total	.43	.48*	.65*	.56*
TUQ Endorse	.31	.49*	.50*	.59*
Micro Social	.27	.67*	.53*	.58*
Macro Social	.45	.65*	.52*	.48*
Leaving Home	.27	.23	.47	.23

* Bonferroni corrected alpha level ($p < .01$)

b) Perceived distress frequency across academic, daily living, and socialisation areas.

	AQ-28 Total		SAS-A Total	
	TD	ASD	TD	ASD
Academic	.24	.02	.42	.41
Daily Living	.56*	.30	.55*	.49*
Socialisation	.30	.49*	.62*	.56*

* Bonferroni corrected alpha level ($p < .0167$)

c) Social Network Size

	AQ-28 Total		SAS-A Total	
	TD	ASD	TD	ASD
Network Size	-.39*	.05	-.43*	.09

* $p < .05$.

Note. AQ-28 = Autism Quotient-28; SAS-A = Social Anxiety Scale for Adolescents; TUQ = Transition to University Questionnaire; TD = Typically Developing; ASD = Autism Spectrum Disorder.

Discussion

This is the first study investigating students' worries associated with transitioning to university, as well as students' social network structure and perceived social support, using a carefully controlled group-matched design. We found that compared to a well matched group of TD students, autistic students displayed higher levels of social anxiety, were more worried about social aspects of university life, and also reported greater distress frequency across the range of academic, daily living, and socialisation areas, which is consistent with prior findings of challenges reported by autistic students at university (Adreon & Durocher, 2007; Gelbar et al., 2014). It is important to note that although the current samples of TD and autistic students were group matched, with two of the

selection criteria being more focused on both academic ability (pre-university qualification achievement) and new academic demands (degree subject studied at university), autistic students still perceived more frequent academic distress compared to their TD peers. This highlights that the need for additional support for autistic students may be independent of students' academic abilities at university, and autistic students may be more vulnerable to stressors associated with university life overall when compared to TD students.

The change in structure of academic studies from school to university may be challenging for autistic students to navigate, given that more autonomous study requires greater organisational and planning on behalf of the students, but also require more social skills (such as working in group projects), both of which are areas that autistic students often find challenging. Therefore, despite having the academic ability to succeed in one's course at university, the additional organisational and social demands intertwined into one's academic studies might hinder autistic students to perform to the best of their academic abilities, resulting in greater distress. It is also important to highlight that the current measures were taken close to the start of university, where both student groups may have faced similar levels of academic demands or lack thereof. Hence, the significant differences in students' perception of academic distress highlights how autistic students might have greater anticipatory worry and distress compared to TD students regarding academic studies. Our findings suggest that stakeholders providing academic support need to accommodate for individual variances in skills associated with academic studies at university (such as supporting students' organisation and planning skills, and facilitating students' group work discussions), rather than varying the level of academic support provided solely based on students' pre-university academic performance.

Addressing the second research aim in assessing differences in social networks, autistic students reported having a smaller social network size compared to TD students, though both student groups perceived a similar level of support. TD and autistic students reported similar levels of social network density, which suggests that the potential flow of social capital within their social networks are similar. However, during times of transition such as going to university, networks that are both relatively lower in density and larger in size might be more protective, so an individual losing access to one portion of their social network (such as moving away from family life and friends from home)

would not impair their ability to access social resources from other network clusters (Scott, 2017). Having a larger network also provides greater access to newer sources of information that might help the individual quickly adapt to their new environment. Therefore, despite both groups having similar network density and PSS at the start of university, the smaller network size for autistic students might increase their vulnerability to the changes in social dynamics during transition to university over time. Stakeholders and future studies can use a longitudinal approach to better monitor changes in autistic students' SNS over time, to better examine whether smaller network size might have any negative impact on students' transition outcomes across the first year of university.

In the current study, both student groups reported similar levels of perceived quantity and quality of support and found family and friends to have provided greater support, despite autistic students listing more "other" network members than TD students. This finding is interesting to consider in light of previous literature, which suggested that autistic students might rely more on support from family members than friends (Elias et al., 2019; Mitchell & Beresford, 2014), and perceived their professors and other academic staff to be best at providing support related to their academic studies (LeGary, 2017). One potential explanation accounting for the differences observed is based on methodological differences between the current study and previous studies. Whereas in the current study, each student was asked to recall individual social network members that students are in direct contact with, and then rate the types of specific support provided by each network member, previous studies used a more collectivist approach and asked students to report the levels of PSS from family, friends, and professors as a whole, across broader domains of support rather than individual areas (LeGary, 2017). This difference in self-report method may have resulted in differences in reporter bias when recalling who provided what kinds of support from students' social networks, with the current study methods giving specific probes to recall support from each network member in a systematic way over a clearly defined time period. It has been shown that autistic adults are better at recalling self-referenced episodic memories using cued recall rather than free recall (Hare et al., 2007), thus suggesting that more guided and structured prompts provided by the SNaPSS may be more helpful in increasing reporting accuracy in autistic students compared to previous studies, though this requires further investigation.

Finally, our third research aim explored how levels of social anxiety and autistic traits may be associated with differences identified in perceived distress and transition worries, as well as in SNS and PSS. We found that greater worries about social life at university was associated with having higher levels of social anxiety in both TD and autistic students, though for autistic students, those who experienced greater levels of autistic traits also reported more social worries. Therefore, whereas social anxiety might bring some common challenges to both TD and autistic students transitioning to university, social impairments specifically related to autism might make social life at university even more daunting for autistic students to navigate. The distinct patterns of association between autistic traits and social anxiety and worries about university further suggests that the two constructs are qualitatively distinct from each other (White et al., 2012), and both have differential impacts on students' early perceptions of university life, and may affect autistic and TD students differently.

It is important to note that neither autistic traits nor social anxiety were related to perceived academic distress frequency in both TD and autistic students. Given that the current study specifically examined anticipatory worries during transition *into* university, the actual academic stressors may not have fully started (e.g., course deadlines, exam preparation), and students' perceived distress and worries reflect their expectations of academic life at university. It may be that autistic traits and social anxiety have a greater impact on the overall academic ability between TD and autistic students, and the impact of these factors on academic performance is more pronounced when students face different levels of academic demands later in the academic year. Given that both levels of pre-university academic ability and new academic demands dictated by subject of study at start of university were controlled for in the current study, much of the variance associated with autistic trait and social anxiety may already be controlled for during transition *into* university, and the difference in perceived distress frequency in academic studies may thus be accounted for by other unmeasured factors (such as one's overall wellbeing, mental health, and/or physical health).

Furthermore, whereas higher level of social anxiety was significantly related to more frequent distress in both daily living and socialisation areas in both student groups, higher levels of autistic traits was only associated with more daily living distress in TD students, and more socialisation distress in autistic students. This highlights that having higher levels of autistic traits is a complex

phenomenon that may affect not only social competency, which can influence one's ability to socialise with others, but also other skills such as planning, organisation and flexibility that are necessary for some daily living skills. Therefore, it may be that the non-social aspects of autistic traits (such as increased behavioural rigidity) might present more challenges for TD students, whereas the poorer social communication skills associated with autistic traits may have a more negative impact on autistic students' social relationships. It should be noted that due to the small sample size, the current study did not break down autistic traits nor social anxiety into subscales or dimensions. Future research might seek to refine our understanding by using larger samples to understand how different subdomains of autism traits impact on student function might be associated with distress, SNS, and PSS.

The current study also found that whereas a smaller social network size reported by TD students was associated with higher levels of autistic traits and social anxiety, neither was associated with social network size amongst autistic students. One potential explanation may be due to ceiling effect observed in the current study, with levels of autistic traits and social anxiety having a more significant impact on one's overall number of social relationships in the non-clinical sub threshold population (i.e., TD students), where a larger range of symptom severity on both measures can account for a greater proportion of the variance associated with social network size. In contrast, for autistic students who mostly scored above clinical cut-off on both measures of autistic traits and social anxiety, the impact of both factors on one's social network size may be at ceiling level, and therefore variations in social network size might be more likely accounted for by some other unmeasured factors such as personality traits. Future studies could use a larger sample of both TD and autistic students with multiple measures of autistic traits, social anxiety, as well as other factors that can influence one's social relationships such as measures of personality traits and self-esteem, to gain a better understanding of potential factors that might underlie differences in social network size observed in the TD and autistic student groups.

Limitations and Future Directions

Although the inclusion of a well-matched TD student control group through the use of group matched design is a major strength of the current study, there are several limitations to be considered.

The current sample size in both TD and autistic students is relatively small, and the current study's roughly balanced 1:1 male to female sex ratio is different to the 4:1 male to female ratio typically found in autism (Fombonne, 2009). Sex differences in students' SNS and PSS have been explored in one previous study (Hays & Oxley, 1986) amongst TD college students in the US. The authors found that female TD students more frequently interacted with their network members and exchanged informational and emotional support. The sex differences in functional use of students' SNS to access PSS might highlight either that females perceive university life to be more stressful than their male counterparts or are better at disclosing and seeking support when in need. Alternatively, male students may not be able to provide a high quality of social support compared to female students. Sex differences in functional use of social networks are yet to be explored in autistic university students. Although the main focus of the current study was to explore students' perception of university experience when comparing between TD and autistic students, rather than exploring the impact of sex differences, future studies should seek to replicate the current study using both a larger sample of more diverse students to compare sex differences. In addition, future studies should seek to replicate a sex ratio more representative of autistic students enrolled in higher education, to improve generalisability of current findings.

Due to the cross-sectional design of the current study, it is unclear how students' worries, SNS and PSS might change over the academic year, and whether such changes may be influenced by one's level of social competency (e.g., autistic traits and social anxiety). Future studies should seek to adopt a longitudinal design with multiple data collection points throughout the first academic year to fully compare and contrast autistic students' ability to settle into university life when compared against their group matched TD peers. Long-term follow-up information can help stakeholders to reflect retrospectively on what interventions or support services would be beneficial for both autistic and TD students at the beginning of the academic year, and tailor support towards individual needs to improve transition outcomes for both TD and autistic students.

Conclusion and practical implications

In summary, this is the first study to use a group-matched design to compare and contrast autistic and TD students' worries associated with transitioning to university, as well as differences in

students' SNS and PSS. Despite similar pre-university academic performance compared to TD peers, autistic students expressed greater anticipatory distress and worry regarding the academic demands of university. Therefore, stakeholders planning academic adjustments should look beyond students' prior academic performance and take into consideration broader social and other skills that may negatively impact on students' academic performance at university. Both groups perceived similar levels of support from their social network at the start of university, though autistic students had a smaller social network size compared to their TD peers, which might place them at a disadvantage in terms of accessing new sources of information and adapting to changes in their social environment during transition to university. Stakeholders may consider how to improve accessibility to key information for autistic students during transition to university, to ensure they have similar available resources despite having a smaller social network size. Finally, social anxiety and autistic traits differed in impact on students' perceived academic, social, and daily living stresses across the two groups. Higher social anxiety in both groups was consistently related to greater perceived distress in daily living and socialisation domains. Stakeholders should therefore consider delivering interventions to educate students on ways of effectively managing and coping with social anxiety early on during university transition, to ease students' transition experience and improve quality of life.

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Post Chapter Four Commentary

Chapter Four built upon Chapter Three by using Social Network and Perceived Social Support (SNaPSS) to investigate differences in structural and functional social networks between a group matched sample of autistic and typically developing students. Chapter Four also investigated to what extent autistic and typically developing students differ in their transition worries at the start of first year of university. Finally, Chapter Four investigated to what extent between-group differences identified were related to students' levels of autistic traits and/or social anxiety.

The findings from Chapter Four highlighted many similarities in students' perceived structure and function of their social networks across the two student groups. However, the smaller social network size reported by autistic students might have limited students' access to new sources of information and support compared to their typically developing peers when interpreted under the context of transition to university. Given that typically developing students who had higher levels of social anxiety and autistic traits also reported smaller social network size, evidence suggests that they might also experience additional social communication difficulties which can potentially impact their social network structure. For both student groups, having higher levels of social anxiety at the start of university was associated with having greater social worries. Autistic students who reported greater levels of autistic traits also reported having more socialisation worries, further suggesting how potential social communication differences may negatively impact students' social experiences during the start of university transition. Finally, despite both groups having similar levels of pre-university academic performance and entering university to study similar degree subjects, autistic students had greater anticipatory academic worries compared to typically developing students within the first two weeks of starting university. Therefore, transition planning for autistic students should not determine the level of academic support provided solely based on students' pre-university academic records, but also take into account students' worries and support them to develop better anxiety management strategies which therefore improves academic transition.

Given that Chapter Four was a cross-sectional study that examined between-group differences in a small sample of group-matched autistic and typically developing students at the start of university, it is unclear whether such baseline characteristics within each student group might have

more long term impact on students' transition outcomes later on during first year of university. Therefore, building upon the findings from the cross-sectional study presented in Chapter Four, Chapter Five adopted a longitudinal design where changes in students' perceived distress, social network structure and perceived social support were monitored at three different timepoints, as well as assessing the effect of baseline measures of autistic traits and mean levels of social anxiety over time might influence university transitions outcomes later during first year of university.


Chapter Five

Evaluating the role of autistic traits, social anxiety, and social network changes during transition to first year of university in typically developing students and students on the autism spectrum

Chapter Rationale

Building upon Chapter Four which assessed differences in transition worries, social network structure and perceived social support in a group matched-sample of autistic and typically developing first year university students cross-sectionally at the start of university, Chapter Five takes a longitudinal approach to address how baseline transition characteristics might influence students' transition outcomes later on during first year of university.

The findings from Chapter Four indicated that levels of autistic traits and social anxiety reported by both student groups have some shared and unique patterns of associations with both the structural and functional aspects of social networks, as well as students' worries in anticipation of university transition. Chapter Five further explores these associations by assessing whether levels of autistic traits and social anxiety have more long-term impact on students' transition experiences and outcomes. Due to differences in sample size between autistic and typically developing students who completed this study, analyses were conducted separately within each student group rather than between-group comparisons, to try and minimise potential elevations of Type II error rate. Given that Chapter Two identified no previous studies that have examined changes in autistic students' social network and perceived social support across first year of university, Chapter Five offers a first exploratory step into the evaluation of longitudinal changes in students' social network structure and perceived social support independently in autistic and typically developing first year university students.

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Abstract

This is the first longitudinal study to quantitatively evaluate changes in social network structure (SNS) and perceived social support (PSS) amongst first-year students on the autism spectrum ($n = 21$) and typically developing (TD; $n = 182$) students transitioning to university. The relative impact of changes in SNS/PSS, students' social anxiety and autistic traits, on first-year university transition outcomes were also examined. Both groups gained friends over time who provided better support quantity and quality during first year of university. Social anxiety had different effects on different domains of functioning for students on the autism spectrum and TD students, including academic, social and personal/emotional adjustments, and institutional attachment. Our results suggest stakeholders should focus on delivering interventions to reduce social anxiety to improve university transition outcomes.

Keywords: Autism Spectrum Disorder, social anxiety, Social Network, Perceived Social Support, university, college

Evaluating the role of autistic traits, social anxiety, and social network changes during transition to first year of university in typically developing students and students on the autism spectrum

It has long been recognised that university transition can be a stressful time (Compas et al., 1986; Felner et al., 1983; Lambe et al., 2018; Lei et al., 2018), as students separate from established social networks at home, adjust to independent living and build new ties to integrate into the university community (Tinto, 1988; Van Gennep, 1960). Students who experience high levels of social anxiety (de Lijster et al., 2018), or social communication differences and a preference for sameness as exemplified by high levels of autistic traits (Jobe & Williams White, 2007) may find such social network changes particularly challenging, which in turn may impact on university transition outcomes. Using a longitudinal design, the current study evaluates how changes in social network structure and perceived social support of first-year typically developing (TD) students and students on the autism spectrum⁵ might influence university transition outcomes, and to what extent these outcomes are affected by social anxiety and autistic traits.

Social Network Changes in University Students

Social network structure (SNS) includes dimensions such as size (i.e., number of people that a person is in contact with), density (i.e., the degree of contact between network members), and composition (i.e., the relative proportion of family, friends, and other members) (Scott, 2017). The functionality of social networks can be measured by perceived social support (PSS), i.e., an individual's subjective experience of tangible (e.g., practical/informational) and less tangible (e.g., emotional/social) support provided by different network members (Cohen & Wills, 1985; Roohafza et al., 2014). There has only been one previous study which simultaneously investigated changes in SNS and PSS amongst first-year TD university students. It found that those who lived on campus had higher density social networks, with more friends and fewer family members compared to their peers who lived at home, and perceived friends to provide greatest support relative to other network

⁵ This article chooses to use identity first language by referring to individuals as being on the autism spectrum, in line with recent research by Kenny et al. (2016) which found that identity first language is preferred by members of the autism community.

members (Hays & Oxley, 1986). Students who report higher PSS have shown better mental and physical health (Gall et al., 2000; Tao et al., 2000). Over time, students increasingly rely on friends for informational and emotional support, and spend more leisure time with family (Friedlander et al., 2007; Hays & Oxley, 1986; Swenson et al., 2008). Students who perceived greater support from professors engaged in more positive coping strategies (Tao et al., 2000), and had better mental health outcomes (Azmitia et al., 2013). The noticeable changes in PSS provided by different social network members across first year of university highlights the dynamic flow of social capital within a social network over time (Azmitia et al., 2013; Friedlander et al., 2007; Gall et al., 2000; Swenson et al., 2008).

However, previous literature has some limitations. First, only one study (Hays & Oxley, 1986) simultaneously measured changes in both PSS and SNS, though changes were only examined across the first semester of university. Second, previous measures of PSS have often asked students to report overall levels of support across general informational, emotional, and practical domains provided by the social network as a whole, rather than evaluating the unique contribution made by individual network members to the specific support domains. Therefore, it remains unclear how changes in SNS and PSS provided by different network members may contribute to different domains of university transition outcomes beyond semester one in first year.

Autistic Traits and University Transition Outcomes

Establishing new social ties at university requires students to have sufficient social skills and confidence to approach others. However, previous studies investigating changes in SNS and PSS have not assessed relevant social factors such as social communication skills and social anxiety. Autism Spectrum Disorder (ASD) is a pervasive neurodevelopmental condition characterised by social communication difficulties and restricted and repetitive behaviours (American Psychiatric Association, 2013) affecting up to 1 in 59 children (Centers for Disease Control and Prevention, 2019). For many students on the autism spectrum, the inherent social communication difference not only affects their ability to establish a new functional social network at university, but also interferes with academic work such as doing group projects, and living in shared accommodation (Adreon & Durocher, 2007; Gelbar et al., 2014; Lambe et al., 2018; Lei et al., 2018, 2019). Many students on the

autism spectrum report high levels of anxiety (71%), loneliness (53%), and depression (47%) (Gelbar et al., 2014), as well as elevated rates of suicidal ideation and attempts (Jackson, Hart, Brown, et al., 2018) as a result of poor university adaptation.

Compared to TD students, students on the autism spectrum at university often continue to receive support from parents rather than peers (Elias & White, 2018; Fleischer, 2012), though to the best of our knowledge, no studies so far have directly examined the changes in SNS and PSS of students on the autism spectrum during transition to university over time. The broader autism phenotype in non-clinical populations also includes poor social communication and understanding (Austin, 2005; Jobe & Williams White, 2007; Sasson et al., 2013). TD students with higher levels of autistic traits (as measured by the Autism Quotient, including domains such as social skills and communication deficit, attention and switching, and lack of imagination) have reported greater loneliness, and poorer social relationship quality than their peers at university (Jobe & Williams White, 2007).

Social Anxiety and University Transition Outcomes

Another factor associated with students' social functioning is social anxiety. Fear of negative evaluation by others, with consequent anxiety in and avoidance of social situations are key features of social anxiety disorder (Clark & Wells, 1995; Rapee & Heimberg, 1997). Symptoms of social anxiety affect between 19-23% of TD undergraduate students, (Beidel, Turner, Stanley, & Dancu, 1989; Strahan & Conger, 1998; Strahan, 2003), and 4-29.2% of young people on the autism spectrum (Hollocks et al., 2019; Kent & Simonoff, 2017). The transition to university can heighten social anxiety amongst all students, with those who do not have a clinical diagnosis of social anxiety still experiencing shyness and symptoms from time to time in various social situations at university (Purdon et al., 2001).

Prior research findings on the impact of social anxiety on students' academic and social transition outcomes have been mixed (Arjanggi & Kusumaningsih, 2016; Brook & Willoughby, 2015; Strahan, 2003; Zukerman, Yahav, & Ben-Itzhak, 2019). Some found greater social anxiety correlated with poorer academic adjustments, and suggested that highly socially anxious students may be unable to seek help for academic assignments, especially from those in a position of higher authority (e.g.,

teachers, tutors, or lecturers) (Arjanggi & Kusumaningsih, 2016; Brook & Willoughby, 2015; Zukerman et al., 2019). However, others have found that greater social anxiety did not affect academic achievement at university, and suggested socially anxious students are better at coping with academic compared to social challenges (Strahan, 2003).

Current Study – Research Aims

The current study is the first to investigate how changes in SNS/PSS, autistic traits and social anxiety differentially affect first year university student transition outcomes in both typically developing and students on the autism spectrum using a longitudinal design. The study had five aims. We first evaluated changes in students': 1) perceived distress across a range of academic, daily living, and socialization areas; 2) SNS; and 3) PSS over the first year of university. We also examined to what extent 4) changes in SNS/PSS and 5) level of social anxiety (measured over time) and autistic traits (measured at start of the academic year), influenced different first-year transition outcomes (academic, socialization, personal/emotional adjustment, and attachment to institution).

Method

Study Design

The current study was approved by the university's departmental ethics committee and is in line with the Declaration of Helsinki as revised in 2000. All participants received study information and completed written informed consent online via Qualtrics prior to participating in the research study. Eligibility criteria included having attended secondary school in the UK, being aged 17-19 years, and starting first-year of university in the UK for the first time. Recruitment methods included handing out flyers on university campus, posting on social media, and through presentations given in introductory lectures during the first two weeks of semester one to first-year university students.

All participants completed baseline questionnaires within the first two weeks of starting university and were re-contacted via email in December (towards the end of semester one) to complete session two, and in March (towards the end of semester two) to complete session three. All sessions were completed online via Qualtrics. At the end of each session, participants were shown an information sheet about available services both within the university, in the local area, and also national charities for mental health/autism support. For each session completed, participants were

either entered into a prize draw to win a £50 gift voucher or received one course credit. Typically developing and students on the autism spectrum were recruited at the same time, and the data were analysed separately due to differences in sample sizes.

Participants

Typically developing (TD) group. Eligibility criteria for TD students included not experiencing any current acute or chronic mental or physical health conditions or any specific learning disability at the time of study enrolment (i.e., within first two weeks of starting semester one), to ensure that the TD student group did not have any additional vulnerabilities at the start of university. A total of 267 TD students completed the first session, with 106 students recruited in 2017, and 159 in 2018. Overall, 182 students completed all three sessions (retention rate of 70.27%).

Autism group. A total of 28 students on the autism spectrum completed the first session, with 8 students recruited in 2017, and 20 in 2018. Twenty-one students completed all three sessions (retention rate 75%). All students disclosed that they had received an autism diagnosis from a clinical professional (i.e., not self-diagnosed). Seventeen students had a clinical diagnosis of Asperger's syndrome, 10 with ASD, and 1 with Pervasive Developmental Disorder – Not Otherwise Specified. All students were known to and have disclosed and verified their autism diagnosis by showing official diagnostic letters from clinical professionals to their university's disability team, through which they can access various types of support on campus. Six students (21%) reported having at least one other co-occurring condition, including anxiety ($n = 3$), depression ($n = 3$), attention deficit hyperactivity disorder ($n = 1$), sensory processing disorder ($n = 1$), and dyspraxia ($n = 1$). Five of these six students completed all three sessions and were included in the final sample ($n = 21$).

Measures

Autism Quotient-Short (AQ-S; Hoekstra et al., 2011). AQ-S is a 28-item abridged version (Hoekstra et al., 2011) of the full 50-item Autism Quotient scale, a self-report measure of autistic traits. See Appendix 1 for more details. All participants completed the AQ-S at T1 to measure level of autistic traits.

Social Anxiety Scale – Adolescents (SAS-A; La Greca, Ingles, Lai, & Marzo, 2015). SAS-A is a 22-item self-report measure of social anxiety in adolescents (La Greca et al., 2015). Validation

of the SAS-A is described by La Greca et al. (2015), and see Appendix 1 for more details. All participants completed the SAS-A at T1, T2 and T3 to monitor changes in social anxiety over time.

Social Network and Perceived Social Support (SNaPSS; Lei, Ashwin, Brosnan, & Russell, 2019). The SNaPSS is an online self-report tool to characterise perceived distress frequency across academic, daily living, and socialization areas, and SNS and PSS amongst students going to university. Details of the measure development and scoring can be found in Lei et al. (2019), and in Appendix 1. Participants completed the SNaPSS at T1, T2, and T3 to assess changes in SNS and PSS over time.

Student Adaptation to College Questionnaire (SACQ; Baker & Siryk, 1984). The SACQ is a 67-item self-report questionnaire evaluating students' transition outcomes including academic, social, personal emotional adjustments, and goal commitment and institutional attachment when adapting to university life (Baker & Siryk, 1984). See Appendix 1 for more details. Participants completed the SACQ at T2 and T3, to monitor changes in transition outcomes across first year of university.

Data Analyses

All data analyses were completed using SPSS version 25 (*IBM SPSS Statistics*, 2016), and Gephi2 (Bastian et al., 2009) to calculate SNS density and visualise social network structure. We used an alpha level of .05 and used Bonferroni corrections to adjust for multiple comparisons where appropriate. We used parametric tests for analysing data from TD students, and non-parametric tests for data from students on the autism spectrum, due to the relatively smaller sample size for students on the autism spectrum ($n = 21$). Analyses included only students who completed the study and were completed in three steps for each study. First, we assessed changes in social anxiety over time, using either repeated measures ANOVA (TD group), or Friedman's Test (autism group). Second, we investigated changes in perceived distress frequency, SNS and PSS over time, using either repeated measures ANOVA (TD group), or Friedman's tests (autism group). Third, we explored how levels of autistic traits, social anxiety, as well as changes in SNS and PSS might influence different aspects of students' transition outcomes, using either stepwise linear regressions (TD group), or Kendall's tau-b correlations (autism group). See Appendix 2 for additional details.

Results

Participant Demographics

Table 1 shows participant demographic information for TD students ($n = 182$) and students on the autism spectrum ($n = 21$) who completed the study. See Appendix 3 for more details on analyses comparing demographic variables across year group and retention status. There were no differences across educational cohorts and retention status amongst TD students, or retention status amongst students on the autism spectrum across any demographic variables.

For TD students, repeated measures ANOVA found a main effect of time for changes in social anxiety ($F(2, 180) = 33.73, p < .001, \eta_p^2 = .27$). Students reported highest level of overall social anxiety symptoms reported at T1 relative to T2 ($p < .001$) and T3 ($p < .001$) and did not change between T2 and T3 ($p = .223$). For subsequent analyses, we used the mean of the total social anxiety score across T1, T2, and T3 as a control variable to reflect overall levels of social anxiety experienced by the student across the transition process, rather than taking the baseline social anxiety score by itself due to potential ceiling effects.

For students on the autism spectrum, Friedman's test found students showed significant differences in social anxiety over time ($\chi^2(2) = 8.22, p = 0.016$). Post hoc analyses using Wilcoxon signed-rank test with Bonferroni to correct for multiple comparisons resulted in an adjusted alpha level of .017. Median (interquartile range) levels of social anxiety across the three time points were 71 (61.5 – 84.5) (T1), 69 (62 – 82) (T2), and 65 (59 – 77) (T3). Social anxiety did not differ between T1 and T2 ($Z = -.02, p = .985$), or 3 ($Z = -1.96, p = .05$), though it significantly decreased between T2 and T3 ($Z = -2.65, p = .008$). Similar to TD students, we computed the mean level of social anxiety (T1 to T3) to be used in subsequent analyses, to avoid any potential ceiling effects at T1.

Table 1

Demographic and clinical information for typically developing (n = 182) and autistic (n = 21) students.

	TD		ASD	
	M (SD)	Range	M (SD)	Range
Age (years)	18.27 (0.50)	17 - 19	18.33 (0.48)	18 – 19
Sex	(n)	(%)	(n)	(%)
Male	36	19.78	11	52.4
Female	146	80.22	10	47.6
A-Level average score¹	5.10 (0.56)	3 – 6	4.31 (1)	2.5 – 6
Autistic Traits (AQ-S total)²	62.70 (9.01)	42 – 89	83.19 (10.32)	64 – 104
Social Anxiety (SAS-A-total)³				
T1	56.08 (11.83)	24 – 85	71.24 (12.74)	46 – 89
T2	52.12 (12.88)	23 – 90	71.43 (12.38)	51 – 90
T3	51.11 (13.59)	21 - 90	67.24 (12.12)	46 – 88
Ethnicity	(n)	(%)	(n)	(%)
Caucasian	144	79.12	21	95.2
Asian	26	14.29	1	4.8
Black	3	1.65	0	0
Mixed/Other	9	4.95	0	0
Degree Faculty	(n)	(%)	(n)	(%)
Sciences	32	17.58	8	38.1
Technology	6	3.30	3	14.3
Engineering	8	4.40	1	4.8
Mathematics	2	1.10	1	4.8
Arts and Humanities	4	2.20	1	4.8
Social Sciences	130	71.43	7	33.3

Notes: TD = Typically Developing; ASD = Autism Spectrum Disorder; AQ-S = Autism Quotient – Short; SAS-A = Social Anxiety Scale for Adolescents. ¹ A-Level average score is measured on a scale of 6 (A*) to 1 (E). ² AQ-S has a recommended cut-off score of >65. ³SAS-A has a recommended clinical cut-off score of 50.

Changes in Perceived Distress Frequency (T1 to T3)

Table 2 shows changes in perceived distress frequency for academic, daily living, and socialization areas over time for TD students and students on the autism spectrum.

For TD students, using repeated measures ANOVA, we found no significant main effect of time ($F(2.56, 331.27) = 2.56, p = .084, \eta_p^2 = .014$). A significant main effect of type ($F(1.89, 342.47) = 64.79, p < .001, \eta_p^2 = .264$), and a significant time by type interaction on perceived distress frequency ($F(3.14, 568.88) = 86.88, p < .001, \eta_p^2 = .324$) were found. Overall, TD students perceived significantly greater distress in academic areas compared to daily living ($p < .001$) and socialization ($p < .001$). Pairwise comparisons (with Bonferroni corrections) showed that over time, the significant interaction was driven by an increase in perceived distress in academic area ($p < .001$) and decrease in daily living ($p < .001$) and socialisation ($p < .001$) areas from T1 to T3. In contrast for students on the autism spectrum, using Friedman's test, there were no differences in perceived distress frequency in academic, daily living, and socialization domains over time ($\chi^2(2) = 3.71, p = .156$), nor differences in total perceived distress frequency across each time-point ($\chi^2(2) = 2.33, p = 0.311$).

For TD students, autistic traits did not interact with either time or type to influence any changes in perceived distress frequency. However, mean levels of social anxiety significantly interacted with type ($F(1.89, 338.72) = 5.51, p = .005, \eta_p^2 = .03$), and students with higher social anxiety perceived greater distress frequency in socialization areas compared to daily living areas ($p = .001$). In contrast for students on the autism spectrum, using Kendall's tau-b correlation, greater mean level of social anxiety, not autism symptom severity, was associated with greater perceived distress in academic ($\tau_b = .32, p = .046$), daily living ($\tau_b = .33, p = .042$), and socialization ($\tau_b = .45, p = .004$) areas.

Table 2

Changes in perceived distress frequency, social network structure, and perceived social support over time, as measured by Social Network and Perceived Social Support (SNaPSS).

	TD (n = 182)						ASD (n = 21)					
	Time 1		Time 2		Time 3		Time 1		Time 2		Time 3	
	M (SD)	Range	M (SD)	Range	M (SD)	Range	M (SD)	Range	M (SD)	Range	M (SD)	Range
<i>Perceived distress</i>												
Academic	4.91 (3.23)	0 – 21	8.31 (3.94)	0 – 19	8.15 (4.06)	0 – 20	8.95 (4.81)	0 - 16	11.86 (4.20)	5 - 20	11.38 (5.58)	2 – 20
Daily Living	5.44 (3.48)	0 – 18	4.88 (3.47)	0 – 15	4.36 (3.30)	0 – 16	8.52 (4.90)	1 - 16	8.38 (4.93)	0 - 17	8.14 (5.26)	0 – 19
Socialisation	6.44 (4.75)	0 – 19	4.43 (4.07)	0 – 18	3.82 (3.75)	0 – 18	9.57 (6.02)	1 – 20	10.53 (4.69)	3 – 20	9.52 (5.42)	1 – 20
<i>SNS</i>												
Size	11.98 (5.10)	0 – 20	10.58 (5.13)	0 – 20	10.33 (5.17)	0 – 20	8.04 (5.03)	0 – 20	8.19 (5.05)	1 – 20	7.33 (5.27)	0 – 18
Density	.36 (.19)	0 – 1	.31 (.16)	0 – 1	.30 (.16)	0 – 1	0.32 (0.19)	0 – 0.7	0.39 (0.26)	0.13 - 1	0.37 (0.28)	0 – 1
% Family	37.13 (19.52)	0 – 100	30.66 (17.21)	0 – 100	30.83 (15.18)	0 – 75	27.21 (18.89)	0 – 72.73	38.58 (25.60)	0 - 100	27.33 (21.52)	0 – 90.91
% Friends	60.65 (18.50)	0 – 100	67.54 (18.51)	0 – 100	67.68 (16.20)	0 – 100	48.53 (24.38)	0 - 85	54.06 (26.66)	0 – 100	58.64 (33.01)	0 – 100
% Other	3.49 (7.22)	0 – 33.33	.70 (2.89)	0 – 23.53	.88 (3.76)	0 – 27.27	10.17 (19.60)	0 – 81.82	7.36 (13.97)	0 – 57.14	9.26 (18.99)	0 – 66.67
<i>PSS Quantity</i>												
Academic	2.93 (2.69)	0 – 10.29	2.92 (1.88)	0 – 9	2.92 (2.06)	0 – 10.79	2.25 (2.62)	0 – 8.5	2.71 (2.25)	0 – 7.5	2.43 (1.91)	0 – 5
Daily living	4.77 (2.11)	0 – 10	3.76 (2.14)	0 – 10	3.22 (1.92)	0 – 10	4.26 (2.57)	0 – 9.9	3.78 (2.56)	0 - 10	3.32 (2.35)	0 – 8
Socialisation	4.58 (2.23)	0 – 10	3.32 (2.00)	0 – 9	2.91 (2.04)	0 – 8.50	3.53 (2.43)	0 – 8.4	3.75 (2.64)	0 - 10	2.83 (1.78)	0 – 6.33
Family	6.22 (3.31)	0 – 15	3.89 (2.89)	0 – 15	3.34 (2.74)	0 – 14	4.99 (4.02)	0 – 15	4.28 (3.8)	0 – 14.5	2.90 (3.02)	0 – 11.5
Friends	5.57 (3.28)	0 – 13.17	5.90 (2.99)	0 – 13.50	5.58 (2.89)	0 – 14.50	4.03 (4.17)	0 – 14	5.22 (3.80)	0 – 11	4.38 (4.06)	0 – 11.83
Other	0.49 (1.18)	0 – 6	0.21 (1.01)	0 – 9	0.13 (0.76)	0 – 8	1.02 (1.85)	0 - 7	0.74 (1.68)	0 - 6	1.30 (2.49)	0 - 8
<i>PSS Quality</i>												
Academic	4.83 (3.86)	0 – 15	5.19 (3.09)	0 – 14.5	5.21 (3.13)	0 – 14.67	3.54 (3.64)	0 - 12	4.62 (3.59)	0 – 13	3.42 (2.77)	0 – 9
Daily living	7.24 (2.75)	0 – 15	6.77 (2.97)	0 – 13	6.54 (2.99)	0 – 13	6.42 (4.07)	0 – 15	5.40 (3.13)	0 – 10	5.16 (2.98)	0 – 10
Socialisation	6.84 (3.00)	0 – 15	5.80 (2.91)	0 – 13.45	5.29 (3.24)	0 – 12.17	4.46 (3.28)	0 - 10	4.45 (3.27)	0 - 10	4.94 (3.39)	0 – 14
Family	9.41 (4.10)	0 – 15	7.65 (4.66)	0 – 15	7.19 (4.79)	0 – 15	6.53 (4.70)	0 - 15	6.11 (5.00)	0 – 15	4.85 (4.63)	0 – 13.5
Friends	8.49 (4.21)	0 – 15	9.67 (3.79)	0 – 15	9.54 (3.86)	0 – 15	5.62 (5.06)	0 – 15	6.71 (4.11)	0 – 15	6.42 (4.98)	0 – 15
Other	1.01 (2.59)	0 – 15	.43 (1.85)	0 – 13	0.30 (1.43)	0 – 10	2.26 (3.96)	0 - 15	1.64 (3.91)	0 - 14	2.26 (4.08)	0 – 12

Note. TD = typically developing; ASD = Autism Spectrum Disorder; SNS = Social Network Structure; PSS = Perceived Social Support.

Changes in Social Network Structure (SNS) (T1 to T3)

Table 2 and Appendix 4 show changes in SNS over time for TD students and students on the autism spectrum. For TD students, repeated measures ANOVAs showed a significant main effect of time for social network size ($F(1.72, 312.51) = 14.21, p < .001, \eta_p^2 = .073$), density ($F(1.89, 341.96) = 8.51, p < .001, \eta_p^2 = .045$), and network composition of percentage of family ($F(1.71, 309.59) = 5.25, p < .001, \eta_p^2 = .078$), friends ($F(1.97, 356.03) = 12.26, p < .001, \eta_p^2 = .096$), and other network members ($F(1.48, 267.83) = 20.71, p < .001, \eta_p^2 = .103$). Networks had greater size and density at T1 relative to T2 ($p < .001; p = .008$) and T3 ($p < .001; p = .001$), though did not differ between T2 and T3 ($p = .403; p = .878$). In contrast for students on the autism spectrum, using Friedman's test, no statistically significant differences over time were found for network size ($\chi^2(2) = 0.46, p = .796$) or density ($\chi^2(2) = 0.08, p = .961$).

For network composition, TD students reported more family and other network members at T1 relative to T2 ($p < .001; p < .001$) and T3 ($p < .001; p = .007$), though there were no differences between T2 and T3. TD students reported lowest percentage of friends at T1 relative to T2 ($p < .001$) and T3 ($p < .001$), though no differences between T2 and T3. Similarly, for students on the autism spectrum, the mean percentage of family, friends, and other network members significantly differed across all three time-points ($\chi^2(2) = 27.71, p < .001$). Post-hoc analyses using Wilcoxon signed-rank test with Bonferroni to correct for multiple comparisons resulted in an adjusted alpha level of 0.017. Median (interquartile range) percentages for network composition over time were 31.27% (19.92 - 39.39%) for family, 59.64% (31.67 - 69.44%) for friends, and 3.70% (0 - 12.68%) for other network members. Students on the autism spectrum had a significantly greater mean proportion of friends than family ($Z = -2.52, p = .012$), and both a greater mean proportion of family ($Z = -3.56, p < .001$) and friends ($Z = -.384, p < .001$) compared to other network members.

For TD students, neither autistic traits nor social anxiety interacted with time to influence changes in any SNS measure. Appendix 4a shows examples of both social pruning and network expansion observed over time in TD students.

For students on the autism spectrum, using Kendall's tau-b correlations, neither autism symptom severity nor social anxiety were associated with mean social network size ($\tau_b = .06, p = .715$; $\tau_b = -.08, p = .61$, respectively), density ($\tau_b = -.02, p = .903$; $\tau_b = .04, p = .785$, respectively), or composition ($\tau_b = -.12$ to $-.01, p = .466$ to $.952$; $\tau_b = -.32$ to $.15, p = .054$ to $.414$, respectively). Appendix 4b highlights individual differences in social network structural changes over time amongst students on the autism spectrum.

Changes in Perceived Social Support (PSS) (T1 to T3)

Table 2 shows the mean quantity and quality of PSS provided by network members and across different areas over time for TD students and students on the autism spectrum. For each student group, two separate models examined differences in PSS across 1) different network members over time; 2) different areas of support over time.

By member over time. For TD students, perceived support quantity provided by network members over time showed a significant main effect of time ($F(1.80, 324.82) = 39.50, p < .001, \eta_p^2 = .18$), network member type ($F(1.95, 352.22) = 433.44, p < .001, \eta_p^2 = .71$), and time by network member interaction ($F(3.65, 660.13) = 48.11, p < .001, \eta_p^2 = .21$). PSS quantity was higher at T1 than T2 ($p < .001$), and T3 ($p < .001$), and at T2 than T3 ($p = .007$). Overall, friends provided the greatest support quantity relative to family ($p < .001$), and other network members ($p < .001$), and family provided more support relative to other network members ($p < .001$). Pairwise comparisons (with Bonferroni corrections) showed that the interaction was driven by family ($p < .001$) and other network members ($p = .001$) providing reduced quantity of support From T1 to T3, though friends provided similar quantity of support from T1 to T2 ($p = .604$), and T2 to T3 ($p = .328$). Neither autistic traits nor social anxiety interacted with time, or member status to influence changes in perceived support quantity.

For students on the autism spectrum, using Friedman's test, we observed significant differences in students' perceived support quantity ($\chi^2(2) = 14.77, p = .001$) provided by different network members across all three domains over time. Post-hoc analyses using Wilcoxon signed-rank test with Bonferroni to correct for multiple comparisons resulted in an adjusted alpha level of 0.017

for both support quantity. For PSS quantity over time, median (interquartile range) were 3.67 (1.89 – 5.44) for family members, 4.58 (2.04 – 6.72) for friends, and 0 (0 – 2.17) for other network members. Family ($Z = -3.53, p < .001$) and friends ($Z = -3.41, p = .001$) provided greater PSS quantity than other network members, though there were no differences between family and friends ($Z = -1.38, p = .167$). Kendall's tau-b correlations found no significant associations between support quantity across different network members and autism symptom severity ($\tau_b = 0$ to $0.1, p = 0.952$ to 1), or social anxiety ($\tau_b = -.17$ to $.12, p = 0.123$ to $.525$)

For TD students, when testing for perceived support quality provided by network members over time, a significant main effect of time ($F(1.93, 348.66) = 9.04, p = .002, \eta_p^2 = .03$), member type ($F(1.83, 331.45) = 570.59, p < .001, \eta_p^2 = .76$), and time by member type interaction ($F(3.91, 707.32) = 23.34, p < .001, \eta_p^2 = .11$) were found. PSS quality was higher at T1 than T3 ($p = .003$), though no differences between T1 and T2, nor T2 and T3 were observed. Overall, friends provided best quality support relative to family ($p < .001$), and other network members ($p < .001$), and family provided better quality support relative to other members ($p < .001$). Pairwise comparisons (with Bonferroni corrections) showed that the interaction was driven by family ($p < .001$) and other network members ($p = .003$) providing reduced quality of support from T1 to T3, though friends provided significantly better-quality support from T1 to T3 ($p = .003$). Neither autistic traits nor social anxiety interacted with time or network member type to influence changes in perceived support quality.

For students on the autism spectrum, for PSS quality over time, we observed significant differences in students' perceived quality of support ($\chi^2(2) = 10.76, p = .005$) provided by different network members. For PSS quality over time, median (interquartile range) were 5.33 (2.81 – 7.08) for family, 6.67 (3.83 – 8.40) for friends, and 0 (0 – 4.75) for other network members. Family ($Z = -3.29, p = .001$) and friends ($Z = -3.10, p = .002$) provided better quality support than other network members, though there were no differences between family and friends ($Z = -.96, p = .339$). Kendall's tau-b correlations found no significant associations between support quantity across different network members and autism symptom severity ($\tau_b = -.039$ to $.00, p = .808$ to 1), or social anxiety ($\tau_b = -.22$ to $.28, p = .19$ to $.83$).

By area over time. For TD students, perceived support quantity provided across different domains (academic, daily living, and socialization) over time, a significant main effect of time ($F(1.80, 324.82) = 39.50, p < .001, \eta_p^2 = .18$) and domain ($F(1.88, 340.70) = 44.88, p < .001, \eta_p^2 = .19$), and time by domain interaction were found ($F(3.57, 645.22) = 20.46, p < .001, \eta_p^2 = .10$). PSS quantity was greater at T1 than T2 ($p < .001$) and T3 ($p < .001$), and at T2 than T3 ($p = .007$). Overall, participants perceived greater support quantity in daily living skills relative to academic ($p < .001$) and socialization ($p = .003$), and also greater support quantity in socialization relative to academic area ($p < .001$). Pairwise comparisons (with Bonferroni corrections) found that the interaction was driven by a significant reduction in support quantity in daily living ($p < .001$) and socialisation ($p < .001$) from T1 to T3, whereas no changes in perceived quantity of academic support ($p = .195$) from T1 to T3 was found. Neither levels of social anxiety nor autistic traits significantly interacted with time to influence changes in perceived support quantity. However, a significant interaction between level of social anxiety support domain was found ($F(1.88, 336.54) = 4.68, p = .011, \eta_p^2 = .03$). TD students with greater social anxiety reported greater PSS quantity in socialization than academic area ($p = .04$). No interaction between autistic traits and support domains was found.

For students on the autism spectrum, using Friedman's test, we observed significant differences in students' perceived quantity ($\chi^2(2) = 6.03, p = .049$) of support across the three domains over time. For PSS quantity over time, the median values (interquartile range) were 2.33 (0.82 – 4.08) for academic, 3.33 (2 – 5.28) for daily living, and 3.92 (1.75 – 4.63) for socialization areas. PSS quantity was greater in both daily living ($Z = -3.04, p = .002$), and socialization ($Z = -2.67, p = .008$) compared to academic studies, though no differences between daily living and socialization areas were observed ($Z = -.946, p = .344$). Kendall's tau-b correlations found no significant associations between PSS quantity in any domains, with either autism symptom severity ($\tau_b = -.099$ to $.122, p = 0.36$ to $.54$), or social anxiety ($\tau_b = .039$ to $.22, p = 0.164$ to $.808$).

For TD students, perceived support quality provided across different domains over time, a significant main effect of time ($F(1.93, 348.66) = 6.26, p = .002, \eta_p^2 = .03$), domain ($F(1.88, 339.72) = 54.79, p < .001, \eta_p^2 = .23$), and time by domain interaction ($F(3.68, 665.73) = 9.90, p < .001, \eta_p^2 = .10$) were found.

.052) were found. PSS quality was greater at T1 than T3 ($p = .003$), though no differences between T1 and T2, or T2 and T3. PSS quality was greater in daily living areas than academic ($p < .001$) or socialization ($p < .001$), and also greater in socialization relative to academic area ($p < .001$). Pairwise comparisons (with Bonferroni corrections) found that the interaction was driven by a relative decrease in quality of daily living ($p = .006$) and socialisation ($p < .001$) support from T1 to T3, though no significant changes in quality of academic support ($p = .579$) from T1 to T3 was noted. Neither social anxiety nor autistic traits significantly interacted with time to influence changes in PSS quality. However, a significant interaction between mean level of social anxiety and domain of support was found ($F(1.89, 337.75) = 5.15, p = .007, \eta_p^2 = .03$). TD students with greater social anxiety perceived better socialization support than academic support ($p = .003$). No interaction between autistic traits and domains was found.

For students on the autism spectrum, using Friedman's test, we observed significant differences in students' perceived quality ($\chi^2(2) = 9.10, p = .011$) of support across the three domains over time. For PSS quality over time, median (interquartile range) were 4 (1.67 – 5.67) for academic, 6 (4 – 7.08) for daily living, and 4.18 (3.33 – 6.19) for socialization areas. PSS quality was better in daily living relative to academic studies ($Z = -2.62, p = .009$), though no differences between socialization and academic areas ($Z = -1.89, p = .059$), or daily living ($Z = -1.55, p = .121$). Kendall's tau-b correlations found no significant associations between PSS quality in any domains, with either autism symptom severity ($\tau_b = -.15$ to $.09, p = .063$ to $.348$), or social anxiety ($\tau_b = -.15$ to $.07, p = .348$ to $.694$, respectively).

University Transition Outcomes

Table 3 shows transition outcomes (SACQ) at T2 and T3 for TD students and students on the autism spectrum.

Table 3

Students' transition outcomes at times 2 and 3, as measured by Student Adaptation to College Questionnaire (SACQ).

	TD (n = 182)				ASD (n = 21)			
	Time 2		Time 3		Time 2		Time 3	
	M (SD)	Range	M (SD)	Range	M (SD)	Range	M (SD)	Range
Academic	143.96 (23.12)	67 – 196	144.32 (31.95)	76 – 439	126.48 (26.87)	62 – 186	125.71 (29.58)	75 – 177
Social	128.42 (25.19)	46 – 178	128.01 (26.36)	39 – 176	97.76 (26.19)	44 – 132	99.14 (25.24)	55 – 142
Personal/ Emotional	82.40 (18.70)	31 – 133	84.70 (19.46)	37 – 129	62.05 (17.85)	25 – 87	63.95 (20.24)	24 – 104
Attachment	108.10 (17.00)	38 – 135	106.87 (18.47)	39 – 134	87.95 (18.60)	44 – 117	95.29 (18.64)	51 – 119
Total	412.69 (59.84)	221 – 548	413.04 (61.83)	222 – 572	333.14 (72.60)	168 – 457	335.38 (73.95)	270 – 462

Note. TD = Typically Developing; ASD = Autism Spectrum Disorder.

TD students. Pearson's correlation showed a significantly positive correlation between overall transition outcome ($r = .78, p < .001$), as well as academic ($r = .50, p < .001$), social ($r = .79, p < .001$), personal emotional ($r = .70, p < .001$), and attachment to institution ($r = .75, p < .001$) subscales at T2 and T3. Paired sample t-test showed no significant differences between T2 and T3 for the total or any subscale scores when Bonferroni is used to control for multiple comparisons ($p > .01$). The average scores for SACQ total and subscales from T2 and T3 were used as dependent variables for all subsequent stepwise linear regression models, assessing how autistic traits, mean level of social anxiety, and changes in SNS and PSS might influence transition outcomes.

Both levels of social anxiety ($\beta = -.51, p < .001$) and autistic traits ($\beta = -.15, p = .041$) were negatively associated with overall transition outcome (SACQ total), and together explained 36% of variance ($F(2, 179) = 50.87, p < .001$). Adding T1 SNS and PSS in step 2 did not improve overall model fit ($F_{\text{Change}}(4, 175) = 2.01, p = .095, R^2 \text{ Change} = .03$). In step 3, adding T3 SNS and PSS significantly improved model fit ($F_{\text{Change}}(4, 171) = 4.13, p = .003, R^2 \text{ Change} = .05$), and better overall

transition outcome was associated with lower social anxiety ($\beta = -.50, p < .001$), and smaller network density at T3 ($\beta = -.16, p = .01$).

For academic, personal/emotional, and attachment to institution transition outcomes (Table 4), only lower levels of social anxiety significantly predicted better transition outcomes in each domain ($p < .001$), even when measures of SNS and PSS at T1 and T3 were added to the model in steps 2 and 3. Similarly, for socialization adjustments, both lower levels of autistic traits ($p = .001$) and social anxiety ($p < .001$) predicted better socialization at university, and no measure of SNS or PSS at T1 or T3 helped to improve model fit.

Table 4

Stepwise linear regressions showing how changes in social network structure and perceived social support (from time 1 to time 3), and baseline characteristics (time 1) influence transition outcomes in typically developing students (n = 182).

	Academic		Socialisation		Personal/ Emotional		Attachment to Institution	
Model 1	B (SE)	β	B (SE)	β	B (SE)	β	B (SE)	β
AQ-S Tot (T1)	-.11 (.22)	-.04	-.63 (.20)	-.23*	.03 (.15)	.02	-.29 (.14)	-.16
SAS-A Tot M	-.66 (.17)	-.33*	-.87 (.15)	-.43*	-.70 (.12)	-.47*	-.56 (.11)	-.40*
R^2	.12		.34		.21		.25	
$F (2,179)$	12.62*		45.89*		24.31*		30.42*	
Model 2								
AQ-S Tot (T1)	-.08 (.22)	-.03	-.59 (.20)	-.22*	.04 (.16)	.02	-.26 (.14)	-.14
SAS-A Tot M	-.70 (.17)	-.35*	-.85 (.15)	-.41*	-.66 (.12)	-.45*	-.55 (.11)	-.39*
Size (T1)	-.40 (.36)	-.09	.13 (.32)	.03	.20 (.25)	.06	.03 (.23)	.01
Density (T1)	-6.38(9.25)	.05	-16.30 (8.15)	-.13	-.81 (6.52)	-.01	-8.94 (5.86)	-.10
PSS Qty (T1)	-.14 (.50)	-.03	-.03 (.44)	-.01	-.29 (.35)	-.10	-.30 (.32)	-.10
PSS Qlty (T1)	.56 (.37)	.18	.27 (.33)	.09	.16 (.26)	.07	.48 (.24)	.22
ΔR^2	.03		.03		.01		.04	
$\Delta F (4,175)$	1.37		1.79		.38		2.29	
$F (6,175)$	5.16*		16.76*		8.24*		11.96*	
Model 3								
AQ-S Tot (T1)	-.11 (.22)	-.04	-.61 (.20)	-.23*	.02 (.15)	.01	-.28 (.14)	-.15
SAS-A Tot M	-.69 (.17)	-.34*	-.84 (.15)	-.41*	-.66 (.12)	-.45*	-.54 (.11)	-.39*
Size (T1)	-.57 (.41)	-.12	.01 (.37)	.00	.05 (.29)	.02	-.16 (.26)	-.05
Density (T1)	-2.31 (9.30)	-.02	-13.92 (8.33)	-.11	2.04 (6.58)	.02	-6.39 (5.87)	-.07
PSS Qty (T1)	.39 (.54)	.09	.16 (.48)	.04	.08 (.38)	.03	-.04 (.34)	-.01
PSS Qlty (T1)	.16 (.40)	.05	.08 (.36)	.03	-.06 (.28)	-.03	.23 (.25)	.13
Size (T3)	.46 (.40)	.10	.28 (.36)	.06	.39 (.28)	.11	.44 (.25)	.14
Density (T3)	-20.91 (11.20)	-.14	-16.27 (10.03)	-.11	-11.50 (7.92)	-.10	-15.26 (7.06)	-.15
PSS Qty (T3)	-.90 (.55)	-.19	-.19 (.49)	-.04	-.63 (.39)	-.18	-.28 (.35)	-.08
PSS Qlty (T3)	.62 (.38)	.19	.25 (.34)	.08	.28 (.27)	.12	.23 (.24)	.10
ΔR^2	.05		.02		.04		.05	
$\Delta F (4, 171)$	2.77		1.25		2.35		2.29	
$F (10,171)$	4.33*		10.61*		6.04*		8.75*	

Note. AQ-S Tot = Autism Quotient – Short Total; SAS-A Tot M = Social Anxiety Scale – Adolescent total mean; PSS = Perceived Social Support; Qty = Quantity; Qlty = Quality. * $p < .01$ (Bonferroni corrected for multiple comparisons).

Students on the autism spectrum. Wilcoxon signed-rank test (Bonferroni corrected for multiple comparisons, with alpha level of .0125) found no significant differences between T2 and T3 in academic ($Z = -1.14, p = .889$), social ($Z = -.47, p = .641$), or personal emotional adjustments ($Z = -.68, p = .498$), or attachment to institution ($Z = -.19, p = .848$). We used the mean adjustment score for each transition outcome domain across T2 and T3 for subsequent analyses.

Kendall's tau-b correlations showed autism symptom severity was not associated with academic ($\tau_b = -.17, p = .289$), social ($\tau_b = -.07, p = .649$), personal-emotional ($\tau_b = -.20, p = .203$) adjustments, or attachment to institution ($\tau_b = -.11, p = .505$). However, higher level of social anxiety was associated with poorer academic adjustment ($\tau_b = -.41, p = .009$), poorer personal/emotional adjustment ($\tau_b = -.34, p = .034$), and poorer attachment to institution ($\tau_b = -.35, p = .027$), though not with socialization adjustment ($\tau_b = -.19, p = .226$).

Next, we conducted Kendall's tau-b correlations between measures of SNS and PSS that showed significant changes over time, and different university transition outcomes. For SNS, network composition was not significantly associated with academic ($\tau_b = -.06$ to $.17, p = .29$ to $.88$), social ($\tau_b = -.18$ to $.29, p = .065$ to $.29$), personal-emotional adjustments ($\tau_b = -.11$ to $.19, p = .227$ to $.88$), and attachment to institution ($\tau_b = -.08$ to $.13, p = .397$ to $.658$). For PSS, total combined support quantity and quality across different areas, network members, and over time was not associated with academic ($\tau_b = -.17, p = .277$; $\tau_b = -.08, p = .629$, respectively), social ($\tau_b = -.11, p = .506$; $\tau_b = -.09, p = .587$, respectively), personal-emotional adjustments ($\tau_b = -.21, p = .194$; $\tau_b = -.03, p = .833$, respectively), or attachment to institution ($\tau_b = .14, p = .381$; $\tau_b = .01, p = .928$, respectively).

Discussion

The current study was the first to employ a longitudinal design to quantitatively evaluate changes in perceived distress frequency, SNS, and PSS amongst first-year students transitioning to university. We also assessed whether these changes are associated with first-year transition outcomes and the role of autistic traits and social anxiety in TD students and students on the autism spectrum.

Perceived Distress Frequency

Whereas TD students perceived greatest distress in academic studies, students on the autism spectrum perceived greater distress across all areas over time. One common thread linking together

the academic, daily living, and socialization areas is the necessity for maintaining and engaging in social interactions across all aspects of university life, which can be anxiety-provoking and exhausting (Anderson et al., 2017; Elias & White, 2018; Jackson, Hart, & Volkmar, 2018; Van Hees et al., 2015). Similarly, TD students with higher social anxiety perceived greater distress frequency also in socialization, reflecting potentially lower social competency and greater vulnerability when coping with social changes at university (de Lijster et al., 2018).

Changes in Social Network Structure

We found that TD students reported a reduction in their social network size and density over the first semester, and this selective social pruning is concordant with the socioemotional selectivity theory (Carstensen et al., 1999; English & Carstensen, 2014), which suggests the individual's social network helps them to gather information through new network ties during times of change (e.g., transitioning to university). However, during times of stability, the social network serves to maintain an individual's social and emotional wellbeing by undergoing a selective pruning process, by only keeping network members who are considered to be close and supportive to the individual. Therefore, TD students might be selectively pruning out both old (before university) and new (since university) social network ties as they settle into university life. The decrease in social network density over time also perhaps reflects the increasing separation of a TD's student's peer network and family networks during university, as family members are less familiar with new social network ties that the students have made at university. Although the increasing network fragmentation might reflect increasing independence an individual has in establishing his/her new social world, it could also mean that access to social capital becomes more fragmented and specialised amongst each small cluster of network members identified in one's social network (Scott, 2017).

In contrast, students on the autism spectrum did not report any significant changes in their social network size or density over time. Social networks contained an average of around 7-8 people, and a density of 0.32-0.39. From social network literature, the average social network size lies between a tight knit support clique (5 people), and a bigger and more diverse sympathy group (12 people), both of which are considered to include mostly network members from whom the individual is likely to seek advice and support when needed (Dunbar & Spoors, 1995; Hill & Dunbar, 2003).

Students on the autism spectrum may therefore have listed primarily people they considered closest to them (as measured by SNaPSS). From the higher education literature, both the social network size and density reported here is concordant with previous findings in first-year TD students who live on campus (network size 7-9 people; density 0.3-0.37) (Hays & Oxley, 1986). Despite converging towards an average size and density which fall within the expected range from both social network and higher education literature, SNaPSS helped to capture and visualise the great diversity and individual differences in students' SNS over time via personalised ecomaps.

Consistent with developmental literature, both autistic and TD students reported an increase in relative percentage of peers relative to family and other network members over time, as peers provide more functional support over the course of adolescence and adulthood when young people move away from home (Lee & Goldstein, 2016). The current study found students on the autism spectrum established some new relationships with same aged peers at university (Barnhill, 2016; Gurbuz et al., 2019; Jackson, Hart, Brown, et al., 2018; Morrison et al., 2009). Given that prior literature found elevated levels of loneliness amongst students on the autism spectrum, it may be that they are not as satisfied with their SNS compared to TD students, and are unable to initiate social activities with peers, both of which were not directly measured and remain a future direction to be explored.

Changes in Perceived Social Support

Consistent with prior literature, both TD students and students on the autism spectrum found friends to provide better support quantity and quality compared to other network members (Hays & Oxley, 1986; Swenson et al., 2008). Over time, friends may become an increasingly important source of social support, as family members begin to provide increasingly less informational and emotional support to students (Swenson et al., 2008). Concordant with prior literature where parents reported that they continued to support students on the autism spectrum at university (Cai & Richdale, 2016), students on the autism spectrum also perceived family members to provide better quality support. Despite previous literature suggesting that students on the autism spectrum receive support from institution and professionals (Gurbuz et al., 2019; Ward & Webster, 2018), the current study found students on the autism spectrum did not find other network members as supportive as family and

friends. It might be that students on the autism spectrum did not list as many university staff or other support members using the SNaPSS because they did not feel personally close to them or may not have kept in contact with the person overseeing their support needs at university.

Both TD students and students on the autism spectrum perceived greatest support in daily living skills (such as cooking, managing time and finances), relative to socialization and academic areas. The reduced quantity and quality of PSS in the academic area is especially interesting, given that academic area was perceived to be the most distressing amongst TD students. According to the stress-buffering hypothesis, social support can only buffer stress where the type of support provided matches the source of stress itself (Cohen & Wills, 1985), thus the low level of PSS in academic areas may be unable to buffer against academic distress, though direction of causation between support and distress remain to be explored in future studies.

Finally, although social anxiety did not have any impact on PSS of students on the autism spectrum, TD students who had greater social anxiety perceived more support in socialization areas relative to other areas. Given that the same group of students still perceived greatest frequency of distress in socialization areas, this suggests that PSS from network members is unable to sufficiently buffer against social distress when experienced alongside social anxiety. Students with higher social anxiety might have more negative perceptions of their own social competency regardless of the amount of external support offered (de Lijster et al., 2018), and future studies can explore the impact of negative self-perception on social competence over time.

University Transition Outcomes

We found that changes in SNS and PSS, as well as social anxiety and autistic traits had differing impact on students' transition outcomes. For TD students, better overall transition outcome was associated with lower social anxiety over time and having a smaller social network density by the end of semester two (Time 3), though the direction of causation is unclear. Perhaps students who are less socially anxious can selectively prune their social network to maintain only social contacts that are closest and most helpful to them. Alternatively, having a closely-knit social network can also improve flow of social capital and support, and may help to maintain a low level of social anxiety.

Future directions can explore how students utilise their social network in relation to social anxiety through qualitative interviews, to better understand the direction of causation.

For both groups, the negative association between higher levels of social anxiety and poorer academic and personal/emotional adjustments is consistent with prior literature (Arjanggal & Kusumaningsih, 2016; Brook & Willoughby, 2015; Zukerman et al., 2019). Previous findings have hypothesised that greater social anxiety may restrict an individual's access to social capital and access to information, resulting in poorer academic performance. Previous findings also found lower personal emotional adjustment is associated with greater psychological distress, poorer independence in managing one's own emotions, and being more likely to be known to the campus psychological/counselling services (Baker & Stryk, 1999). The current study found that when taking into account social anxiety, changes in SNS and PSS were not associated with either academic or personal emotional adjustments, further suggesting that some of the variance associated with poor transition outcomes in either domain explained by changes in students' social world may be largely attributable to one's level of social anxiety.

For social transition outcomes, we found that better social adjustment in TD students was associated with lower levels of autistic traits and social anxiety, which is concordant with prior literature that examined the broader autism phenotype in TD university students (Jobe & Williams White, 2007; Trevisan & Birmingham, 2016). It is interesting to note that the relationship between autistic traits and socialization adjustment held even when taking into account social anxiety symptoms and changes in SNS/PSS, suggesting that autistic traits have a negative impact on social transition outcomes beyond that of social anxiety, as well as changes in an individual's social world. Therefore, both social anxiety and autistic traits can independently contribute towards TD students' social vulnerability when transitioning to university. In contrast, for students on the autism spectrum, socialization adjustment was not associated with changes in SNS/PSS, autistic traits, or social anxiety. The relatively small sample of students on the autism spectrum in the current study had high levels of social anxiety as well as autistic traits, and therefore may not have provided sufficient range of scores or enough power for either factor to bear a significant association with social transition outcomes. Future studies should include a larger sample of students on the autism spectrum with high versus low

levels of social anxiety, to directly compare the extent to which autistic traits and social anxiety might differentially relate to social adjustments during first year of university.

Finally, both TD students and students on the autism spectrum with greater social anxiety also experienced poorer attachment to institution, suggesting poorer commitment and/or satisfaction with their degree choice, as well as reduced satisfaction with the institution that they are attending (Baker & Siryk, 1999). Previous studies suggest lower scores on attachment to institution is associated with a greater likelihood of discontinuing one's studies at university (Baker & Siryk, 1999). Therefore, stakeholders should consider targeting students' social anxiety during transition planning for both student groups, beyond support strategies aimed at improving students' SNS/PSS at university, to try and minimise the negative impact that social anxiety has on students' satisfaction at university and elicit more widespread positive transition outcomes.

Strengths, Limitations, and Future Directions

The current study has many strengths. First, we used a longitudinal design which spanned over two semesters during first year of university, thus assessing longer term transition outcomes than previous studies. Second, previous studies have often assumed a relationship between greater social anxiety and a smaller and less supportive social network without directly measuring either changes in SNS or PSS during transition to university. We used a novel online tool (SNaPSS) and found that social anxiety did not affect changes in the TD students' SNS, though did influence PSS by increasing the amount of social support provided by network members. Therefore, a directly linear relationship between social anxiety, structural and functional aspects of social network should not be assumed.

Third, we simultaneously assessed the impact that social anxiety and autistic traits had on first-year students' university transition (Brook & Willoughby, 2015; Jobe & Williams White, 2007; Strahan, 2003). Whereas social anxiety is more related to fear of negative evaluation by peers and rumination of negative interpretations of social interactions (Clark & Wells, 1995), poor social communication skills as manifest by high autistic traits might be associated with reduced social understanding and theory of mind ability (Baron-Cohen et al., 1985). Furthermore, autistic traits encapsulates a broader range of behaviours such as preference for routines, sensitivity to numbers and patterns, and the ability to switch flexibly between tasks (Hoekstra et al., 2011). Therefore, the current

study helped to understand how social and other skills affect university transition outcomes for both TD students and students on the autism spectrum, by measuring both social anxiety and autistic traits.

The current study has a set of limitations to consider. First, we observed a very high rate of social anxiety across a majority of TD students at the start of university, before they have made adjustments to fully adapt to university life (Brook & Willoughby, 2015; Purdon et al., 2001; Strahan, 2003). It may be that some of the students who surpassed the clinical cut-off for social anxiety in the current study may have had undiagnosed social anxiety disorder. This is especially considering that patients with social anxiety disorder often have fewer primary care visits to seek help or diagnosis due to greater social avoidance (Gross et al., 2005; Roy-Byrne & Stein, 2005). Future studies could include a clinically diagnosed socially anxious group as a control group, to examine generalisability of current results in TD students to a clinical population.

Second, the current study used exclusively subjective self-report measures to gain insight into first-hand experiences of life at university. However, the study lacks an objective measure of transition outcome (e.g., academic records, participation in societies/clubs/other campus events, retention rate etc). Objective outcome measures can help assess whether perceived distress at university is due to objectively poor performance or related to trait anxiety that may have caused the participant to perceive the transition experience in a more negative manner. Future studies assessing predictors of university transition outcomes can use both subjective and objective measures.

Third, the sample of students on the autism spectrum was relatively small ($n=21$), and meant that different statistical approaches were used to analyse data from the two groups, which did not enable direct between-group comparisons to be made. Given the longitudinal nature of the study and the need for students to complete baseline measures within first two weeks of starting university, recruitment was particularly challenging in finding first-year students on the autism spectrum who were willing to take part in research during a particularly stressful time. Recruitment challenge further highlights the need for collaboration between institutions and researchers, to ensure incoming students on the autism spectrum who are willing to take part in research have the necessary information to help them contribute.

Fourth, the current study only included a TD student group who had no current mental, physical health, or specific learning disabilities to represent students who did not experience additional vulnerabilities at the start of university. Although we still observed elevated levels of social anxiety amongst the TD students in the current study who did not have a clinical diagnosis, such selection to exclude students not on the autism spectrum who had concurrent clinical diagnoses may not be truly representative of the population of students not on the autism spectrum at university. Future studies can benefit from replicating the current study with the addition of a student group who face non-autism related vulnerabilities (such as those who have a clinical diagnosis for mental or chronic physical health condition, and/or specific learning disabilities) as an additional comparison group, to examine both the reproducibility of current results, but also highlight whether results noted in the current study are unique to students on the autism spectrum, or shared amongst more vulnerable students transitioning to university in general.

Finally, given that there is a large diversity in students' SNS over time, it will be helpful to assess to what extent the visual presentation of social networks based on their reports are in line with students' more abstract considerations of what their social world is like, and how satisfied they are with their social network. The relationship between SNS, PSS, and mental health may not be linear. Understanding students' perceptions of their SNS can help stakeholders better interpret what resilience and vulnerabilities in social networks might look like for TD and students on the autism spectrum, and to help plan more tailored support to address those needs during transition to university.

Conclusions and Practical Implications

In conclusion, our study showed the SNaPSS helped to successfully capture individual differences in SNS and PSS over time. Collecting students' social network maps upon entering university can also help stakeholders easily visualise the current support structure that the student perceives to be most important to them, and identify which social capital resources might no longer be available to students when transitioning to university, to better focus on meeting students' support needs in those areas. Stakeholders can also provide better training and communication between family members, peers, and university staff to further triangulate support for university students. The current

study also found both autistic traits and social anxiety can impact transition outcomes for students on the autism spectrum and TD students during first year of university. Therefore, stakeholders may consider delivering workshops to help students mitigate social distress and introduce more positive coping mechanisms in managing social anxiety in the first semester of university, which might have more widespread long-term benefits in improving students' transition outcomes across academic, social, personal-emotional domains, and increase students' satisfaction with their degree and institution.

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Appendix 1

Measures

Autism Quotient-Short (AQ-S; Hoekstra et al., 2011). AQ-S is a 28-item abridged version (Hoekstra et al., 2011) of the full 50-item Autism Quotient scale, and has been validated in 3 independent samples across the Netherlands and UK. The abridged scale includes items that assess a range of social behaviours that are related to autistic traits, such as “I prefer to do things the same way over and over again”; “I frequently get strongly absorbed in one thing”. The abridged scale has good internal consistency (Cronbach’s alpha is between .77 and .86). The abridged AQ-S also had high predictive validity, where scores >65 had a sensitivity of .97 and specificity of .82. Each item is rated on a four-point Likert scale, ranging from Definitely Agree (1) to Definitely Disagree (4). All participants completed the AQ-S at T1, as part of participant characterisation on level of autistic traits.

Social Anxiety Scale – Adolescents (SAS-A; La Greca, Ingles, Lai, & Marzo, 2015). SAS-A is a 22-item self-report measure of social anxiety in adolescents (La Greca et al., 2015), where each item is rated on a five-point Likert scale, ranging from 1 (Not at all) to 5 (All the time). Of the 22 items, three subscales are derived from 18 items, with the remaining 4 items being filler items. The three subscales consist of: 1) fear of negative evaluation (FNE; 8 items); 2) social avoidance and distress in new situations (SAD-NEW; 6 items); 3) generalised social avoidance and distress (SAD-G; 4 items). Validation of the SAS-A is described by La Greca et al. (2015). All participants completed the SAS-A at T1, as part of participant characterisation, as well as at T2 and T3 to monitor changes over time.

Social Network and Perceived Social Support (SNaPSS; ; Lei, Ashwin, Brosnan, & Russell, 2019). The SNaPSS is in three sections. Part one measures participants’ perceived distress frequency across 15 academic, daily living, and socialization areas on a 5-point scale ranging from 0 (never) to 4 (6 or more times a week). Part two measures SNS, and participants are asked to name up to 20 individuals (network size) with whom they have been in contact with over the past three months, and whose relationships were considered to be particularly important and worthwhile to the participant. Participants report the type of relationship (e.g., family, friends, other individuals such as teacher/lecturer, support/social worker etc; % network composition), degree of similarity, the

frequency, and modes of contact between self and each network member named. Network density is approximated by asking individuals to state whether to the best of their knowledge, each network member named know and are in contact with other network members named. Density is scored between 0 (low) to 1 (high), with high density reflecting that all network members named know and are in contact with each other. Part three measures PSS, where participants rate whether each network member named has provided them with support across any of the 15 academic, daily living, and socialization areas, and the perceived quantity and quality of support provided. Total perceived frequency and quality of support are scored between 0 and 15, with 0-5 within each of academic, daily living, and socialization domain.

Student Adaptation to College Questionnaire (SACQ; Baker & Siryk, 1984). The SACQ is a 67-item self-report questionnaire evaluating students' transition outcome when adapting to university life (Baker & Siryk, 1984). There are four subscales: academic adjustment (24 items), social adjustment (20 items), personal emotional adjustment (15 items), goal commitment and institutional attachment (15 items). Each item is rated on a nine-point scale ranging from "applies very closely to me" to "doesn't apply to me at all". The SACQ has been shown to have high internal consistency (Cronbach's alpha ranges from .77 to .95), and has been shown to be negatively associated with measures of loneliness and anxiety, as well as positively associated with self-appraisal and positive attitudes towards family and the institution (Baker & Siryk, 1999). Participants completed the SACQ at T2 and T3, to monitor changes in perceived adaptation to university life during the first year of university.

Appendix 2

Data Analyses

Typically Developing (TD) Students. First, we conducted independent sample t-tests to examine whether there are any cohort effects when comparing TD students who enrolled in 2017 versus 2018 across any baseline demographic factors (age, A-level average score, level of autistic traits and social anxiety, perceived distress frequency), as well as baseline social network structure (size, density, network composition), and overall quantity and quality of perceived social support. Next, we used chi-squared test to assess whether there are any associations between year of participation and retention status. Finally, we assessed whether across the entire sample, if there are any significant differences across the same variables as mentioned above when comparing students who dropped out of the study versus those who remained in the study.

All remaining analyses are completed using the final sample of TD students ($n = 182$) who completed all three questionnaire sessions online. We conducted repeated measures ANOVA to investigate changes in perceived distress frequency over time, as well as changes in SNS and PSS over time. We then conducted repeated measures ANCOVA with both social anxiety and autistic traits as covariates, to examine any interaction effects between the covariates and effect of time, type of support, or membership status. Where sphericity is violated ($p < .05$), we used Greenhouse-Geisser estimates in our reported results. We also used Bonferroni to control for multiple comparisons.

To assess whether baseline levels of autistic traits or mean level of social anxiety had any significant effect on transition outcomes (SACQ), we conducted the following analyses. First, we assessed whether there are significant differences in transition outcomes by assessing the total and subscale scores of the SACQ between times 2 and 3 by using paired sample t-test (using Bonferroni to control for multiple comparison), and also conducted Pearson's correlation to assess the degree of similarity in ratings across the two timepoints. Next, we took an average score of the SACQ total and subscale scores measured at times 2 and 3 as the final transition outcome score. We computed step-wise linear regressions to assess how baseline levels of anxiety and autistic traits, as well as changes in social network structure and perceived social support may have had a significant impact on final transition outcomes. We entered the SACQ total and subscale scores as dependent variables in

separate regression models. In step 1, we entered both the mean total social anxiety across T1 to T3 (SAS-A) and autistic trait (AQ-S) scores measured at T1 as predictors. In step 2, we entered time 1 social network size, density, and total perceived quantity and quality of social support as control variables. In step 3, we entered the same measures as step 2 that were reported at time 3 as predictors, to assess whether changes in social network structure and perceived social support over the course of transitioning to university had any impact on transition outcomes.

Students on the autism spectrum. Unlike the TD analyses, given the small sample size of students on the autism spectrum, we conducted mostly exploratory analyses using non-parametric tests. First, we conducted Mann Whitney's U test to compare students who dropped out ($n = 7$) and students who completed ($n = 21$) the study across demographic variables, such as autism symptom severity and levels of social anxiety at baseline, as well as age, pre-university entry academic performance (average A-Level score). For students who remained in the study, we also conducted a Friedman's test to assess changes in their level of social anxiety over time, and used Wilcoxon signed-rank test as a post hoc analysis.

All remaining analyses were conducted using the final sample ($n = 21$) who completed all three questionnaire sessions online and was conducted in four steps. In step one, we conducted Friedman's test to assess whether there were any significant differences in the mean level of perceived distress frequency across time between academic, daily living, and socialization areas. We then conducted Friedman's test to assess whether there were any differences in the total level of perceived distress frequency (the sum total of academic, daily living, and socialization perceived distress frequency at each time point) across time. We conducted Wilcoxon signed-rank test as a post hoc analysis to follow up any significant differences identified from Friedman's tests. To examine whether autism symptom severity and level of social anxiety were associated with the mean level of perceived distress frequency for academic, daily living, and socialization areas over time, we conducted Kendall's tau-b correlations.

In step two, for SNS, we used Friedman's tests to assess changes in social network size and density over time. For network composition, we used Friedman's test to examine differences in the mean percentage composition of family, friends, and other network members across all three

timepoints. In step three, for PSS, we used Friedman's tests to first examine whether there were any significant differences between the mean quantity and quality of support for academic, daily living, and socialization support provided by all network members across time. Next, we used Friedman's tests to examine whether there were any significant differences between the mean quantity and quality of support across all three domains (academic, daily living, and socialization) across different types of network members (family, friends, and other). For both changes in SNS and PSS, we conducted Wilcoxon signed-rank test as a post hoc analysis to follow up any significant differences identified from Friedman's tests. We also conducted Kendall's tau-b correlations to examine whether autism symptom severity and level of social anxiety were associated with changes in SNS and PSS.

Finally, in step four, we explored the relationship between any changes identified in steps one to three across perceived distress frequency, changes in SNS and PSS, and different university transition outcomes measured at timepoints two and three. We first conducted a Wilcoxon signed-rank test to examine whether there were any significant changes in any transition outcomes between timepoints two and three, and a mean transition outcome score was computed for any domains which did not show any significant changes over time. Next, we conducted Kendall's tau-b correlations to assess whether autism symptom severity and level of social anxiety had any significant associations with the mean score for transition outcomes across academic, socialization, personal-emotional, or attachment to institution domains. Next, we conducted separate Kendall's tau-b correlations to examine whether any significant changes identified in steps one to three across perceived distress frequency, changes in SNS and PSS had significant associations with any of the transition outcome domains.

Appendix 3

Results – Participant Demographics

The current study had differences in sex ratio between TD students (19.8% male) and students on the autism spectrum (52.4% male). For the TD group, the strong bias towards females was due to the majority of students (130 out of 182) studying psychology degree (a predominantly female heavy subject). For the ASD group, the 1:1 male to female ratio observed in the current study is not dissimilar to other research projects completed in adults and young people on the autism spectrum (e.g., Jackson, Hart, Brown, et al. (2018): N = 56, 46.4% male; Gurbuz et al. (2019): ASD n = 26, 53.8% male; Anderson et al. (2018): N = 48, 50% male), suggesting that adult females on the autism spectrum may be more likely and willing to take part in research than male counterparts.

Typically Developing (TD) Students. To assess cohort effects by comparing TD students who enrolled in 2017 (n = 106) and 2018 (n = 153), independent sample t-tests showed that no significant differences were observed for any student demographic variables including age ($t(257) = -1.29, p = .257$), pre-university entry level (A-Level average score) ($t(256) = -.81, p = .418$), level of autistic traits ($t(257) = -1.41, p = .159$), level of social anxiety ($t(257) = .32, p = .747$), or perceived distress frequency across academic ($t(257) = -.03, p = .974$), daily living ($t(257) = .15, p = .885$), nor socialization ($t(257) = -.38, p = .708$) areas. No differences in social network structure were observed for network size ($t(257) = -1.69, p = .092$), density ($t(257) = -.58, p = .564$), percentage of family ($t(257) = .30, p = .767$), friends ($t(257) = -.61, p = .543$), or other members ($t(257) = -1.15, p = .252$). No differences were observed in baseline perceived overall quantity of support ($t(257) = .17, p = .868$), or quality of support ($t(257) = -.11, p = .915$).

Comparing study retention rates across 2017 (69.8%) and 2018 (70.6%), chi-squared showed that there were no associations between year of participation and study retention ($\chi^2(1) = .018, p = .893$). Overall, comparing students who completed the research study (n = 182) versus those who dropped out of the study (n = 77), independent sample t-tests showed that no significant differences were observed for any student demographic variables including age ($t(257) = .24, p = .808$), pre-university entry level (A-Level average score) ($t(256) = -.65, p = .519$), level of autistic traits ($t(257) = -1.29, p = .199$), level of social anxiety ($t(257) = -.26, p = .793$), or perceived distress frequency

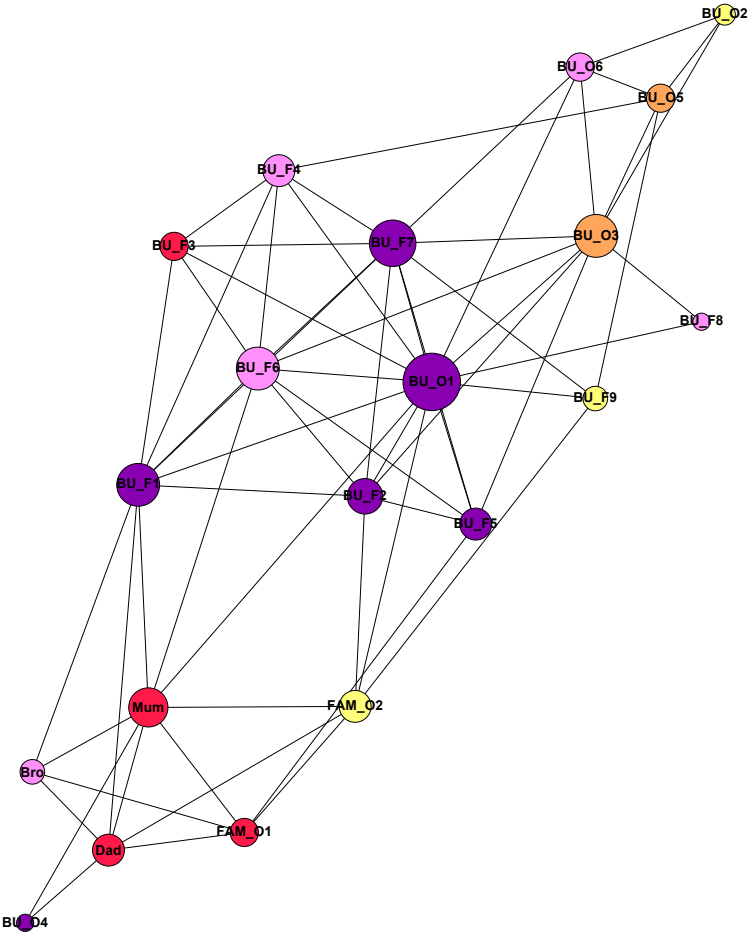
across academic ($t(257) = 1.42, p = .158$), daily living ($t(257) = .03, p = .974$), nor socialization ($t(257) = .85, p = .394$) areas. No differences in social network structure were observed for network size ($t(257) = .85, p = .396$), density ($t(257) = -.10, p = .917$), percentage of family ($t(257) = -1.71, p = .089$), friends ($t(257) = 1.56, p = .12$), or other members ($t(257) = .47, p = .637$). No differences were observed in baseline perceived overall quantity of support ($t(257) = .93, p = .078$), or quality of support ($t(257) = -1.30, p = .195$).

It should be noted that the mean total score for social anxiety (SAS-A total) showed overall elevated levels of social anxiety across the sample (56.08), with a total of 115 out of 182 students scoring above the recommended clinical cut-off score of 50 at baseline for social anxiety. Given that the baseline measure was taken within the first two to three weeks of starting semester one at university amongst first year students, there may be ceiling effects as the first few weeks of university transition might be a particularly stressful and anxiety provoking time for students, relative to the rest of the academic year. We chose to conduct all subsequent analyses across the whole sample ($n = 182$), rather than splitting our sample into those with high versus low social anxiety at baseline. This is because of two main reasons. First, given that none of the participants had a current diagnosis of anxiety disorders at the point of enrolment, the recommended cut-off score of 50 cannot be solely taken as a clinical cut-off score, but rather to show that the elevated levels of social anxiety observed at baseline may reflect state anxiety, highlighting that experiences of elevated levels of social anxiety during the first three weeks of starting university can be pervasive across students. Second, using the whole sample enabled us to examine how baseline individual differences across a wide range of autistic traits and social anxiety might influence changes in SNS/PSS and transition outcomes, which is in line with our main research interest defined pre-hoc, rather than focusing on directly comparing those with high versus low levels of social anxiety at baseline (post-hoc).

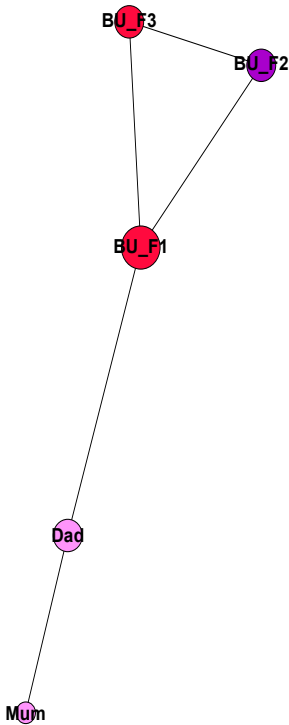
Students on the autism spectrum. Using Mann-Whitney's U test, we did not observe any differences between students on the autism spectrum who completed the study ($n = 21$), and students who dropped out ($n = 7$) in age ($U = 70, p = .819$), pre-university academic performance (average A-Level score; $U = 64, p = .64$), autism symptom severity ($U = 67, p = .756$), and social anxiety ($U = 60, p = .499$).

Appendix 4a

a. Time 1: Size = 20; Density = 0.33.



Time 2: Size = 6; Density = 0.33.

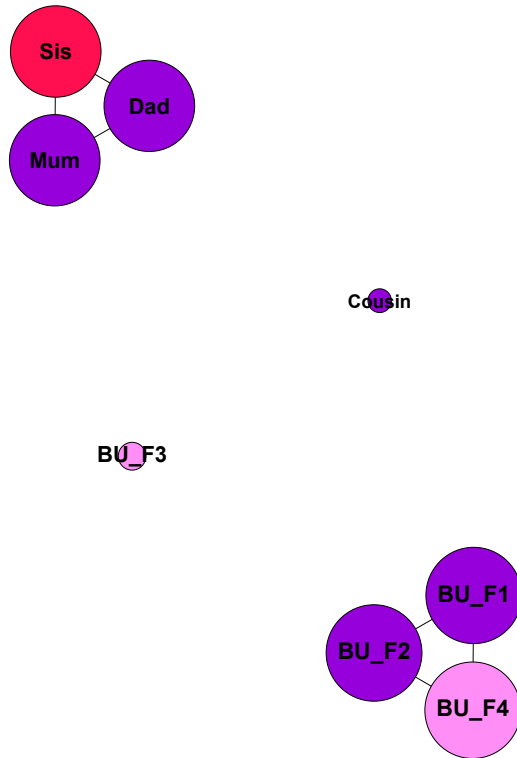


BU_O1

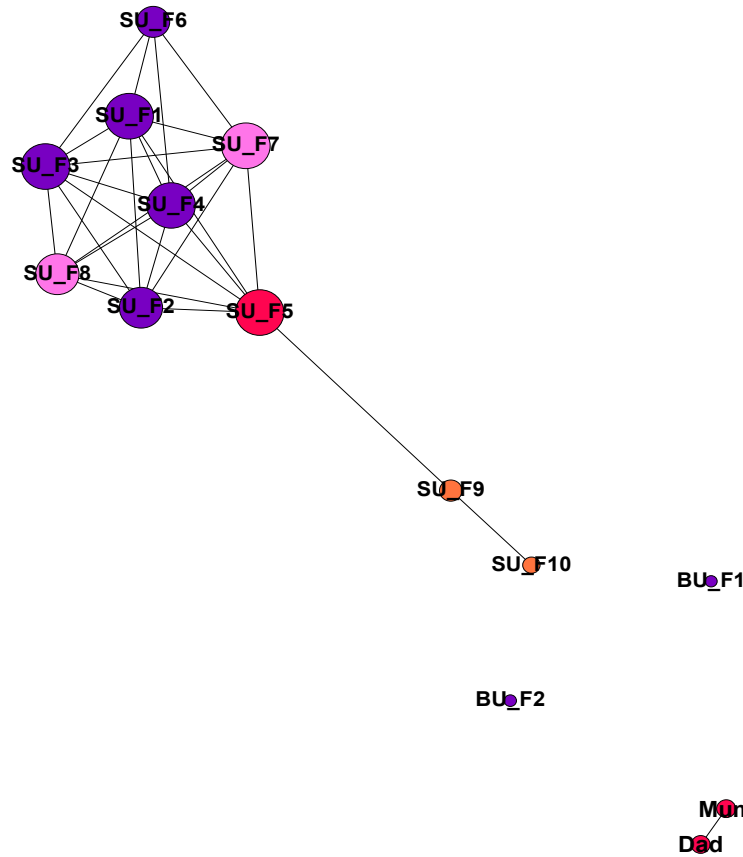
Time 3: Size = 6; Density = 0.2.



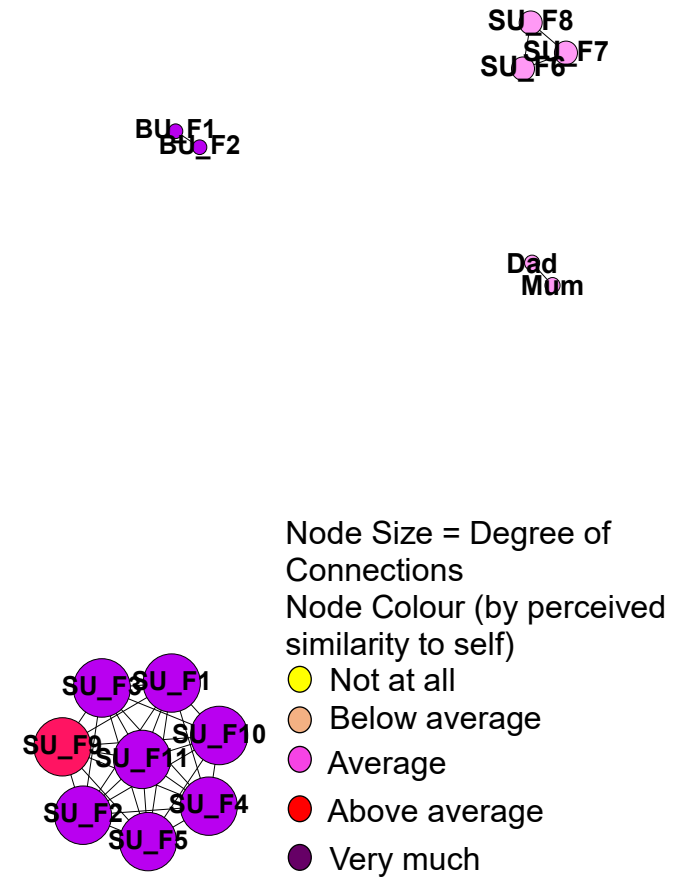
b. Time 1: Size = 8; Density = 0.21.



Time 2: Size = 14; Density = 0.31.



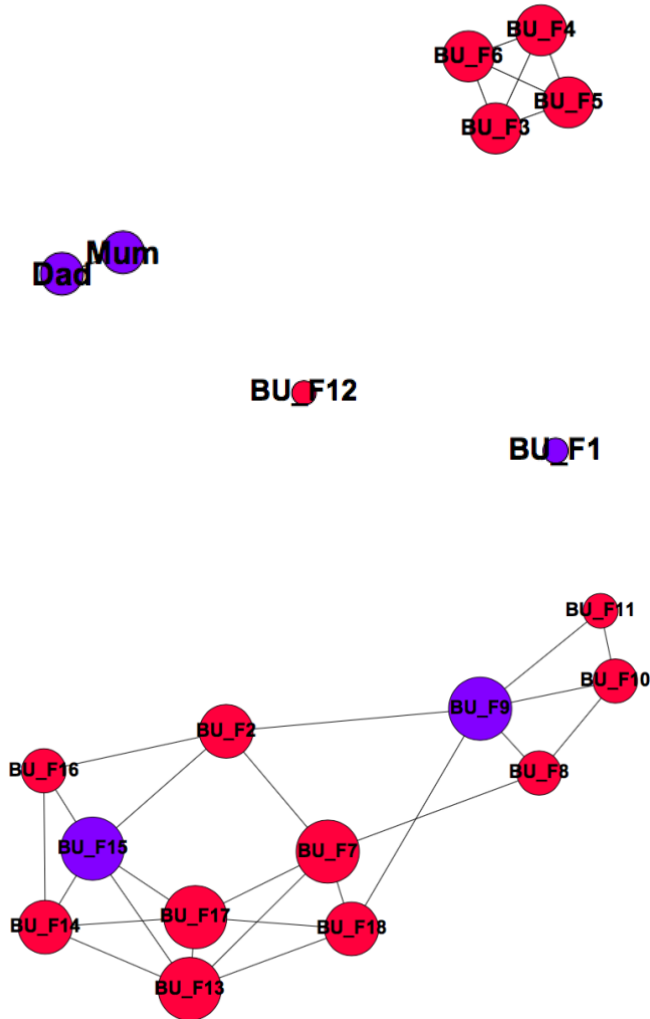
Time 3: Size = 15; Density = 0.51



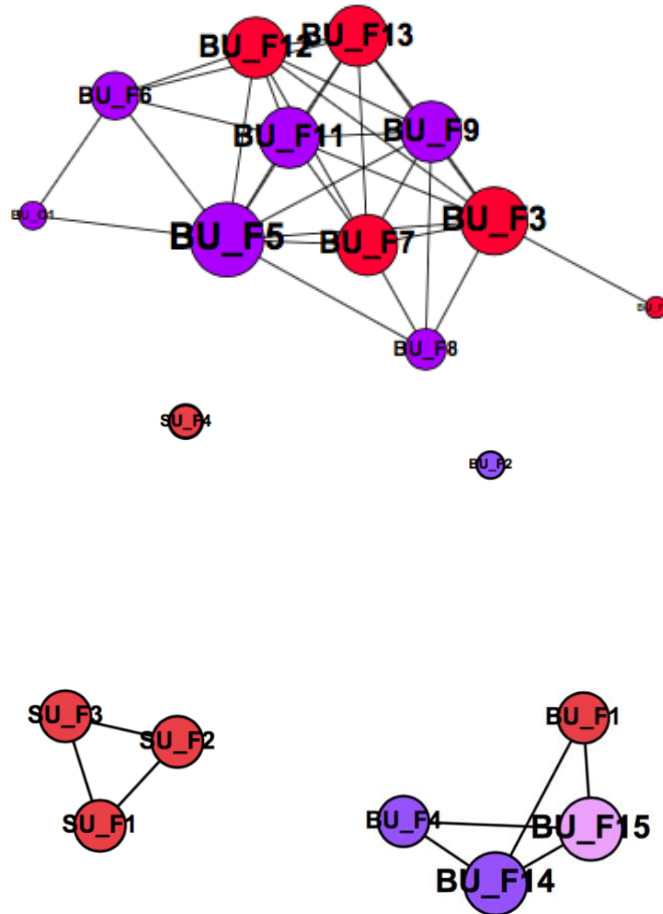
Appendix 4a. Contrasting examples of typically developing students' social network structural changes over time, highlighting individual differences. Bro = Brother; Sis = Sister; BU = Before university; SU = Since university; F = Friend; O = Other. A) Participant showed decreases in both network size and density over time. B) Participant showed increases in both network size and density over time.

Appendix 4b

a. Time 1: Size = 20; Density = 0.16.



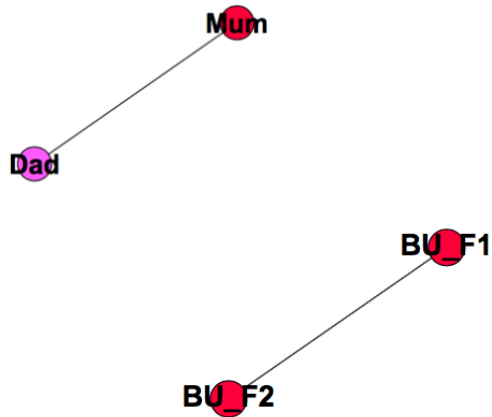
Time 2: Size = 20; Density = 0.21.



Time 3: Size = 13; Density = 0.15.



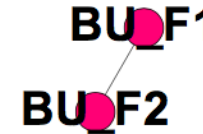
b. Time 1: Size = 4; Density = 0.33.



Time 2: Size = 5; Density = 0.2.



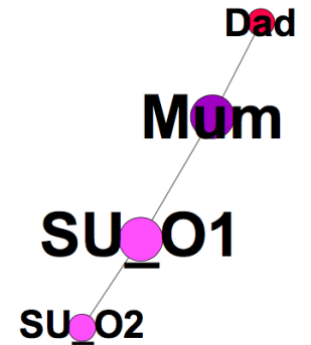
SU_O1



Time 3: Size = 6; Density = 0.2

SU_O4

SU_O3



Node Size = Degree of Connections
 Node Colour (by perceived similarity to self)
 ● Not at all
 ● Below average
 ● Average
 ● Above average
 ● Very much

Appendix 4b. Contrasting examples of autistic students' social network structural changes over time, highlighting individual differences. Bro = Brother; Sis = Sister; BU = Before university; SU = Since university; F = Friend; O = Other. A) Participant showed decreases in both network size and density over time. B) Participant showed increases in both network size and density over time.

Post Chapter Five Commentary

Chapter Two identified the paucity of literature that have adopted a longitudinal approach to investigate how simultaneous changes in social network structure and perceived social support can affect autistic and typically developing students' university transition. By using the Social Network and Perceived Social Support (SNaPSS) measure developed in Chapter Three, Chapter Five builds upon the cross-sectional between-group findings in Chapter Four by examining longitudinal within-group changes in the structural and functional components of social networks within both autistic and typically developing students.

Compared to cross-sectional findings from Chapter Four, Chapter Five further identified having higher levels of social anxiety over time to be a key factor that negatively impacted students' perceived distress across academic, daily living, and socialisation aspects of university life, as well as being negatively associated with a wide range of long-term university transition outcomes in both student groups. In contrast, higher levels of autistic traits are only associated with having poorer socialisation transition outcomes in typically developing students, and not autistic students. It may be that typically developing students who experience greater levels of social communication difficulties as shown by higher levels of autistic traits and social anxiety might be more vulnerable to poor social experiences at university relative to their peers, and lack access to any potential support services that autistic students might have due to absence of diagnosis. Chapter Five highlights that regardless of having autism diagnosis, higher levels of social anxiety over the first year of university can have more widespread negative consequences for all students. Stakeholders may consider delivering psychoeducation or workshops at the start of university for all students transitioning to university to equip student with better knowledge, awareness, and anxiety management and coping strategies to try and mitigate the long-term impact of social anxiety on transition outcomes.

When examining changes in the structural and functional components of social networks, both student groups showed more similarities than differences with friends making up the largest proportion of networks over time, and family and friends to provide better quantity and quality of support. When interpreted in the context of Chapter One which examined current literature that outlined difficulties associated with autistic students' transition to university, one challenge

highlighted was autistic students' reports of poor quality of social experiences at university and loneliness. Given that the current study found rather similar structural and functional patterns of social networks across both student groups, it may be that autistic students find it more difficult to cope with the unplanned social changes during transition to university, and therefore perceive such changes more negatively.


To help autistic students better understand and anticipate potential social changes they might encounter during transition to university, social network maps can offer a clear visual tool to help students plan for how they would like to maintain existing and establish new relationships at university through different social channels. Chapter Six discusses the development, pilot and evaluation of a social network workshop where autistic students provide their feedback on the use of social network maps to plan for social changes associated with transitioning to university through the workshop.

Chapter Six

Autistic students' experience of using social network maps in preparation for university transition

Chapter Rationale

Using Social Network and Perceived Social Support (SNaPSS) measure in both cross-sectional and longitudinal studies, Chapters Four and Five respectively highlighted similarities and differences in social network structure between autistic and typically developing first-year university students. Although similar patterns of relative network composition (i.e., the relative proportion of family, friends, and other staff members) changes over time during first year of university were identified in both student groups, previous literature highlighted in Chapter One suggests that many autistic students perceive university to be a more lonely, and often socially isolating place. Relative to their typically developing peers, autistic students might find adapting to changes in their social sphere particularly difficult, and therefore stakeholders should consider the possibility of formulating more individualised social transition planning helping autistic students anticipate, evaluate, and plan for potential social changes they might encounter. Chapter Six aims to gain further insight into how students perceive their pre-university transition network when visualising it through the network maps generated from SNaPSS. Furthermore, Chapter Six assesses the development and pilot of a social network workshop that is aimed to help autistic students make efficient use of their pre-university transition map to plan for potential changes they will encounter during university transition. Qualitative and quantitative feedback are gathered to evaluate accuracy of social network maps, as well as the students' opinions on using social network analysis to help them prepare for upcoming social transitions associated with university.

This declaration concerns the article entitled:			
Autistic students' experience of using social network maps in preparation for university transition.			
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Statement from Candidate	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature.		
Signed		Date	20/05/2020

Abstract

Background: For many students, the social changes associated with transitioning to university can be anxiety-provoking. For autistic students who may find adapting to social changes particularly challenging, developing a strength-based approach that enables students to systematically visualise existing social relationships and plan for upcoming changes may actively engage them in developing ways to cope with anticipated social transitions before starting university. **Method:** This mixed-method study examined the development, pilot, and evaluation of a workshop designed to help autistic students ($n = 29$; 16-32 years) to gain a better understanding of the relationship between social network structure and support accessibility. Individual social network maps were created for each student based on their response on the Social Network and Perceived Social Network tool. During the workshop, students used either their own or an example social network map to think about upcoming social changes in preparation for transition to university and provided feedback regarding their experience of using social network maps and taking part in the workshop. **Results:** Most students enjoyed learning about social network structure and found the concrete visualisation of their social relationships using a network map to be useful when planning for social network changes during university transition. Ways to improve social network map and workshop clarity are discussed. **Conclusions:** Social network maps may provide a useful tool for autistic students to visualise and gain awareness about how they can scaffold their own social network at university. Wider implications for university stakeholders, limitations and future directions are also discussed.

Keywords: Autism Spectrum Disorder, Social Network, university, college, transition support

Autistic students' experience of using social network maps in preparation for university transition

For students transitioning to university, maintaining and establishing new sources of social network relationships can help students gain access to different sources of support (English & Carstensen, 2014), including informational, practical, and socio-emotional support (Friedlander et al., 2007; Gall et al., 2000; Hays & Oxley, 1986; Swenson et al., 2008; Tao et al., 2000). Adapting to a new social network structure can be particularly challenging for students who experience social difficulties, such as autistic-students⁶ (Jackson et al., 2018; Wehman et al., 2014). Autism Spectrum Disorder (ASD) is characterised by having both social communication difficulties and restricted and repetitive patterns of behaviours and interests (American Psychiatric Association, 2013), and many experience co-occurring mental (Hollocks et al., 2019) and physical health conditions (Bolton, 2009).

Previous research investigating autistic-students' transition to university have identified social transitions to be particularly challenging (Elias & White, 2018; Geller & Greenberg, 2009; Jackson et al., 2018; MacLeod & Green, 2009; Wehman et al., 2014; Zeedyk et al., 2016). Despite expressing a desire for friendship at university, many autistic-students may be ill equipped to navigate the diverse social scene at university, and often struggle to keep up with the social demands required across academic studies (e.g., group work), daily living (e.g., accommodation), and socialisation (e.g., clubs and societies) aspects of university life (Adreon & Durocher, 2007; Hillier et al., 2018; Zeedyk et al., 2016). Students report experiencing difficulties with initiating social interactions and expressing their ideas to others (Gurbuz et al., 2019), and even for those who are satisfied with their close relationships, broader difficulties to integrate into the wider university community still result in feelings of poor quality social interactions, increased levels of stress, loneliness, anxiety and depression (Jackson et al., 2018). Some autistic-students find maintaining a large number of social contacts at university exhausting (Van Hees et al., 2015), and parents often continue to be an important source of social support at university (Elias & White, 2018).

⁶ In this study, we have chosen to use identity first language when referring to autistic individuals, as this was found to be preferred by members of the autism and autistic community by Kenny et al. (2016).

Developing effective educational interventions prior to transition may be helpful for encouraging students to identify and plan for the upcoming social network changes. One way to visualise social changes is through social network analysis, which uses quantitative methodology to map out the structural and functional components of one's relationships with people that one is in contact with (Kreider et al., 2016; Scott, 2017). Social network maps can take the form of either an ecomap (where an individual names and describes the relationship they have with people that are close and important to them across multiple contexts), or a sociomap (where all individuals who are usually found in a common space, e.g., a classroom, answer questions about relationships with each other).

Previous studies investigating social networks in autistic children focused on sociomap which depicts the relative relationship strengths defined within a particular social circle/space, and found that compared to their typically developing (TD) peers, autistic children tend to experience greater peer rejection, fewer reciprocal friendships, and have poorer friendship quality that can lead to increased feelings of isolation and loneliness (Anderson et al., 2016; Bauminger et al., 2003; Bauminger & Kasari, 2000; Chamberlain et al., 2007; Kasari et al., 2011; Locke et al., 2010, 2013). Autistic children often appeared on the periphery of their classroom networks, and were less connected to other peers in the classroom (Chamberlain et al., 2007; Kasari et al., 2011; Locke et al., 2013; Rotheram-Fuller et al., 2010). Despite characterising quantitative social network differences, none of the above studies gathered qualitative feedback from the students to expand upon their interpretations of the social world that is constructed around them, and to what extent the network map reflects their own understanding of the social relationships they have with others.

During transition to university, as individuals begin to socialise with different people across multiple contexts (such as in accommodation, course related activities, and extracurriculars), an ecomap provides succinct way to summarise the diverse range of relationships that an individual maintains over time. An ecomap enables an individual to clearly see network structure including the size (i.e., number of people one is in contact with), density (i.e., to what extent the network members named know of and are in contact with each other), as well as identify clusters (i.e., individuals within a cluster are in more frequent contact with each other than non-cluster members), and composition

(i.e., family, friends, and other network members including teachers, support workers, medical staff). Network structural differences have been found to relate to one's access to functional support (Scott, 2017), such that during periods of transition such as moving to university, a network low in density with multiple clusters might buffer against some of the potential relationship losses as students move away from their existing social relationships.

Educating students transitioning to university so that they are aware of the structure of their existing pre-transition relationships with various family, friends, and other network members can help them consider which relationships are particularly supportive to them, and how such relationships might change when they go to university. Helping students understand that network size is not the only dimension to measure "social success", and the value in creating a network structure that provides them with better access to different support may also enlighten students to carefully consider the purpose of maintaining or establishing new relationships during university transition.

A recently developed novel online tool designed to assess Social-Network Structure and Perceived Social Support (SNaPSS; Lei, Ashwin, Brosnan, & Russell, 2019a) has been shown to effectively capture individual differences in social-networks amongst autistic-students visually (Lei et al., 2019b). A visual social-network-structure may be better suited to the cognitive style of autistic-students. Guidance from the National Institute for Clinical Excellence (NICE) recommends that psychological interventions should be adapted to meet the needs of autistic people, and adaptations should include the use of visually based materials (National Institute for Health and Care Excellence, 2012). Exploring students' experience of using their individual social-network map may help stakeholders gauge whether social-networks can be a useful means of educating students to actively plan for prospective social transitions.

Current study

This study developed a workshop to educate students about the different aspects of social-network structure in relation to access to support and provide information and practical exercises to individualise and apply social-network principles. To address the lack of qualitative feedback from autistic-students in previous social-network analysis studies (Chamberlain et al., 2007; Kasari et al., 2011; Locke et al., 2013; Rotheram-Fuller et al., 2010), we used mixed methods to explore students'

experiences of viewing their own social-network-maps and receiving a social-network-workshop specifically addressing potential social changes during university transition.

Method

Participants

A total of 29 participants who participated in the 2019 Autism Summer School held at University of Bath took part in the workshop. Details about the Autism Summer School programme and research protocol are provided in full (Lei et al., 2018). The Autism Summer School aims to provide students who are either seeking to apply to or will be attending university to learn more about university life, through a campus residential programme of workshops, lectures, and activities. Eligibility for enrolling in the summer school was based on: 1) having a prior diagnosis of Autism, Asperger's, Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS), or ASD from a clinical professional; 2) aged 16 years or older; and 3) making an application to or holding a place for a higher education undergraduate programme.

Social Network Workshop

The social-network workshop was developed by the first author with the aim of helping students understand *what* a social-network is, *why* social network is important to consider especially in relation to accessing support, and *how* social-network might change when students transition from school to university. The workshop comprised information presented didactically on overhead slides by the group facilitator, supplemented by practice exercises to apply the principles and facilitate active learning. Students were provided with a hard copy of the information on the slides. A second facilitator assisted with any questions and provided help when needed. Students were introduced to the basic metrics used to measure social-network structure (i.e., size, density, clusters), and the differences between an ecomap, and a sociomap. Students were then introduced to the link between the structural and functional components of social networks, i.e., how networks with high versus low density can provide varying degrees of support across different life transitions. The goal was to help students understand that in addition to social-network size, network density and social clusters can also play an important role in determining flow of support within a network.

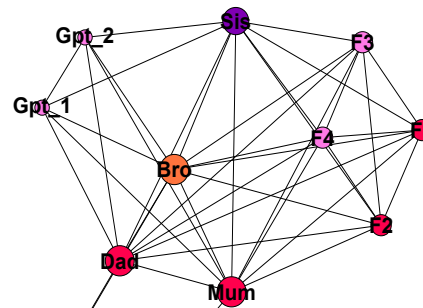
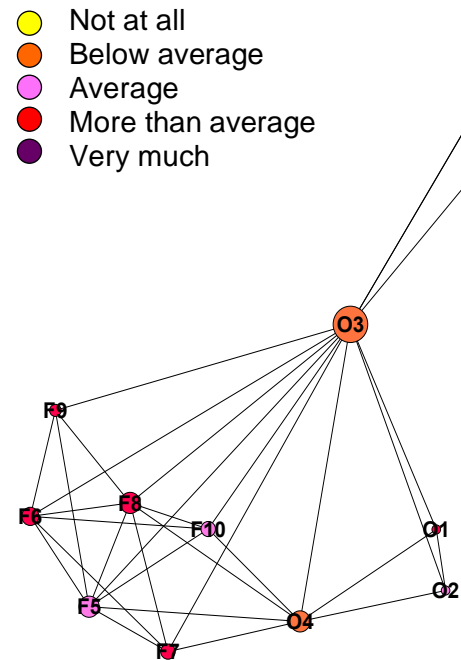
Next, the workshop focused on helping students to consider how their social-networks might change or stay the same when they go to university, and how visualising social-network structure can provide helpful information regarding *who* is providing *which* types of support to students both pre- and post- university transition. Students were provided with an example social-network map of a fictional character (Anne) who is about to go to university and asked to think about who the most important people to Anne pre-university transition are, and how Anne's social relationships might change when she goes to university. Students were then offered an opportunity to repeat this exercise using either: 1) their own social-network map generated based on their responses of the Social-Network-and-Perceived-Social-Support (SNaPSS) questionnaire; or 2) an example network map of a fictional character (Jack). We anticipated that the paucity of some students' own social network maps may be upsetting for them to review, and students may choose not to engage with their own map which may be anxiety provoking. Providing an example fictional map allowed these students to be included in the activity session, and practice some of the principles learnt in the workshop about how to interpret social network structure. Students who chose to work their own social-network map answered additional questions regarding network satisfaction and map accuracy. Examples of students' own social-network maps are shown in Figure 1, to illustrate what participants were provided with during the workshop when examining own social networks.

Finally, all students completed a brief feedback survey evaluating their experience of the social-network-workshop. The total running time for the workshop was up to 1 hour, with teaching taking place in the first 20-30 minutes, and in the remaining time students worked through their workshop exercises and discussed with others their thoughts.

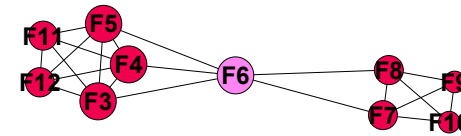
a) Size: 20
 Density: 0.358
 Satisfaction: 3 (Neutral)
 Accuracy: 4 (Somewhat accurate)

Node size:
 Correspond to degree of connections of each individual.

Node colour:
 Correspond to perceived similarity between individual and self.



b) Size: 20
 Density: 0.184
 Satisfaction: 5 (Very satisfied)
 Accuracy: 4 (Somewhat accurate)

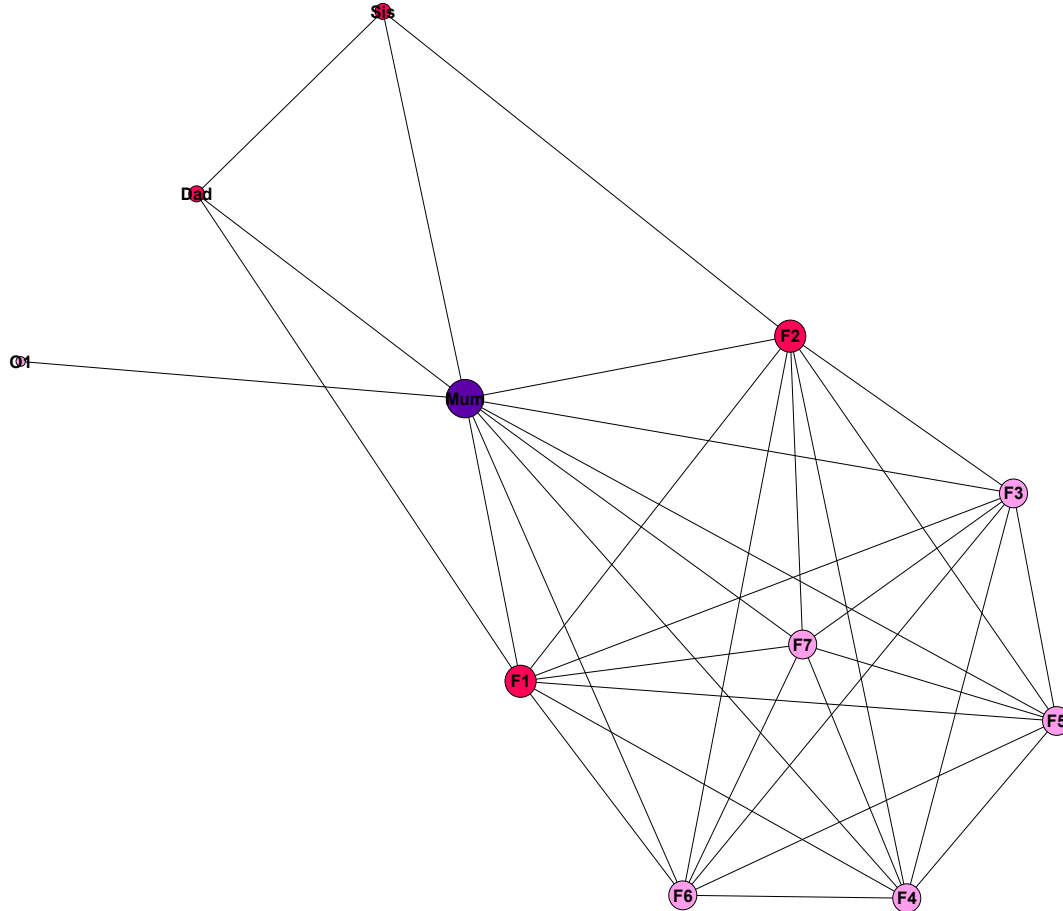


F1
 F2

F1
 F2
 F3
 F4
 F5

Mum
 Dad
 Bro
 FAM_O3
 FAM_O1

c) Size: 11
 Density: 0.618
 Satisfaction: 5 (Very satisfied)
 Accuracy: 4 (Somewhat accurate)



d) Size: 4
 Density: 1
 Satisfaction: 5 (Very satisfied)
 Accuracy: 3 (Somewhat accurate)

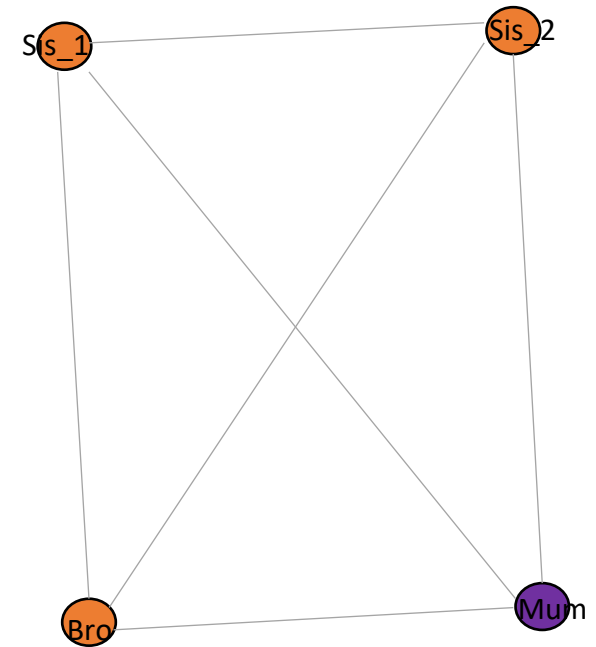


Figure 1. Example social network maps of students: a) large size; med density; b) large size; low density; c) medium size; high density; d) small size; high density. *Note.* Sis = Sister; Bro = Brother; Gpt = Grandparent; FAM = Family; F = Friend; O = Other.

Measures

Autism symptom severity (see Appendix A). We assessed participant's autism symptom severity by using both the Social Communication Questionnaire – Lifetime (SCQ; Rutter, Bailey, & Lord, 2003), a 40-item parent-report measure of autism symptoms which may have been present throughout the individual's lifetime, and the Social Responsiveness Scale – Short (SRS-S; Kanne, Christ, & Reiersen, 2009), an 11-item self-report measure of autism symptom severity developed from the full SRS-S (Constantino & Gruber, 2005; Constantino & Gruber, 2012). Measures were not used to verify autism diagnosis provided by clinical professionals.

Social Network and Perceived Social Support (SNaPSS; Lei, Ashwin, Brosnan, & Russell, 2019). Details of the SNaPSS have been described elsewhere (Lei et al., 2019a; see Appendix A for summary). Only the social network section of the SNaPSS was used in the current study, to provide a social network map of up to 20 network members whom the participant considered close to them.

Feedback of viewing social networks (see Appendix A). Participants rated their satisfaction with their current social network, network map accuracy, and ease of using a network map using a 5-point Likert scale. Participants also provided qualitative feedback on how they hoped their social network to change during university transition, and experience of viewing a social network map in preparation for transition to university.

Workshop evaluation feedback. All participants rated the workshop on a 5-point Likert scale in terms of enjoyability (1 = very not enjoyable; 5 = very enjoyable), and helpfulness (1 = very unhelpful; 5 = very helpful). Participants also provided qualitative feedback on which aspects of the workshop they found particularly enjoyable/not enjoyable, and helpful/not helpful using open text boxes.

Ethical Considerations

All procedures performed in the current study were in line with the Declaration-of-Helsinki as revised in 2000 and was approved by the University's Psychology-Ethics-Committee. All participants provided written informed consent prior to participating in the research study.

Study Procedure

All 29 participants who took part in the Autism Summer School and their parents were sent an online link via Qualtrics to complete a set of pre-arrival questionnaires (parents completed student demographic information and the SCQ; students completed SRS-S and the SNaPSS amongst other measures). All participants and parents were sent study information online about the purpose of collecting the questionnaires as part of research during the summer school and provided written informed consent prior to answering any questions online. A social network map was then generated using Gephi2 (Bastian et al., 2009) for each student based on their responses on the SNaPSS.

The social network workshop was delivered in small groups (n=3) to the students only, without any parental involvement. Each workshop consisted of 9-11 participants, which offered the opportunity for greater student interaction and discussion for each topic. The first author provided training for five other group facilitators/helpers (three licensed clinical psychologists, one clinical psychologist in training, and one postdoctoral autism research psychologist) about the session content and delivery format, as well as introducing the different workshop exercises and their purpose. All participants received workshop handouts and indicated whether they preferred to complete the exercise regarding their own social network map or the example (Jack). Participants were able to complete their responses either by hand, or online via Qualtrics.

Analysis Plan

To evaluate participants' experience of viewing and using their social networks, and experience of the workshop, we assessed the mean, standard deviation, median and mode values of participants' quantitative ratings of network satisfaction, network accuracy, and ease of use of their network maps, as well as whether they found the workshop enjoyable and helpful. We also conducted the non-parametric one-sample Wilcoxon Signed Rank test to assess whether participants' median ratings differed significantly from a neutral rating of 3. A non-parametric test was used due to the small sample size in the current study. All statistical analyses were conducted using SPSS v.25 (*IBM SPSS Statistics*, 2016).

For qualitative feedback, two independent raters (JL and LJ) conducted content analysis of all participants' responses to assess the positive and negative experiences that participants reported in terms of viewing and using their social-network maps, and the workshop itself. Given that students'

responses showed content overlap across some questions, the questions and answers were collated into three categories to be analysed separately: 1) understanding changes in social networks (i.e., identifying aspects of social networks that might change or stay the same during transition to university); 2) social network map accuracy; 3) using social network map and workshop experience (i.e., aspects of the network map and workshop that students found to be enjoyable and helpful) (Tables 4 & 5). The two raters discussed any discrepancies in coding and sought supervision from a third independent rater when no agreement was reached for specific codes.

Results

Participants' diagnostic information, gender, ethnicity, and co-occurring conditions are shown in Table 1. Participants' social network size, density, and composition are shown in Table 2, and are comparable to a previous study with autistic participants aged 17-19 years (Lei et al., 2019a; see Appendix B).

Students' perception of using social network maps

Of the 29 participants, 27 chose to use their own social network map for the practical exercise, and two students expressed that they did not want to see or use their own network map and preferred to work from the example. Most participants rated family (especially parents) as particularly important to them in their current social network (Table 3). Quantitative feedback about participants' satisfaction with their current social network, and the perceived accuracy and ease of use of their social network is shown in Table 3. Overall, participants felt neutral regarding satisfaction ($p = .097$) and accuracy ($p = .147$) with their current social network structure ($p = .097$), though found network maps easy to use ($p < .001$). Four participants explicitly stated that they had made errors in their online responses regarding their social network structure, which may have led to inaccuracies in the network map. When these four participants' accuracy ratings were removed from the analysis, the remaining participants rated their social network map as significantly more accurate than neutral ($p = .021$).

Table 1

Participant (n = 29) demographic information and characterisation.

	M (SD)	Range
Age (years)	17.86 (2.82)	16 – 32
Diagnostic information		
Age of diagnosis	11.03 (4.66)	3 – 19
Diagnostic source	(n)	(%)
CAMHS	18	62.07
Paediatrician/Child neuropsychologist	8	27.59
Clinical psychologist	2	6.90
Education psychologist	1	3.45
Gender	(n)	(%)
Female	10	34.50
Male	18	62.10
Prefer not to say	1	3.40
Ethnicity	(n)	(%)
White/Caucasian	26	89.60
Black	1	3.40
Mixed/Other	2	6.80
Co-occurring conditions	(n)	(%)
Mental Health difficulties	14	48.28
Anxiety disorder (SAD, GAD, Panic, OCD)	10	34.48
Depression	4	13.79
ADHD	4	13.79
Gender dysphoria	1	3.45
Learning difficulties	4	13.79
Dyslexia	3	10.34
Intellectual disability	1	3.45
Medical conditions	5	17.24
Social Communication Questionnaire Total (n = 28)	15.57 (5.93)*	5 – 32
Social Responsiveness Scale – Short Total	18.93 (5.82)	5 – 28

Note. CAMHS = Child and Adolescent Mental Health Service (CAMHS is the service provided by the U.K. National Health Service (NHS) for assessment of children and young people's emotional and behavioural wellbeing); SAD = Social anxiety disorder; GAD = Generalised anxiety disorder; OCD = Obsessive compulsive disorder; ADHD = Attention deficit hyperactivity disorder. *A total of 15 students met the clinical cut-off score of 15 and above on the Social Communication Questionnaire.

Table 2

Participants' social network structure as reported by using the Social Network and Perceived Social Support questionnaire.

	M (SD)	Range
Size	10.24 (5.46)	3 – 20
Density	0.42 (0.21)	0.15 - 1
% FAM	39.05 (25.04)	0 – 100
% FRI	40.67 (29.46)	0 – 100
% OTH	20.28 (23.93)	0 – 75

Note. FAM = Family; FRI = Friend; OTH = Other.

Table 3

Participants' quantitative feedback regarding social network and workshop.

	M (SD)	95% CI	Median	Mode	<i>p</i> value*
Most important member(s)	(n)	(% of total 27)	-	-	-
Family	16	59.26	-	-	-
Parent	16	59.26	-	-	-
Siblings	4	14.81	-	-	-
Other family members	3	11.11	-	-	-
Friends	11	40.74	-	-	-
Other network members	2	7.41	-	-	-
Social Network Map					
Satisfaction (n = 27)	3.37 (1.04)	2.96, 3.78	3	3.5	.097
Accuracy (n = 25)	3.32 (1.07)	2.88, 3.76	4	4	.147
Accuracy (w/o mistake) (n = 21)	3.57 (0.98)	3.12, 4.02	4	4	.021
Ease of use (n = 26)	4.19 (0.94)	3.81, 4.57	4.5	5	< .001
Social Network Workshop					
Enjoyable (n = 29)	3.83 (0.76)	3.54, 4.12	4	4	< .001
Helpful in general (n = 28)	4.00 (0.67)	3.74, 4.26	4	4	< .001
Helpful regarding university transition (n = 28)	4.07 (0.77)	3.77, 4.37	4	4	< .001

Note. **p* value is calculated by conducting one-sample Wilcoxon Signed Rank test with a hypothesised median of 3 (neutral rating score).

In respect of the content analysis of the qualitative feedback (i.e. answers to the nine-open text-box questions), inter-rater reliability of the codes was between 67 to 89% across different questions after initial coding. For questions related to understanding changes in social networks, participants discussed similar ideas around managing existing and new relationships. For questions related to the experience of using social network map and workshop, participants discussed similar pros and cons related to the practicality of using social network maps during the workshop. Frequencies of final codes and students' quotes for questions related to social networks are displayed in Table 4, and for questions related to the workshop are displayed in Table 5. We have chosen quotes across all three group workshops to be used illustratively to represent a range of participant views.

Table 4

Code frequencies from content analysis of participants' feedback regarding use social network maps.

a) Understanding changes in social networks

Code	<i>What might change¹</i> (n, %) (n = 27)	<i>Stay the same²</i> (n, %) (n = 27)	<i>Different³</i> (n, %) (n = 27)	Selected student quotes
Losing relationships	16 (59.26)	1 (3.70)	1 (3.70)	<i>My school friends will most likely be lost in terms of contacts apart from one person. The connections between me and my family may weaken and my support worker will no longer be needed for support.</i>
Lose family	5 (18.52)	0	0	
Lose friends	8 (29.63)	1 (3.70)	0	
Lose other members	6 (22.22)	0	0	
Network changes	16 (59.26)	4 (14.82)	17 (62.96)	<i>A new branch, similar to the one of my London friends is likely to form, probably somewhat more spread out.</i>
New friends	4 (14.81)	1 (3.70)	16 (59.26)	
More family	1 (3.70)	0	4 (14.82)	<i>More friends – wider friend network I see regularly, separate to current friends, so I can talk face to face.</i>
New other members	0	0	3 (11.11)	
Structural differences	11 (40.74)	3 (11.11)	12 (44.44)	<i>I would like to see more clusters that are not amongst themselves and are loosely connected. I do not want the clusters to alienate each other.</i>
Managing current network	6 (22.22)	25 (92.59)	2 (7.41)	<i>Continue texting friends, may need support from people who knew me well, get advice regarding uni (one friend in second year) and socialising. Family – continue group chat to see what family is up to, call parents semi-regularly and call brother sometimes, text parents about my week, ask parents to send videos of pets.</i>
In touch with family	2 (7.41)	12 (44.44)	0	
In touch with friends	2 (7.41)	14 (51.85)	1 (3.70)	
In touch with other members	1 (3.70)	4 (14.81)	0	<i>Contact with family, I have accepted that there will be reduced contact with my current friends.</i>
Change in communication mode	2 (7.41)	2 (7.41)	0	<i>... can text/call/skype parents, meet up with friends at holidays (same as new) and text in between.</i>

Relationship with others	2 (7.41)	2 (7.41)	7 (25.93)	<i>My family are close to me and know most of my friends, that is important. While I may be away from my London friends, my experience there and relationships formed have shaped me. My core support team of family, and a few friends will remain much the same.</i>
“Significant but not close”	2 (7.41)	1 (3.70)	1 (3.70)	
Identity and similarity	0	1 (3.70)	1 (3.70)	<i>Many people were important to me due to the location I was at and were focused upon by the timing given in the questionnaire. As I have moved away from that, they will still remain significant but not as close.</i>
Independence	0	0	4 (14.81)	
Not sure, N/A	2 (7.41)	1 (7.41)	1 (3.70)	

Note. ¹Which aspects of your social network do you think might change when going to university? ²Which aspects of your current social network do you wish to stay the same at university? ³Which aspects of your current social network do you wish to be different at university?

b) Social network map accuracy

Code	Accuracies/Inaccuracies (n, %) (n = 27)	Selected student quotes
Nodes inaccuracy	7 (25.93)	<i>Some of my friend groups have increased since along with my friends meeting with family, however from the information I gave at the time it was accurate.</i>
Missing family	1 (3.70)	
Missing friends	2 (7.41)	<i>I just picked those who I had been in contact with recently but they may not particularly be the closest.</i>
“Significant but not close	4 (14.81)	
Edges inaccuracy	9 (33.33)	<i>Some people have a stronger connection to certain people, but this is only one type of connector. Maybe rate the connection between the people with different thickness of lines.</i>
Strengths of connections	6 (22.22)	
Questionnaire queries	7 (25.93)	<i>The timings involved seemed somewhat arbitrary, any of those who seem not have connections simply didn't have regular connections within the last 6 months.</i>
Time frame	2 (7.41)	
Mistake / clarity	5 (18.52)	<i>“Do they know” is a broad question leading to links that may not be very strong.</i>
Accurate	8 (29.63)	<i>Showed my friends from school, my boarding house, and friends from family.</i>
		<i>The larger cluster of my family and how they connect with school was accurate.</i>
		<i>The connections and node colours were accurate.</i>
Not sure / N/A	4 (14.82)	

Note. ¹Can you explain what was accurate/inaccurate about the social map in depicting the people closest to you, and the relationships they have with each other?

c) Using social network map

Code	Map Experience (n, %) (n = 28)	Map – Like/Dislike (n, %) (n = 28)	Map – Useful/ Not Useful (n, %) (n = 28)	Selected student quotes
Positive	15 (53.57)	12 (42.86)	21 (75)	
Useful / improve understanding	7 (25)	4 (14.29)	15 (53.57)	<p><i>I found it useful to have to think about change and what matters most when moving away from familiarity.</i></p> <p><i>It helped me think about what I should do to keep the friends I have but also if I can't keep in contact with all of them because the group isn't so dense, then it could be easier than if it was a dense group.</i></p> <p><i>I felt that the map has helped me understand my relationships and given me an idea about how to change them when/if I go to university.</i></p>
Easy to use	4 (14.29)	4 (14.29)	1 (3.57)	<p><i>The representation lets me see it concretely and is perhaps as useful for autistic people as it is for researchers. We both need a well-defined way of seeing social structures so we can see past intuition. It helped a lot.</i></p> <p><i>I liked how it was colour/size coded and easy to understand.</i></p>
Enjoyable	8 (28.57)	4 (14.29)	0	<p><i>I found it an interesting experience as it provided me with an entire social network as a clear and concise diagram.</i></p> <p><i>I liked how it portrayed my relationships and how it showed their importance to me.</i></p>
Thought provoking	2 (7.14)	0	5 (17.86)	<p><i>It reminds me that I have already been part of close groups that are not merely those I grew up around, friends I have made since leaving home as a parallel to those I will hopefully be making soon.</i></p> <p><i>Compared to how it would have looked a year before, it was affirming to see that I am making progress as it would have been empty before.</i></p> <p><i>I have no network, so noting to work on this.</i></p>

Negative / Suggestions	7 (25)	17 (60.71)	5 (17.86)	
Network related	3 (10.71)	4 (14.29)	4 (14.29)	<p><i>My mum is the centre of everything but I think it would be good to have an indicator of how much you enjoy your interactions with that person. Because you may feel very similar but have a strained relationship.</i></p> <p><i>Disappointing and disheartening. Most of the connections have now gone because I have lost touch with them.</i></p> <p><i>I know the reality of my social situation already and it's depressing. I want it to change but at the moment that isn't possible.</i></p>
Format related	4 (14.29)	8 (28.57)	0	<i>It was very small, because it didn't include everyone I see regularly, and it was a bit sad to see so few people, and strange to see people separated so much.</i>
Instruction related	1 (3.57)	5 (17.86)	1 (3.57)	<p><i>I didn't like not seeing myself; I would preferred visually seeing each name branching off of mine.</i></p> <p><i>Nodes could be larger and letters were hard to read, connection strength is not accounted for.</i></p>
Neutral / Unsurprising	5 (17.86)	0	1 (3.57)	<i>An interesting read, not especially enlightening for me as I tend to be quite self-examining in the first place.</i>
Not sure / N/A	4 (14.29)	6 (21.43)	7 (25)	

Note. ¹How would you describe the experience of viewing your map? ²Which aspects of the map did you like/didn't like? ³Which aspects of the map did you find particularly useful/not useful for helping you think about social transitions when moving to university?

Table 5

Code frequencies and student quotes from content analysis of qualitative feedback regarding experience of social network workshop.

Code	Workshop – Enjoyable/ Not Enjoyable (n, %) (n = 29)	Workshop – Helpful/ Not Helpful (n, %) (n = 29)	Selected student quotes
Positive	21 (72.41)	15 (51.72)	
Useful / improve understanding	12 (41.38)	12 (41.38)	<i>I enjoyed learning and interacting with my peers. I thought the content was interesting and most of it useful, and even the stuff less relevant to me I could see the value in.</i>
Easy to use	2 (6.90)	0	<i>I liked the clarity of a visual representation and how precise it is compared to how social rules are discussed in general, which is more arbitrary.</i>
Enjoyable	17 (58.62)	2 (6.90)	<i>Talking about how more dense/less groups help/hinder going to university and the transition between university and where I am today was enjoyable.</i>
Thought provoking	4 (13.79)	7 (24.14)	<i>It gave me ideas on how transitioning offers networks and how I should try focus on reinforcing it.</i> <i>Realising that social networks do not have to be large if they are dense enough, and that's enough to keep you going.</i> <i>To think about who will be there at uni. Interesting to know about social network.</i>
Negative / Suggestions	4 (13.79)	5 (17.24)	
Network related	1 (3.45)	1 (3.45)	<i>I don't often think about how my friends are interconnected as it makes me feel kinda alone. I just know who my friends are and how they'll leave eventually, so it goes.</i>
Format related	1 (3.45)	2 (6.90)	<i>The workshop should focus more on how to make connections with people who might not be necessary to connect with, who you may not necessarily like.</i>
Instruction related	2 (6.90)	3 (10.34)	<i>Possibly explain more in depth about how to keep in contact with members of family or friends when transitioning to university or when you have transitioned.</i>
Not sure / N/A	4 (13.79)	8 (27.59)	

Note. ¹What did you find enjoyable/not enjoyable today? ²What did you find helpful/not helpful today?

Students' understanding of social network changes. When asked which aspects of their social network might change when going to university (Table 4a), participants talked about both losing and gaining social network relationships. Some participants spoke about ways of maintaining relationships with existing contacts by adapting and changing mode of communication.

When asked which aspects of their current social network they might wish to stay the same at university, almost all participants expressed a desire to stay in touch in some capacity with current relationships, mostly with family and friends, though only a few expressed an interest to stay in touch with current teachers and other support workers, as they may continue to provide an important source of support. Some participants also spoke about the importance of maintaining current relationships as it is an important aspect of their identity, and they would like to adapt their communication style in order to maintain existing relationships.

When asked which aspects of their current social network they wished to be different at university, many participants reported a desire to make new relationships, whilst also being mindful of how these new relationships may impact on their existing social network structure. In particular, when talking about the new social relationships, some participants expressed a clear desire to gain greater independence through new social network ties and having to navigate such relationships independent of their family members and altering their social network structure. One participant also commented on the transient nature of social networks through time and place and highlighted the difference of “close” and “significant” network relationships, highlighting the need to perhaps maintain necessary relationships that may not be particularly rewarding emotionally.

Students' experience of viewing social network maps. In terms of social network map accuracy (Table 4b), many participants reported their maps to be accurate. Some participants reported slight inaccuracies in the network members included on the social network map, such as missing out particular members including family or friends that they have not been in contact with over the past three months but considered close to them, as well as some missing connections between different network members. Participants also expressed a desire to visualise the strengths and quality of relationships between different network members. Some participants reported that there were some

misunderstandings in their reading of the questionnaire online, which may have led to inaccuracies in their report.

When asked to describe their experience of viewing the social network map (Table 4c), over half the participants gave positive remarks such as finding the map to be helpful in improving their understanding of social network structures. Some participants found the map helped to consolidate what they have thought about before with regards to their social network structure, though did not help to extend their self-knowledge.

When asked which aspects of the social network map they particularly liked/disliked, participants spoke about finding the network map easy to use and enjoyed the visualisation aspect of their social network maps. In relation to which aspects of the social network map were experienced as particularly useful/not useful, most participants reported finding the map to be particularly useful and thought provoking and helped them feel more confident about their ability to make new friends when going to university. In addition, the concrete visualisation was appraised as offering a structured way of thinking about social relationships that might be particularly helpful for autistic users, playing to their strengths in systemised thinking to index abstract relationships.

Some participants reported a slightly more negative experience of viewing their social network map regarding their current network structure and found it difficult and unhelpful to visualise the lack or loss of social relationships. However, some found the map to be a helpful reminder that this is something they hoped to work on and change when going to university. Participants also made suggestions on how to improve the information about the network structure and format of visualisation. Some participants explained that they also preferred to visualise themselves in their ecomap, so they can more clearly understand their centrality within a network.

Students' perception of social network workshop

The social network workshop was rated as very enjoyable and helpful, both generally and in terms of thinking about the social transition when going to university (see Table 3). The aspects of the workshop experienced as particularly enjoyable/not enjoyable are presented in Table 5. These included enjoying learning about different ways of interpreting social network structure and having the experience to learn about social networks in a peer group setting.

Aspects of the workshop noted as helpful included comments about how it had improved participants' understanding of social connections, as well as providing a more structured way of thinking about relationships between different groups of people within their social network. Some participants experienced the workshop content as slightly confusing and difficult to follow, despite enjoying the interactive discussions in sessions. One participant commented on wanting to include more strategies on managing social relationships within the social network session. A few participants found the workshop more difficult to engage with when confronted with their own social networks, and some were more concerned about potential social changes and wanted to gain a better understanding of how to maintain current relationship during university transition.

Discussion

The current study examined autistic-students' ability to use and experience of using a social-network-map as generated by a novel online tool (SNaPSS) when learning about social changes related to university transition. Based on participants' feedback regarding taking part in a novel social-network-workshop specifically helping students to understand different structural components of social-networks in relation to functional support, and how social-networks can be used to help visualise potential social changes that students might face during university transition, we discuss wider implications for the workshop for university stakeholders.

Social-Network-Structure

Participants in the current study reported a network size consistent with another study of autistic-students (Lei et al., 2019a; Appendix B) and the broader social-network literature, where general findings range from a small and tightly knit support clique (around 5 people), to a slightly larger and more diverse sympathy group (around 12 people) (Dunbar & Spoors, 1995; Hill & Dunbar, 2003). The relative network density is also comparable, if not slightly higher, than that found in higher education literature as reported by TD students (network size 7-9 people, density 0.3 – 0.37) (Hays & Oxley, 1986). This may be reflected by autistic-students perceiving their family members and parents to be better connected to their school friends and other network members, thus resulting in a slightly better-connected network overall.

In line with developmental literature which depicts a shift from relying on family to friends for support amongst TD peers (Friedlander et al., 2007; Hays & Oxley, 1986; Swenson et al., 2008), autistic participants in the current study expressed a clear desire to expand friendship networks when going to university and gaining greater independence from family when making the transition, despite family (mostly parents) being rated as the most significant people in their current social-network. However, expansions in the relative proportion of friendships within one's social network over time may not directly impact long-term transition outcomes in first year of university. One recent longitudinal study which used the SNaPSS to examine how changes students' social networks influenced first-year university transition outcomes for both autistic and TD students (Lei et al., 2020) found that although both student groups reported relative increases in the proportion of friends in their networks over time, students who showed higher levels of social anxiety over time had more wide-spread negative transition outcomes, ranging from academic to personal-emotional adjustments. Therefore, an important factor for university stakeholders to consider is how to help students reduce their social anxiety during the transition process, independent of relative changes in their social network structure. For example, it may be that the act of planning, monitoring and assessing social changes can help reduce some anxiety and uncertainty that students face when socialising at university, such that students who actively engage with the social network workshops and use the SNaPSS over time may feel more confident and self-determined in their abilities to scaffold their own social networks over time. Future studies can assess whether social anxiety levels may differ between students who do and do not actively engage with the social network workshops, which may in turn positively impact students' long-term transition outcomes during first year of university.

With regards to network accuracy, some students expressed that they would have liked to see a more comprehensive social network that consisted of individuals they perceived to be close to but have not necessarily contacted in the past three months (such as distant family members). Such comments should not be interpreted as a weakness of the SNaPSS, which has a 3 months-time window and is aimed at capturing close relationships with whom the student has had contact with which form the support clique and sympathy group outlined by prior literature (Dunbar & Spoors, 1995; Hill & Dunbar, 2003), and to exclude network members that may not have provided tangible

contact or support to the individual in recent months. The discrepancy however raised by autistic-students' expectations of viewing a more comprehensive map can be reconciled by considering the construction of two ecomaps, one with close and frequent contacts as captured by the SNaPSS, and one with a broader inclusion criteria that captures everyone they can think of that they consider to be close to them. A future direction may be to investigate the difference between the two maps, to identify whether there are people in the wider social map that the student would like to have more frequent contact with and develop a plan to achieve such changes in their more existing yet more distant relationships, to further support them during university transition.

Experience of Using Social-Networks

The current study found that when examining their own social-network-maps (ecomaps), autistic participants felt neutral in terms of satisfaction with their current network. Participants expressed a desire to view on network maps the distinction between “significant” and “close” relationships and to identify ways of maintaining “necessary” relationships that may not be particularly enjoyable. This echoed findings from Jackson, Hart, Brown, and Volkmar (2018) that despite being satisfied with their close friendships and romantic relationships, autistic-students reported greater social difficulties and experienced elevated levels of stress, depression, and anxiety within the broader social sphere of university. The current study did not investigate other aspects of emotional and social wellbeing such as feelings of isolation and loneliness. Future studies could ask students to report on such experiences in addition to network satisfaction, to better investigate the potential bidirectional relationship between psychosocial wellbeing and social-network-structure amongst autistic students.

Using the social-network maps, participants anticipated that university transition will be accompanied by losing a significant proportion of their existing social-networks, particularly friends. Participants also considered how new friendships and networks can become more independent from existing family relations and mark a step towards independence by having a lower density network when transitioning to university. Being mindful of network structural changes such as density and clusters can be particularly helpful in providing autistic students with a more explicit framework when building social relationships. Autistic-students often struggle to meet the varying social demands

across different university settings, despite having a desire to form a new social identity and meet people of similar interests at university (Geller & Greenberg, 2009). Providing specialised support for autistic-students to socialise with peers and others at university across contexts (such as for academic work, in accommodation, or in clubs and societies) can help students increase the diversity of their social-networks and clusters, and also realise different sources of social support at university beyond that of family and parents (MacLeod & Green, 2009; Wehman et al., 2014).

Participants highlighted in their qualitative feedback that the format of networks can be improved with better visualisation using larger nodes and clearer representations of relationship strengths/quality between individuals. Future studies might consider working together with students when using the SNaPSS and Gephi2 or other software to generate the graphics in a way that best helps the student understand their social relationships. Next, participants also raised some queries about the questionnaire, regarding the length (3 months) of time during which to report relationships and clarifying the difference between “significant” and “close”. This is consistent with findings more broadly in the field where literal interpretation of language characteristic of autism can mean questionnaires with less specific or well-defined scaling using terms such as ‘sometimes’ or ‘1-2’ days can be less accessible. Language clarifications of the SNaPSS can thus work on incorporating such distinctions when prompting students to label network members, and perhaps the questionnaire can be completed during the workshop after explaining the different components of social-networks, so students are provided with more context around the purpose of the questionnaire, and improve completion accuracy.

Implications of Social-Network-Workshop

Overall, participants enjoyed visualising and learning about their social network in a structured and concrete way, which provided clear information to help them recognise the scope of current relationships, but also think about potential network flexibility during university transition. Helping students to visualise and understand the different functions of network size, density, and even clustering enabled them to appreciate the *functional* importance of social networks for accessing social support and allowed them to identify different sources of social support prior to university

transition. Some participants felt encouraged by their ability to change and work on their relationships which can be translated and monitored visually over time using network maps.

However, for others, visualising a network that they already perceived to be fairly minimalistic or barely existing can be a disappointing and disheartening process. We therefore highlight that although using social networks might be helpful for university stakeholders to consider when discussing social transitions with some students, it might be a sensitive topic to approach, and may not be suitable for all students. A few participants also found the content difficult to follow and may have needed extra time during the session to digest the material learnt, before starting individual exercises. Slowing down the pace of the workshop and delivering the content using more examples of varying degrees of complexity to illustrate social-network transitions might help students better understand the content.

It should be highlighted that the workshop and transition planning based around social network maps is an individualistic, person-centred and student-led approach. Instead of imposing or teaching students what an “ideal” social network map might look like, each student should be encouraged to think about how to scaffold their own social network in a way that best suits their needs. As a future direction, university stakeholders may use the workshop as an opportunity to help students set goals around how they would like to either maintain or alter their social network structure at the start of university transition, and conduct follow-up workshops/questionnaires to evaluate to what extent such goals are met throughout university transition, to further assess the long-term impact of social network workshop on helping students to adapt to social environment at university. In addition, supporting autistic students throughout their university career to scaffold social networks in a way to maximise their access to informational, emotional, and tangible support may have more long-term positive gains for supporting transition out of university, such as identifying ways to leverage certain social network members to help identify and acquire job opportunities to secure future employment. Therefore, our workshop may offer a promising and novel first step to use social network analysis to engage autistic students in a cascade of social planning to support transitions *into, through and out* of higher education.

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Appendix A

Measures

Social Communication Questionnaire – Lifetime (SCQ; Rutter, Bailey, & Lord, 2003).

The SCQ Lifetime is a 40-item parent-report measure of autism symptoms which may have been present throughout the individual's lifetime, with items relating to social communication difficulties. Each item is scored on a dichotomous scale, indicating the presence (1) or absence (0) of each symptom described. A cut-off score of 15 is recommended for further testing, indicating that the individual is likely to have Autism Spectrum Disorder. The SCQ-Lifetime was used to measure parent-reported autism symptom severity throughout the lifetime of the participant, and not as a verification of autism diagnosis.

Social Responsiveness Scale – Short (SRS-S; Kanne, Christ, & Reiersen, 2009). The SRS-S is an 11-item self-report measure of autism symptom severity developed from the full SRS-S (Constantino & Gruber, 2005; Constantino & Gruber, 2012). All items are rated on a 4-point Likert scale from 0 (not at all true) to 3 (very true), giving a total of 0-33. The selected items relate to social and language impairments, as well as restricted and repetitive behaviours in autism, and items have been shown to have high factor loadings on a single unrotated principal components factor. The validation of SRS-S against the full-scale SRS have been shown elsewhere (Kanne et al., 2009). The SRS-S was used to measure self-perceived level of autism symptom severity in the current study, and not as a verification of autism diagnosis.

Social Network and Perceived Social Support (SNaPSS; Lei, Ashwin, Brosnan, & Russell, 2019). The social network section first asked students to name up to 20 network members whom they have been in contact with over the past 3 months and considered to be close to them. Participants then stated the type of relationship between themselves and each person named (i.e., family, friend, or other network member such as teacher). Participants also reported the degree of perceived similarity between self and each network member named, as well as whether each network member may be in contact with other network members named, which helped to produce their personal social network map (see example maps in Figure 1).

Feedback of viewing social networks. Participants who viewed their own social network map were asked to rate their satisfaction with their current social network using a 5-point Likert scale from very unsatisfied (1) to very satisfied (5) and how accurate the network map was on a 5 point Likert scale (1= very inaccurate, 5 = very accurate). They were asked to write down in open text boxes what they hoped would stay the same, or anything they wished to be different about their social network when they go to university. For participants who did not wish to view their own social network map, the alternative workshop exercise was based on an example social network map depicting a fictional character (Jack). Participants first read the Jack's story to understand his current relationships with different network members depicted on his social network map. Participants were then asked to use Jack's social network map to identify who were particularly important to him and think about what might stay the same or different when Jack goes to university.

All workshop participants also answered some general questions about the experience of seeing and using a social network map. Using a 5-point Likert scale, they rated how easy (1 = very difficult, 5 = very easy) it was to read and use either their own or the exemplar's (Jack) network map, and provided qualitative feedback describing their experiencing of viewing a social network map, and outline which aspects they liked/did not like, and found to be useful/not useful when thinking about transitioning to university, as well as any map inaccuracies they have identified.

Appendix B

Social network map structure

We conducted a Mann-Whitney's U test to directly compare differences in the network size, density, and composition reported by participants in the current study and that reported in Lei et al. (2019a)'s sample of autistic participants ($n = 28$), results are shown in the table below. The social network size, density, and composition reported by participants in the current study are consistent with those reported by participants in a pilot study of the SNaPSS with autistic participants aged 17-19 years applying to university (Lei et al., 2019a). Compared to Part 2 of Lei et al. (2019a)'s study, which included a sample of first year autistic participants aged 17-19 years within the first two weeks of starting university, participants in the current study also reported a similar social network size, density, and percentage of friends ($p > .05$) though reported a significantly greater percentage of family members ($p = .04$) and other network members ($p = .017$).

Appendix B Table.

Participants' social network structure in comparison to other samples of autistic students transitioning to university, using the Social Network and Perceived Social Support questionnaire.

	Current Study ($n = 29$)		Lei et al. (2019) Part 1 ($n = 10$)		Lei et al. (2019) Part 2 ($n = 28$)		Current vs. Part 1*	Current vs. Part 2*
	M (SD)	Range	M (SD)	Range	M (SD)	Range	p Value	p Value
Size	10.24 (5.46)	3 – 20	11.20 (6.49)	5 – 20	8.25 (4.83)	0 – 20	.716	.141
Density	0.42 (0.21)	0.15 - 1	0.55 (0.28)	0.05 – 0.88	0.34 (0.21)	0 – 0.91	.174	.071
% FAM	39.05 (25.04)	0 – 100	36.46 (8.72)	20 – 50	36.18 (23.49)	0 – 80	.937	.040
% FRI	40.67 (29.46)	0 – 100	46.17 (22.80)	0 – 68.42	44.68 (28.72)	0 – 100	.418	.152
% OTH	20.28 (23.93)	0 – 75	17.36 (21.52)	0 - 60	9.41 (19.13)	0 - 81	.716	.017

Note. FAM = Family; FRI = Friend; OTH = Other. * p value is calculated by conducting Mann-Whitney U Test between current study and Part 2 of Lei et al. (2019)'s study.

Post Chapter Six Commentary

Chapter Six examined the development and pilot of a novel workshop using autistic students' social network maps to help them learn about social network structure and function and assist them in planning for potential changes in their social world during transition to university. The feedback from students highlighted many positives, as the visual network maps presented a concrete and structured way of visualising one's social relationships, and features beyond network size (such as network density and clusters) also prompted students to think about the best ways to scaffold and shape their own social networks to increase social resilience and independence from their family. Such positive views were encouraging and inform university stakeholders that social transition planning can be assisted by more concrete visualisation learning tools, and that social network maps is a helpful way for students to think about existing and new relationships, as well as the degree of social connectedness between different social network members. For example, although many students reported that family members play an important role in their current social network, they also expressed a strong desire to establish a new network of friends at university independent of their family.

However, it should be noted that not all students welcomed the visualisation of social networks. For some, it only served to reconfirm their social loneliness, and elicited more negative feelings rather than positive planning for potential social transition changes. Therefore, social networks may be a helpful tool for university stakeholders to review in order to potentially identify those who are more socially isolated and vulnerable to transition change to facilitate support planning, though one must be sensitive when approaching the nature of social connectedness with students who lack close social connections beyond that of their family.

Although the visual-based social network learning may play to autistic students' strength and may be particularly helpful for autistic students to understand social changes, it remains to be explored whether typically developing students may experience similar benefits from social planning using social network maps. Given that social anxiety had been identified in Chapter Five to be particularly elevated in both student groups, especially at the time of entering first year of university, developing a personalised plan for how to maintain and establish new social network relationships

may help relieve some stress associated with social changes for both student groups, and may be beneficial for university stakeholders to consider delivering when welcoming all new students.

One positive message from Chapter Six is that many students expressed a sense of agency and ownership when discussing plans for either maintaining existing or establishing new social network relationships during the transition to university process. Rather than passively accepting the social transitions, supporting students to recognise that they themselves have an active role to play in shaping the social changes they undergo can reinforce a sense of agency and self-determination in both autistic and typically developing students. Beyond accessing support from social network members, having a strong sense of self-determination may benefit students in both social and non-social aspects of university life as they begin to gain greater independence from family and peers, and establish personalised goals to work towards based on their own values. Chapter Seven further explore self-determination and how both autistic and typically developing students are able to shape their own university experience.

Chapter Seven

Understanding the role of self-determination in shaping university experiences for autistic and typically developing students in the UK


Chapter Rationale

Chapters Two to Six have explored the structural and functional nature of autistic and typically developing students' social networks when transitioning to university, with a focus on the changing dynamics in *relationships* between an individual and those whom they consider to be close to them. However, beyond understanding the changing quality and quantity of perceived social support that students have reported from their family, friends, and other university staff members during transition to university, it is also important to gain further insight into how students perceive *themselves* to be playing a pivotal role in shaping their own university experience when transitioning *into, through* and *out of* university. Understanding students' self-determination is particularly important when considered from a developmental perspective. As students become more independent when they embark on the journey to adulthood, having the ability to *autonomously* shape their own goals and formulate a course of action in life, feeling *competent* in their ability to execute those actions in pursuit of goals, whilst being supported by a strong sense of *relatedness* to those whom they consider to be close to them become three important pillars underlying the development of self-determination.

In Chapter Six, qualitative responses from many autistic students who were about to transition to university suggested a sense of optimism and autonomy when thinking about potentially developing new social network relationships at university, highlighting that autistic students may carry intrinsic motivation that allows them to act in a self-determined way to shape their own social life. However, it is unclear to what extent such pre-university transition social goals from autistic students can be successfully executed when autistic students transition *into, through* and *out of* university. Furthermore, it remains to be explored whether similar feelings of self-determination

equally apply to daily living and academic domains of university life, beyond that of social relationships.

Chapter Seven uses a qualitative approach to explore how both autistic and typically developing university students and recent graduates in the UK perceive their ability to actively and effectively shape their own university experience. The inclusion of a typically developing student group that was group matched to autistic students on gender, age, pre-university academic performance, degree studied at university, and year of study helps to explore whether barriers and facilitators of self-determination as identified by autistic students were unique and may be attributed to having a diagnosis of autism, or whether such experiences were more widely shared amongst all students who faced similar academic and social pressures at university. Identifying aspects of university life that uniquely challenged autistic students' self-determination can help university stakeholders consider the development of interventions tailored to help autistic students form better coping strategies, and thus improve their self-determination to support more independent living at university and beyond.

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Statement from Candidate	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature.		
Signed		Date	20/05/2020

Lay Abstract

Prior research suggests that autistic students in higher education might struggle with developing autonomy, competence and establish a sense of relatedness due to their executive functioning and social communication difficulties. We interviewed 18 autistic and 18 typically developing (TD) students to explore how students perceived themselves to be in control of their university experience. Both groups provided anecdotal examples that supported similar perceptions of self-determination in shaping the academic, daily living and socialisation aspects of university life. Autistic students reflected on their cognitive strengths such as attention to detail, persistence and ability to tailor their academic studies towards their interest. Varying degrees of sociability were noted, with some autistic students preferring to focus their self-determination efforts on academic success, whilst others treasured the novel social experiences including peer support and friendship at university. Compared to greater flexibility endorsed by TD students, autistic students perceived establishing a routine at university to be a necessity and were self-determined in maintaining stability amidst a sea of change. Recognising strengths and self-determination efforts in autistic students can help stakeholders support their personal development towards independent living and self-sufficiency in adulthood, and to successfully transition *into, through* and *out* of university.

Keywords: Autism Spectrum Disorder, Self-Determination, autonomy, competence, relatedness, university, college

Abstract

With more autistic students enrolling in higher education, little is known about how autistic students can actively and effectively shape their own university experience through self-determination. The current study explores how both autistic ($n = 18$) and typically developing students and recent graduates ($n = 18$) perceive their self-determination during their transition *into, through* and *out of* university in the UK. Students reported many shared and unique aspects of autonomy, competence, and relatedness underlying self-determination. Many autistic students also discussed autism-related strengths facilitating academic pursuit at university, though found coping with transitional changes more difficult than typically developing students. Using strength-based approaches to help autistic students to actively adapt to routine changes might facilitate their self-determination during transition to university.

Understanding the role of self-determination in shaping university experiences for autistic and typically developing students in the UK

For young people, university can be a springboard to a multitude of social and academic opportunities depending on one's ability to effectively shape their experience through self-determination (Field et al., 2003). Although self-determination has been identified as an important construct related to university transition for autistic students (Field & Hoffman, 1999; Wehmeyer et al., 2010), little is known about how autistic students' perception of their own self-determination through a first-person perspective may compare to their neurotypical peers. To the best of our knowledge, this is the first qualitative study to explore how autistic and neurotypical students perceive their own self-determination transitioning *into, through* and *out of* university. Focus is paid to students' experience across academic, daily living, and socialisation domains of their university lives. Similarities and differences in autistic and neurotypical students' perception of their ability to shape their university experience are highlighted.

Self-determination and higher education

Self-determination is conceptualised as the inherent human tendency towards psychological growth, independence, and improved wellbeing, based on meeting the basic needs of autonomy, competence and relatedness (Deci & Ryan, 1985, 1985; Ryan & Deci, 2000; Wehmeyer, 2005). Autonomy refers to one's ability to self-regulate and initiate actions; competence refers to having the knowledge, skills and understanding to achieve desirable outcomes congruent with one's goals; and relatedness refers to the development of a secure and satisfying social network (Deci et al., 1991). Cognitive Evaluation Theory (Deci et al., 1991) further stated that compared to intrinsically motivated behaviours, extrinsically motivated behaviours can only become self-determined if the external goals are congruent with one's internal values and sense of self, and such integration can foster a sense of belonging and connectedness towards someone they value (i.e., through relatedness) (Gagné & Deci, 2005).

To date, the link between perceived sense of autonomy and competence of typically developing (TD) students as predictor of academic success and enjoyment at university (Black &

Deci, 2000; Goldman et al., 2017; Liu et al., 2014), and how self-determination underlies the pursuit of both intrinsically or extrinsically motivated actions (Niemic & Ryan, 2009) have been documented using quantitative methods. However, the use of qualitative methods to explore TD students' voices and perceptions of self-determination at university are lacking. In contrast, qualitative methods are more widely used to examine the relationship between self-determination and university success amongst students with learning disabilities and specific learning difficulties (Field et al., 2003; Getzel & Thoma, 2008; Ju et al., 2017; Petcu et al., 2017; Sarver, 2000). Using qualitative methods, many attributes such as problem-solving skills, persistence, being aware of one's strengths and weaknesses, setting appropriate short- and long-term realistic goals, and self-management were identified as key self-determination skills that an effective self-advocate would have to access support and succeed in postsecondary education (Getzel & Thoma, 2008; Sarver, 2000). Taken together, educators may facilitate self-determination amongst both student groups by helping them identify and internalise extrinsically motivated goals of academic performance through fostering a collaborative and supportive learning environment at university (Black & Deci, 2000; Goldman et al., 2017; Hong et al., 2011), and ensure student voices are being heard (Niemic & Ryan, 2009). For students with disabilities, developing support systems through meaningful relationships with peers and professors also contributed towards college retention, highlighting that relatedness in addition to autonomy and competence facilitates self-determination in higher education (Getzel & Thoma, 2008).

Autism and self-determination

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterised by social and communication difficulties, and restricted and repetitive behaviours and interests (American Psychiatric Association, 2013). A rise in UK higher education attendance by autistic⁷ individuals reflects recent movements in neurodiversity and widening participation (MacLeod & Green, 2009). According to data reported by Office for Students (2019), the number and relative percentage for students with social or communication impairment (including ASD) have risen from 2,465 (0.2%)

⁷ A recent publication (Kenny et al., 2016) that investigated language preference when referring to autism found that autistic individuals and their families and friends prefer to use identity first language when referring to autism (i.e., autistic individual), rather than person-first language (i.e., person with autism), though the latter was more commonly used by professionals. In this paper, we will use identity-first language.

students in 2010-11 to 10,890 (0.7%) in 2018-19. Given that many autistic students experience co-occurring conditions, a proportion of them may be captured by data including students with multiple impairments (including social/communication impairment, sensory, medical, physical and mental health conditions) which also showed an increase from 30,955 (2%) students in 2010-11, to 44,490 (2.8%) in 2018-19.

In a recent narrative synthesis of studies that have examined neurodiversity in higher education (Clouder et al., 2020), one finding was the need for universities to encourage students to disclose their diagnosis before they reach a crisis point and can no longer cope with the demands of university life (Van Hees et al., 2015). Diagnosis disclosure enables students to access practical and social/emotional support available on campus, as well as for reasonable adjustments to be made (Clouder et al., 2020). However, the quality of support and adjustments may differ depending on the knowledge and training of university staff members (Clouder et al., 2020). The authors also highlighted that despite support systems being available in higher education, students need to be more active and serve as their own advocates when approaching the university to seek out support tailored to their needs, thus suggesting that the role of self-determination and agency may play an important role in their ability to shape their own university experience (Clouder et al., 2020).

Self-determination is therefore important to consider for autistic students (Wehmeyer et al., 2010), though many might have executive functioning difficulties (such as poor cognitive flexibility and working memory to engage with multiple goals concurrently, time management and organisation difficulties) (Dijkhuis et al., 2020) that make the actualisation of their self-determined goals harder to accomplish. Parents of autistic young people have noted that performance and capacity for skills related to self-determination (e.g., problem-solving, self-management, decision-making) for this group of young people was low (Carter et al., 2013). Compared to students with specific learning difficulties and learning disabilities, autistic middle and high school students showed poorer autonomy, self-regulation, psychological empowerment, and self-realisation, suggesting that social communication difficulties unique to autism might place them at a particular disadvantage relative to their peers with other disabilities in establishing a sense of relatedness (Chou et al., 2016).

Wehmeyer et al. (2010) emphasised that educators should encourage autistic students to self-advocate for their strengths and needs, to improve their self-regulation and flexibility and set realistic goals that can be achieved, and to exercise their decision-making skills whenever possible, as all are important for independent living in adulthood (Field & Hoffman, 1999). Educators may consider adopting a strength-based framework to help autistic students increase their sense of autonomy and perceived competence underlying self-determination. For example, helping autistic students recognise their own strengths such as in visual perception and attention to detail, good systemising skills, and having strong interests and in-depth knowledge of certain fields can enable them to become more confident in their own competence (de Schipper et al., 2016; Lee et al., 2019; Urbanowicz et al., 2019), especially when pursuing academic success (Bakker et al., 2019). Helping students recognise how they can best harness and utilise their own strengths to overcome problems in their university lives (beyond the academic domain) can further enable them to experience a greater sense of autonomy and empowerment, and help students live more authentically as self-fulfilling agents with better quality of life (Lee et al., 2019; Urbanowicz et al., 2019).

To date, there is quantitative evidence to support a positive association between better quality of life and autonomy, psychological empowerment, self-realisation, and having the capacity to become self-determined in autistic young adults (White et al., 2018). However, it remains unknown from a first-hand qualitative perspective if and how autistic students perceive themselves to be effective in shaping their own university experience through self-determination compared to TD peers who have similar academic backgrounds and interests.

Current study

This is the first qualitative study to collectively investigate autistic and TD students' reflections on the extent to which they shaped their experiences of transitioning *into, though, and out of* university through self-determination (autonomy, competence, and relatedness). Given that prior literature suggested that autistic students find self-determination more challenging than others due to their social communication difficulties and unique cognitive styles, we selected a group of TD students matched to autistic students (based on age, sex, pre-academic performance level, and degree

subjects studied at university) to investigate both shared and unique experiences related to self-determination between autistic and TD students.

Methods

Participants

A total of 36 participants (18 TD, 18 autistic students) took part in the study. Participants' demographic and diagnostic information are displayed in Table 1. Participants were recruited through flyers and student groups on social media channels advertised to university students throughout the UK. For the autism group, students were included based on their self-report of having received a formal diagnosis of autism from a clinical professional and have disclosed their clinical diagnosis to their university disability service and are eligible to access autism-specific support on campus. Some participants may have received clinical diagnosis during childhood prior to the publication of DSM-5 in 2013 when the umbrella term Autism Spectrum Disorder was introduced, and we report the diagnostic label provided to us by participants. Sixteen out of eighteen autistic students met screening cut-off on the Autism Quotient (AQ), twelve of whom also met clinical cut-off. Many autistic students experienced at least one co-occurring mental or chronic physical health conditions, or specific learning disability, the most prevalent being anxiety, depression, and specific learning disability.

For the TD group, students were only included if they reported no current or past diagnoses for mental health, chronic physical illness, or any other forms of specific learning difficulty or developmental condition. TD students were excluded if they scored above the screening cut-off on the Autism Quotient. None of the TD students met screening cut-off on the AQ, nor had any current or past mental health, chronic physical health, or specific learning conditions.

All students must have either attended, or are currently attending undergraduate studies in the UK, and spoke fluent English. Autistic and TD students were matched on gender, age ($t(34) = 1.34, p = .19$), and pre-university academic performance, both in terms of number of A-Levels (or equivalent) completed ($t(34) = -1, p = .32$), mean grade received for all A-Levels completed ($t(34) = -2.02, p = .05$). Students in the TD group came from ten different institutions, and autistic students came from eleven different institutions in the UK. In terms of living status, one third of autistic students lived at

home with family, compared to TD students who either lived on campus or off campus with peers. Specific information on socioeconomic status was not recorded in the current study.

Ethical consideration

The study was approved by the university's psychology department ethics committee and performed in accordance with the ethical standards of the institution and the with the 1964 Helsinki declaration and its later amendments. All participants provided individual written informed consent prior to participating in the study.

Materials

See Appendix A for information on demographic questionnaires used and the Autism-Quotient (AQ; Baron-Cohen et al., 2001).

Interview-topic-guide

The interview topic guide (see Appendix B) was developed by the first author with the aim of gaining insight into students' experiences at university through their own narrative account. Taking a critical realist approach, we were interested in whether students may describe their personal experience in a way that naturally reflected a sense of autonomy, competence and relatedness without explicitly being asked to provide evidence for each of the three domains of self-determination. Therefore, students were asked to reflect upon their experience of transitioning *into, through and out of* university (or for those yet to graduate, conjecture what life after university might be like). The questions were designed to be more open to allow students to recall aspects of university life perceived to be most important to themselves. To ensure that there was scope within the interview to capture students' sense of agency, students were prompted to think about to what extent they have shaped their academic, daily living, and socialisation life at university. Students were also asked to reflect on how they experience might have compare to others, and whether there were things that they had wished to be different. Finally, students reflected upon whether they have gained any skills during university that might be helpful for the future. For autistic students, one question specifically prompted them to think about the impact of autism on their university experience, to ensure that there is scope to capture how autism associated strengths and weaknesses may have shaped their university experience.

Table 1

Participant demographic information.

	ASD (n = 18)	TD (n = 18)
Age (years)	20.94 (3.24)	(M; SD) 19.83 (1.38)
Gender		(n, %)
Male	9 (50%)	9 (50%)
Female	9 (50%)	9 (50%)
Ethnicity		
White / Caucasian	16 (88.89)	13
Asian	0	3
Mixed	2 (11.11)	1
Prefer not to say	0	1
Autism diagnosis		
Autism / ASD	5 (27.78)	-
Asperger's	12 (66.67)	-
PDD-NOS	1 (5.56)	-
Other diagnoses		
Anxiety	6 (33.33)	-
Depression	5 (27.78)	-
ADHD	3 (16.67)	-
Specific learning disability	6 (33.33)	-
Anorexia Nervosa	1 (5.56)	-
Other medical conditions	2 (11.11)	-
Pre-university qualifications		(M; SD)
Number of A-Levels (or equivalent) completed	4 (1.37)	4.39 (0.92)
Average grade ²	4.34 (1.24)	5.07 (0.91)
Subject/degree at university		(n; %)
Social sciences	7 (38.89)	8 (44.44)
Arts and humanities	4 (22.22)	3 (16.67)
STEM	7 (38.89)	7 (38.89)
Living status		
On campus	6 (33.33)	9 (50)
Off campus with family	6 (22.22)	0
Off campus with peers	6 (44.44)	9 (50)
Current year of study		
First	7 (38.89)	5 (27.78)
Second	7 (38.89)	7 (38.89)
Fourth / Final	2 (11.11)	2 (11.11)
Have graduated already	2 (11.11)	4 (22.22)
Autism Quotient		(M; SD)
Total ³	34.22 (9.57)	11.83 (5.72)
Interview format		(n; %)
Face to face	8 (44.44)	5 (27.78)
Phone	8 (44.44)	12 (66.67)
Skype	2 (11.11)	1 (5.56)

Note. ASD = Autism Spectrum Disorder; TD = Typically developing; PDD-NOS = Pervasive developmental disorder – Not otherwise specified; ADHD = Attention deficit hyperactivity disorder; STEM = Science, Technology, Engineering, Mathematics. ¹In the UK, students typically complete 3-

5 A-Levels in chosen subjects final year of secondary school, before entering university. ²Each A-Level (or equivalent) is scored on a scale of 0 (fail) to 6 (A* = highest grade). ³The clinical cut-off score for the Autism Quotient (AQ) is ≥ 32 , and screening cut-off is ≥ 26 .

Community Involvement

The topic guide was piloted with one autistic graduate student to see whether the questions could elicit recall of their university experience across academic, daily living and social domains, and to ensure that the interview length was appropriate. The same student also provided feedback on ways to improve the wording clarity to minimise the chance of misinterpreting the questions during the interview. Autistic participants did not participate in the research design, analysis or interpretation of findings in the current study.

Procedure

All participants interested in taking part were asked to read through the study information, complete written informed consent, and fill in an online questionnaire (basic demographic information and AQ) via Qualtrics. Participants who met the inclusion criteria and successfully completed the online questionnaires were offered to attend the interview in person, via phone or Skype. The latter options were offered given that many students lived and attended institutions that were far away from where the research team was based, and students preferred to conduct the interview remotely rather than travelling to do so in person. Interviews lasted 20-45 minutes, and students received £10 Amazon gift vouchers upon completing the interview.

Analysis

Analysis

We conducted thematic analysis following the Braun and Clarke's (2006, 2013) method. We adopted the critical realist approach and focused on the semantic features of the interview data. Following a critical realist stance, we first adopted a deductive approach when examining all transcripts to assess whether there may be evidence that relate to and in turn support autonomy, competence, and relatedness underlying the notion of self-determination as outlined by Ryan and Deci (2000). The purpose of this step was to critically evaluate whether observations made at the experiential and actual level (i.e., students' perception of their personal experience, as well as the

events and actions they took during their time at university) may be related to the real level (i.e., whether autonomy, competence or relatedness underlying self-determination served as potential causal mechanisms that influenced students' ability and desire to shape their university experience). Therefore, relevant excerpts across all transcripts that provided evidence supporting self-determination were first identified and sorted into three bins which corresponded to autonomy, competence, and relatedness. Data from both autistic and TD-students were analysed as a whole rather than split into two groups, as we wanted to highlight how university students reflected upon their self-determination at university in general. Nuanced differences at the level of each subtheme raised by autistic students were highlighted to show their additional perspectives beyond that of TD-students.

Next we took an inductive approach when analysing data within each bin and coded semantically to best characterise key features present in the data. The first author who conducted all of the interviews familiarised herself with the data through transcribing, reading, and re-reading of the transcript, and developed initial codes which were then returned to, revised, and evaluated together with the senior author. The first author was not blinded to participant diagnosis during the interviews or analyses, though data was collated across the two student groups to be analysed together, and codes were not created to be autism specific. We did not use a second-rater to assess inter-rater reliability as a measure of quality in the current study. Given that the first author conducted all of the interviews in an interactive manner using a topic guide rather than in a semi-structured way, the subsequent coding and understanding of the data was informed by her interactions with the participants, in a way that a second-rater would be unable to replicate (Morse, 1997). Therefore, the use of a second-rater would be incoherent with the current epistemological and ontological positions adopted (Braun & Clarke, 2006, 2013; Terry & Braun, 2016).

The first author then discussed, revised, and finalised the codes and themes with the senior author who is an experienced autism researcher and clinical psychologist. We first ensured that codes and themes were sufficiently distinct from each other *within* each of the three bins, and remained characteristic of the three domains of autonomy, competence and relatedness underlying self-determination. We then compared the themes *across* the three different bins, to examine whether

certain themes may be discussed within more than one of the three pillars underlying self-determination (i.e., relying on a combination of autonomy, competence, and relatedness). This final step allowed us to distinguish between themes that were unique to each of the three domains underlying self-determination, and themes that were common across multiple domains. We expected there to be some overlap in the way that students recounted their university experience to show that they fulfilled more than one of the three needs underlying self-determination (Ryan & Deci, 2000).

Results

Interview format and duration information are shown in Table 1 and Appendix A.

Thematic analyses

Themes and subthemes identified as unique to, or shared across autonomy, competence and relatedness are shown in the thematic map (Figure 1). Quantification of endorsement by participants (Figure 1) was done *post-hoc* to the development and selection of themes during thematic analyses. Endorsement was coded in a binary sense, based on whether the student referred to that theme at least one time (1) or not (0) in their transcript. Therefore, the number provided can be interpreted as a headcount for the number of students that endorsed each theme. Given that the current study included both a group of typically developing and autistic students, the sole purpose for providing this quantitative comparison is to characterise potential differences in the extent to which each student group related to the specific themes, supplementing the results from the thematic analysis. The quantification should not be interpreted as a guide for the relevance or rank the importance of the themes across the different domains of self-determination, as this is advised against by the thematic analysis approach outlined by Braun and Clarke (2006, 2013). Quote(s) were selected to represent students' general and nuanced opinions. To protect students' anonymity, precautions were taken to remove or modify any potential identifiable information from the selected quotes. We first describe similarities across both student groups when discussing ideas related to each theme, and then highlight between group differences by outlining ways in which autistic students may have had additional or different insight when describing their own experiences.

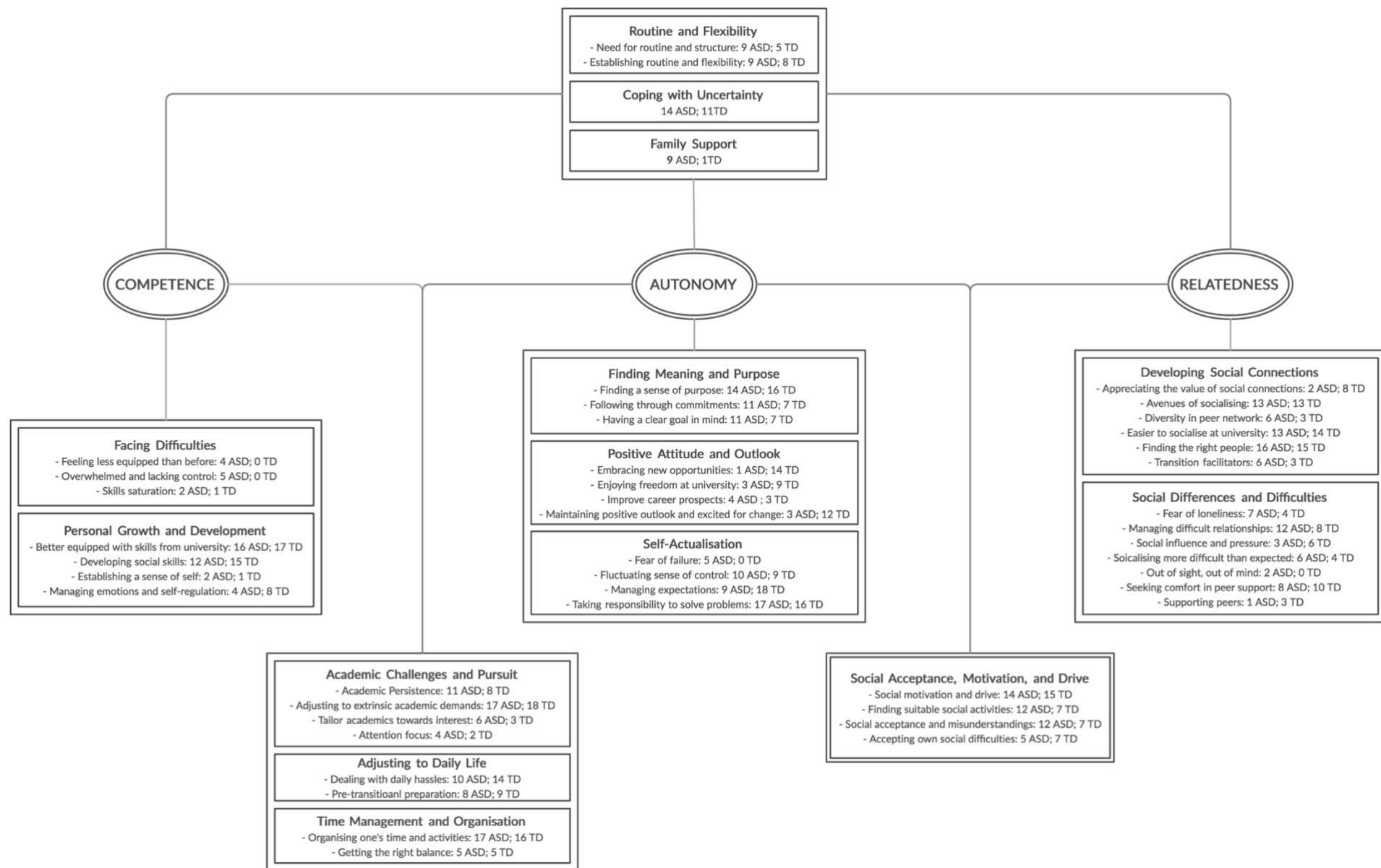


Figure 1. Thematic analyses output map identifying themes that are unique to, or shared between autonomy, competence, and relatedness. The number of autistic (n = 18) and TD (n = 18) students who endorsed each theme are provided.

Autonomy

We identified three themes from students' responses that uniquely reflected autonomy.

Finding meaning and purpose. Despite being determined to achieve their goals, students had uncertainties as to what that goal might be and how it might change over time, especially juggling the social and academic aspects of university life:

"I think that for me now it's less towards getting the top grade... I guess that goal then kind of became more, just kind of wanting to have good personal connections and just be happy." (P11, ASD)

When thinking about the future, students reflected on the lack of a clearly defined path when transitioning out of university. When talking about their degrees, TD students were less likely to draw upon the distinction between intrinsically and extrinsically motivated goals, autistic students spoke about being motivated only to pursue goals that naturally aligned with their intrinsic interests:

"If I'm not interested in something, then I just can't really be bothered, I don't have that motivation, I don't want to do it..." (P06, ASD)

Similarly, for future career prospects, TD students were more flexible in the career paths that they will pursue:

"I knew psychology was what I wanted to do, but at the same time I was still being flexible, like those goals could change... I could find a different route to those goals sort of thing." (P29, TD)

In contrast, autistic students were more fixated on specific professions that were related to their intrinsic interest and the degree they were pursuing.

Positive attitude and outlook. Students talked about trying out new things to broaden their experience and enjoying the freedom to schedule their own time at university when compared to school and agreed that a good degree would improve career prospects. Autistic students were less likely to engage with and described difficulties accessing extracurricular activities, which they

perceived to lack usefulness. TD students described excitement and readiness for change both when transitioning *into* and *out* of university:

“I actually remember not even being actually that nervous which is strange, because obviously it was such a big thing... I just remembering being really excited about it, excited to start, meet new people as well.” (P37, TD)

While autistic students had a less positive outlook towards transitions in general:

“I suppose I’m always maintaining this hope that things are going to get better, but that’s probably just a defence mechanism” (P03, ASD)

Self-actualisation. Students perceived self-control as more of a “state than a trait”. Self-control varied depending on the area of university life, and sometimes led to counter-productive decisions being made and in the absence of self-discipline. Students noted the importance of being able to manage one’s own expectations through recognising personal strengths and weaknesses, and not comparing self to others to maintain mental wellbeing at university. Following advice from others can set up false expectations of what university might be like, which resulted in disappointment when compared to reality:

“You have to kind of lower your expectations, lower your competitiveness, because a lot of people went from top of the school, or quite high up in their school, and now they are average at university, and preparing for that was also quite hard.” (P33, TD)

Finally, students talked about a growing sense of independence, accountability, and responsibility when it comes to problem-solving at university:

“Everything depends on you, and actually you have to do it yourself, because if you don’t do it you just don’t do it, no one will punish you, but no one will help you at the same time.” (P25, TD)

Compared to TD peers, autistic students had more conflicting opinions arose regarding problem-solving, as some wanted to do things independently, and others felt more comfortable seeking support from others who were willing to help. Many spoke of an intense fear of failing academically at university, which can both be highly motivating to secure academic success (sometimes at the cost of

socialising), but can also immobilise one's desire to try harder as it can be rather disappointing if one does not succeed.

Competence

We identified two themes from students' responses that uniquely related to competence.

Facing difficulties. Students commented on low motivation to complete university when they perceived a lack of personal development. Autistic students felt less equipped both socially and academically to cope with the demands at university compared to their TD peers, and this lack of direction and competency contributed towards feeling overwhelmed and inability to stay in control:

"I felt completely lost... School to university was like falling off a cliff. Going... well when I went to work it felt... I don't know... going for a walk on some hills, there were ups and downs but overall it was a lot more even than a cliff face." (P18, ASD)

Personal growth and development. Students spoke about developing some new hard (academic and technical) and soft (inter/intrapersonal) transferrable skills at university, which they foresaw would help them in the future:

"I think at uni they've like equipped us with a sort of confidence to sort of then go out and feel like we can do a job and do well at it." (P23, TD)

Students described being able to adopt a new perspective when faced with difficult situations, indicating growth and development. Akin to a journey of self-discovery, students learnt to present themselves in an authentic way over time. Students described feeling more comfortable to meet and learn from new people. Autistic students talked about an improvement in managing social naïveté in university with a shift in attitude to actively work on one's sociability:

"The having to practice talking to people and cooperating with people because there's so much group work, and be diplomatic and stuff, I think that will be useful in the future because you have to get on with people." (P05, ASD)

Contrastingly, while TD students spoke about learning new strategies to cope with anxiety and stress, autistic students described feeling less able to regulate their own emotions:

“I think the balance between doing things and learning new things, and having these opportunities, and kind of the anxiety that comes with it, and knowing that you can enjoy it, is a really hard balance that I struggle with.” (P11, ASD)

Relatedness

We identified two themes from students’ responses that uniquely related to relatedness.

Developing social connections. Students talked about their appreciation of having made important social connections at university through both formal academic settings, and informally through shared interests and societies. Such friendship provided a source of companionship and support, and is an important part of university life:

“Now that I’ve got this whole community of different people, it’s so wonderful to have such a supportive group of friends, and have peers who kind of band together to help each other with their projects” (P15, ASD)

Students expressed a desire to diversify their social network so that not all friends are from the same group, which can be difficult to manage at times and appear “cliquey”. Students found it easier to socialise at the start of university, as everyone tried to make friends by being open and friendly, though there was a distinction between peers they simply got along with, versus peers that they “clicked” with and became good friends, and thus finding the right group of people was deemed to be important. Students talked about significant people in their lives, such as a helpful lecturer, or older students who provided reassurance to help ease into the transition, and using social media channels to familiarise themselves with housemates prior to transition:

“I’m still closer with the people that I knew from the start, so that just kind of built the very nice initial bond then.” (P24, TD)

In addition, autistic students also remarked that having pre-arrival preparation events organised by the university provided valuable in-person meeting experiences, and that university allowed them to socialise with peers outside of work-related settings.

Social differences and difficulties. Students found university can sometimes be quite a lonely place as socialising is not always easy, though there is a difference between being alone, feeling lonely, and isolated:

“I’ve never felt like I’m completely alone at uni, but sometimes if you are not getting on with your friends so well... or like you see them doing more things at uni, and you feel like oh that’s where I should be, or you feel like you know, I’m not in that group or something. So I’d say that sometimes you feel isolated.” (P31, TD)

“I am probably an awful lot more alone, and sometimes that can feel lonely. Being alone and being lonely are quite different things.” (P03, ASD)

Maintaining social interactions over time can be challenging, especially when relationships begin to breakdown due to individual differences, and the challenges of socialising and being understood by same aged peers. Students talked about how peer influence can motivate them to stay on track but can also lead to a sense of obligation when it comes to socialising, which can be exhausting:

“I guess some aspects were ok, tolerable, others were slightly more tedious, like the going out, you had to intermingle and socialise, that was fairly laborious.” (P16, ASD)

Although both student groups appreciated having a supportive network away from home, providing emotional support to others can be draining at times, and negatively influence one’s own mental health. Autistic students commented on the lack of motivation to initiate social interaction to actively maintain pre-university friendships when they were no longer within physical proximity at university.

Autonomy and competence

We identified three themes from students’ responses that related to both autonomy and competence.

Academic challenges and pursuit. Students found that having a good academic foundation both in terms of school preparation and learning style to prepare for university was crucial. Students talked about enjoying the academic freedom at university to tailor subjects towards their own areas of interest. Students discussed the difficulties of adjusting to the new teaching and independent learning environment at university, and that the lack of clear guidance and structure in terms of how to determine appropriate quantity and quality of workload affected their mental wellbeing and academic motivation. Both student groups emphasised the importance of persistence being the key to academic success and not being let down by failures:

“It’s more about trying rather than maybe succeeding.” (P42, TD)

Autistic students reflected upon how strengths associated with autism such as tenacity and having a more detail orientated, systematic and analytical cognitive style can all be used to their academic advantage. Autistic students found tailoring their academic assessments towards their special interests can lead to peaks and troughs in motivation, concentration, attention focus and work quality:

“I think it’s a mixture of both positive and negative. From a positive aspect, it’s handy that I have a special interest in psychology, so that means I can definitely learn a lot quicker than most people, and I can do really well with it, which is really handy. The downside is when my special interest changes at times, and I end up thinking more on other subjects than I probably should.” (P08, ASD)

Adjusting to daily life. Students talked about the need to have self-discipline and organisation skills to ensure proper self-care. Daily living tasks were often given less priority compared to social and academic tasks and left incomplete, which negatively affected students’ mental wellbeing. Students recognised the lack of independent living skills prior to university when living at home and reported to have actively tried to develop skills such as cooking, driving, and budgeting in preparation for university. Students highlighted previous experiences of living away from home, whether for recreational (e.g., travelling), health (e.g., hospital stays), or academic purposes (e.g., academic summer camp) to be particularly helpful in getting used to being away from home, and not feeling homesick when transitioning to university.

Time management and organisation. In terms of time management, those who recognised poor organisation talked about struggling during unstructured time at university, and how a lack of self-discipline can lead to continued procrastination when working towards deadlines. Students discussed strategies to help them stay on schedule, including seeking support from others, making lists, and setting reminders. Students spoke about trying to strike a good work/life balance, though TD students talked about being more mindful of the bigger picture and accepting that falling behind is bound to be part of life but having the confidence that one will be able to catch up in time:

“I’ve got a part time job which you need to lend time to as well, so I think it’s for me the adjustment of feeling alright with sometimes being behind on work, and that’s not the

end of the world, because you can catch up, so that sort of adult life of balancing everything.” (P23, TD)

In contrast, autistic students spoke about academia taking priority and willingness to sacrifice social opportunities to secure academic success:

“I find that sometimes social life distracts form... I feel like university should be more about academia and doing well and achieving for yourself, but other people seem to value the social side more, and I just don’t really know. It’s a bit uncertain for me how to get the balance.” (P03, ASD).

Autonomy and relatedness

We identified one theme from students’ responses that related to both autonomy and relatedness.

Social acceptance, motivation, and drive. Students spoke about using social motivation to push oneself to socialise at university and actively trying to make friends:

“... And I think when I realised that and I know that I get a lot of pleasure and happiness from social connections, then my kind of driving force behind creating those connections, it wasn’t kind of because I felt like I should be doing it, or because you know, for some kind of strange reason like I’m going to be missing out, it was more like this is how I know I’m going to be happy, and I guess I realised throughout, so that sort of self-determination became less academic and more social, I’ve never had social motivation before to have friends, but again I just was never really fussed, until university, I realised how good it can be.” (P11, ASD)

Students talked about having social selectivity in order to manage their social time more effectively:

“If I didn’t feel like I can get on with someone, or I couldn’t see that we would be friends, then I would just go and focus on the people who I knew I had a stronger bond with, so I guess in that way that was self-determining” (P32, TD)

Splitting the university social scene based on alcohol consumption, students discussed the importance of finding the right social activities, especially for non-drinkers, and feeling comfortable with one’s own decision rather than being peer-pressured into undesirable activities. Differences arose when

students talked about accepting one's own social differences. TD students spoke about becoming less self-conscious and to focus one's efforts on becoming the best version of oneself:

"I think at university just from talking to people, a lot of them, like no one cares, I think everyone is just trying to get about their life as much as possible. I think it's more to do with kind of being like you are your own person..." (P28, TD)

For autistic students, it was acknowledging the quantity and quality of social contact that one needed in order to maintain one's wellbeing, and not feeling pressured to be surrounded by people all the time. Individual differences in sociability were highlighted as some were actively trying to be involved but lacking success, and others who acknowledged they preferred solitude but were aware how this can be unpopular amongst TD peers:

"I don't really like people that much, if I'm networking it's a nightmare. Some people mistake that for unfriendliness, some people don't like that sort of people and I understand, but in a way, that's made making friends really hard." (P03, ASD)

Autistic students discussed the challenges they faced when trying to join a group at university. However, despite the difficulties, university seemed to bring on a sudden social awakening where they experienced for the first time the value of meeting and connecting with others, through pushing themselves to try out new things which they have found to be very enjoyable, and thus worth the amount of social effort they had put in. Autistic students spoke about being more active in their social relationships to initiate social engagements rather than passively taking part. However, autistic students also recognised how their social differences can be misunderstood by others and led to some degree of social exclusion and lack of close friendships, with one autistic student highlighting how she was "lucky" because acceptance by others is "very unusual" when you have autism.

Autonomy, competence, and relatedness

We identified three themes from students' responses that related to autonomy, competence, and relatedness.

Routine and flexibility. Students expressed wanting to have more structured time and a routine at university to guide their activity planning:

“I think if it was a 9-5 course, or normal teaching time, I don’t think I would have had the problems that I had for the whole 3 years, I think it would have been much easier.”
(P11, ASD)

Students talked about developing their own routine and ensuring that they integrated social and academic aspects of university life into their daily schedule. Students commented that it was important to enjoy the spontaneity of university life and have flexibility within one’s schedule to adapt to changes that might occur. Autistic students expressed a desire for clearer guidance and expectations for what to do during unstructured time on campus, which many struggled with.

Coping with uncertainty. Students expressed difficulties when coping with the uncertainties transitioning into and out of university. Having something familiar, such as living at home, having a good friend from school attending the same university, or even having consistent hobbies can all be good ways to ground oneself despite all the changes:

“I was quite lucky there, so I guess that sort of mediated that sort of negativity of not having my family, and my close circles around.” (P38, TD)

Students found the lack of clarity regarding academic expectations, and how relationships can change or deteriorate over time to be particularly stressful. Attitudes towards stepping into the unknown differed amongst students, with some seeking the thrill of exploring unfamiliar territory, whilst others were reluctant to try out new things without guidance. The idea of being surrounded by strangers both in accommodation and at university was particularly stressful for autistic students, who commented that they could only truly unwind when they returned to parental home.

Family support. Compared to TD peers, many autistic students spoke about the importance of family providing a constant source of support throughout university. Parents served as advocates and liaisons for students:

“It’s always easier to fight someone else’s battles than your own battles... my mum would usually end up fighting mine.” (P01, ASD)

Autistic students found living at home to be a source of comfort, knowing that they had a safe space to return to at the end of the day provided reassurance despite facing challenges at university.

Discussion

Following a critical realist approach, we identified aspects of both autistic and TD-students' university experience that are unique and shared across the conceptualisation of autonomy, competence, and relatedness as defined by Ryan and Deci (2000), and provided evidence of self-determination when shaping the academic, daily living, and socialisation aspects of university life. The flexible nature of a topic guide allowed us to follow-up and clarify the role of *self-versus-other* in students' ability to shape their own university experience.

Students expressed similar perspectives with regards to social motivation and having the self-determination to initiate and establish relationships at university, and found such autonomous behaviours resulted in improvements in social competence over time. For autistic-students, our findings resonate with a recent study which showed that self-determination was associated with participation in structured social activities related to autistic adults' interests (Kim, 2019), and such increased social opportunities helped them observe, evaluate, and improve their social skills over time (Müller et al., 2008). Therefore, rather than lacking self-determination as suggested by previous studies (Wehmeyer et al., 2010; Wehmeyer & Shogren, 2008), we found many autistic-students recognised that challenging themselves and developing social competencies was an important part of reaching their goal of relatedness, and chose to compensate for their social communication differences by drawing upon their self-determination skills.

Autistic-students expressed a preference for routine and stability and were more anxious when coping with changes in schedule and experienced greater emotion fluctuations. Compared to TD students, autistic students in the current sample had a myriad of co-occurring mental health conditions, which present additional vulnerabilities in addition to their autism. In the UK, access to formal mental health support through the National Health Service (NHS) often requires long waiting time, and is not often well integrated with the more informal mental health support within the university such as counselling, wellbeing and peer support services (Batchelor et al., 2020; Byrom, 2018). Furthermore, although benefits from peer support has been noted amongst TD students (Byrom, 2018), challenges such as the need to overcome emotional barriers when disclosing one's mental health difficulties to peers and fear of stigma, as well as concerns around the lack of

professional training in peer support may reduce the adoption and efficacy of such alternative interventions (Batchelor et al., 2020). For autistic students, receiving mental health support that is adapted to cater for social communication differences in autism may be especially difficult (Camm-Crosbie et al., 2019), and there may be added issues around disclosure of autism diagnosis and both personal and external autism acceptance to consider in addition to mental health difficulties (Cage et al., 2018). Therefore, the role of self-determination and self-advocacy for autistic students to navigate and seek out appropriate mental health support at university in light of the challenges above may be even more important when compared to their TD peers.

Furthermore, autistic students' experience of mental health may also be partially influenced by the acceptance of their autism diagnosis by both themselves and others (Cage et al., 2018), such that greater personal and external autism acceptance was associated with lower depressive symptoms, though only the former was associated with reduced stress. Interestingly, anxiety was not associated with autism acceptance by self or others (Cage et al., 2018), which suggests other factors may be at play. In our study, autistic-students may have a greater "tendency to react negatively on an emotional, cognitive, and behavioural level to uncertain situations and events" (Buhr & Dugas, 2009, p.216), which is consistent with the reported increase of intolerance of uncertainty (IU) in autism (Boulter et al., 2014; Cai et al., 2018; Hwang et al., 2020; Wigham et al., 2015). IU encompasses a desire for the future to appear certain (Desire for Predictability), and difficulties making cognitive decisions or taking actions in the face of uncertainty (Uncertainty Paralysis) (Berenbaum et al., 2008; Birrell et al., 2011). IU might mediate the association of autism and anxiety (Boulter et al., 2014), and influence emotion regulation in autistic young people (Cai et al., 2018), where those with higher levels of IU were more likely to engage in maladaptive emotion regulation strategies such as suppression which inhibits appropriate emotional expression (Gross & Levenson, 1993), rather than adaptive strategies such as reappraising a situation to evaluate and modify its emotional impact (Lazarus & Alfert, 1964). Therefore, the need for autistic-students to establish fixed routine might be driven by a stronger sense of IU which increases their vulnerability to experience elevated levels of anxiety (Boulter et al., 2014). Given that we did not explicitly ask students about their IU, anxiety, and emotion regulation

strategies, future studies might investigate if and how any of such factors can interact with self-determination amongst both autistic and TD-students at university.

Another striking comparison between autistic and TD-students was the focus of self-determination efforts at university. Many autistic-students commonly reported viewing academics to be the most important aspect of university life and had a strong sense of persistence and self-determination to succeed. Our study provides evidence that autistic-students are aware of and able to flexibly use their cognitive strengths to their academic advantage at university, thus acting in an autonomous and competent manner (Field & Hoffman, 1999; Wehmeyer et al., 2010). Some autistic-students were aware that their academic focus was at odds with the preference for socialisation shown by their TD peers, who were more engaged in a wider range of social settings and valued social life just as, if not more, important than academic-studies.

However, whilst some autistic students viewed socialising to be a source of threat that could jeopardise their academic success if indulged in, others highlighted the importance of social connections at university beyond that of academics. Autistic-students who positively embraced new opportunities and developed meaningful social connections at university have been found to report better wellbeing, relative to those who had more difficulties in making friends (Bailey et al., 2019). Autistic-students in the current study expressed different degrees of sociability, drawing the distinction between feeling “alone” and “lonely”, with the latter contributing to low mood and anxiety. With some autistic-students finding socialisation at university to be “necessary but exhausting” (Van Hees et al., 2015), university stakeholders might consider encouraging students to find the right balance of academic and social life for themselves at university, with an overall goal of maintaining one’s wellbeing at university, beyond that of either social and/or academic success.

It should be noted that some of the challenges highlighted by autistic students in the current study such as the lack of structure and organisation at university that can exacerbate one’s sense of anxiety due to fear of uncertainty, and the contrast between better quality family support versus poor social integration, feelings of loneliness and lack of proactive campus-based support resonate with factors that were associated with the decision to drop-out of university by autistic students in recent quantitative and qualitative studies (Cage et al., 2020; Cage & Howes, 2020). Given that some of the

students in the current study were just beginning their undergraduate studies, follow-up studies can be an important next step to explore how students may develop coping strategies as they progress through university, or whether some of the current challenges discussed may predict their retention status in the near future. It is also important to note that for almost half of the current sample of autistic students, family support facilitated a greater sense of self-determination in their pursuit of university studies. Having a high and consistent level of family support when faced with varying quality of institutional and peer support may be especially relevant to maintain autistic students' engagement at university (Cage & Howes, 2020), and considered as one part of the micro support system around the individual to secure better transition and retention outcomes (Cage et al., 2020). Future studies should seek to compare and contrast how support from family, peers and educational staff may interact to support the development and maintenance of students' self-determination in their ability to pursue, continue and complete higher education in the UK amongst autistic and TD-students.

Another limitation is that the critical realist position adopted in the current study might limit the extent to which our findings may be of use to research stemming from a more positivist background. However, anecdotal evidence from the current study can help contextualise and extend beyond the quantitative differences in the capacity for self-determination from previous studies (Chou et al., 2016; Wehmeyer et al., 2010), and future studies may benefit from mixed-method designs (Chou et al., 2017; Wehmeyer & Kelchner, 1995; Wolman et al., 1994).

Finally, the use of the AQ as a way of screening for and characterising autistic traits in both student samples also has caveats. Although the AQ has good sensitivity and specificity when used to discriminate between autistic individuals and TD controls (Booth et al., 2013), poorer specificity arises when the AQ is used to predict autism diagnosis in a clinically referred yet undiagnosed sample (Ashwood et al., 2016). When using the AQ to predict autism diagnosis in a sample referred to an autism diagnosis clinic in the UK, nearly two thirds of participants who scored below the clinical cut-off went on to receive an autism diagnosis, thus suggesting that the AQ did not predict autism diagnosis beyond chance level in a clinically referred sample (Ashwood et al., 2016). In the context of the current study, the high sensitivity of the AQ may be helpful in detecting elevated autistic traits in a

healthy TD sample, but its low specificity would mean that it cannot sufficiently prove that those who score below the cut-off in the clinical sample do not have an autism diagnosis. Therefore, elevated levels of autistic traits in the TD sample was used to exclude controls, though AQ scores for the autism sample was only used to assess current levels of autism traits and not used to exclude students if they scored below the cut-off. However, given that the AQ was the only means of characterising autistic traits/autism symptoms in the current study, there may be some inaccuracies in self-reporting of symptoms, and future studies should seek to include and triangulate clinician and parent/carer assessments to further inform and verify autism diagnosis.

In conclusion, the current findings help us understand self-determination that young people harness when navigating their development as young adults orienting to life goals. While a highly individualistic process, shared experiences expressed by all students highlight that they provide a remarkable resource for themselves and others in similar positions. For autistic-students, sharing their self-determination through the self-advocacy movement may support other incoming students to become more self-reliant and secure a successful transition *into, through* and *out* of university.

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Appendix A

Methods

Materials

Demographic Questionnaire

Participants were asked to report their age, gender, ethnicity, autism and other past or current mental health, chronic physical illness, or specific learning disability or developmental conditions. Participants were asked to list their pre-university performance by stating the number of A-Levels (or equivalent) they completed, and the grades received. Students reported their current degree of study and university attended, the current year of study they were in, and living status.

Autism Quotient (AQ; Baron-Cohen et al., 2001)

The AQ is a 50-item self-report questionnaire which assesses five different domains of autistic traits, including social skills, attention switching, attention to detail, communication, and imagination. Participants rate the extent to which they agree with each statement, which is subsequently scored either 0 or 1 depending on whether or not the autistic trait has been endorsed. The AQ has good internal consistency and test re-test reliability (Baron-Cohen et al., 2001), and has a screening cut-off score of ≥ 26 , and clinical cut-off score of ≥ 32 .

Results

Interview Format and Duration

All participants completed the interview either in person or via the phone (Table 1), which lasted between twenty to fifty minutes for TD students, and twenty minutes to one hour for autistic students. Comparing the word count from interview transcripts, there were no statistically significant differences ($t(34) = .60, p = .55$) between interview length for autistic students ($M = 5878.33, SD = 1595.90$), and that of TD students ($M = 5575.72; SD = 1409.94$). Given that the topic guide clarity was improved based on one autistic students' feedback during pilot phase, both student groups perceived the interview schedule to be clear and easy to follow, and no further adaptations were made.

Appendix B

Questions from the interview topic guide:

WARM UP QUESTIONS

1. Which course are you studying?
2. Which year of study are you in? How long is your programme?
3. How did you reach the decision to start university? How old were you?

INTERVIEW QUESTIONS

1. Thinking back to first starting university, what was transitioning to university like for you?

PROMPT:

Think back to moving in, Freshers' Week, introductory lectures, meeting your flatmates for the first time?

2. Were there any previous experiences, or things that you've done, which you felt were helpful in preparing you for making the transition to university?

3. How has university life been like for you?

PROMPTS:

Can you tell me about some of the positive and negative experiences you have had?

Has anything changed since first transitioning to university? How have things changed?

Prompt for academic, daily living, and social domains.

4. To what extent do you feel like your university life is being shaped by you? (or in other words, to what extent do you feel like you are in control of your university life?)

PROMPTS:

Which personal qualities or strengths do you think have helped you?

Are there other people that have helped you along the way?

Any formal / informal support? If yes, What has helped you in seeking support?

5. How do you think your university life might compare to other students?

Prompt for academic, daily living, and social domains.

6. Are there things you wish would be different in your university life? What are they?

Prompt for academic, daily living, and social domains.

7. Autistic students only: In what ways do you think autism has had an impact on your university life?

8. What do you think life might be like when you graduate from your current degree or when you leave university?

PROMPT:

How do you think it will compare to your experience of transitioning to university?

9. Do you think there are things you've done, or skills you've gained during your time at university that will help prepare you for transitioning out of university?

10. Is there anything else about your experience of university life (transition to and from university) that you would like to add / that you think is important and we have not mentioned yet?

Post Chapter Seven Commentary

Chapter Seven explored self-determination in both autistic and typically developing students and recent university graduates in the UK across academic, daily living, and socialisation aspects of university life. The current qualitative study identified many similarities in themes underlying autonomy, competence, and relatedness of self-determination in both student groups, and highlight that there are many shared goals, skills, and perspectives when reflecting upon their ability to shape their own university experience, regardless of having an autism diagnosis.

Whereas previous quantitative studies which found poorer levels of self-determination in autistic students relative to students with specific learning difficulties hypothesised that their social communication difficulties might negatively influence their ability to form secure and supportive social relationships relative to their peers (Chou et al., 2016), the implied association that poor relatedness to others would directly underpin relatively poorer autonomy and competence is not fully supported by the current study. Although some autistic students reflected upon their social differences and difficulties that affected their ability to relate to other peers, many also commented on establishing more positive social relationships at university and benefitting from a more enriched social life compared to school. In contrast, we found evidence supporting that some autistic students became more autonomous in their approach to social relationships at university, and were able to more actively pursue and initiate social interactions that improved the quality of their social relationships, and thus overcoming some of the social difficulties they had experienced. Therefore, the qualitative nature of the current study allowed us to understand to what extent autistic students perceived their own social communication differences to affect their ability to act in a self-determined way at university when relating to others, thus offering a more comprehensive and in depth exploration on this matter compared to previous quantitative findings.

More positively, Chapter Seven also showed that many autistic students were able to identify and make use of their autism associated strengths at university to positively influence their academic studies. The detail orientated approach and perseverance that many autistic students found to be beneficial for academic performance resonated the literature identified in Chapter One that highlighted autism related strengths at university. Therefore, university stakeholders should consider

how to best adopt a strengths-based approach when scaffolding any academic related support for autistic students during transition to university, and encourage autistic students to find and make use of the learning style that would allow them to play to their cognitive strengths when completing assignments related to their course, thus improving both their autonomy and competence.

In contrast, compared to typically developing students, autistic students reported to have found the transition experience and coping with change to be more difficult overall, and expressed a stronger desire for routine and structured activities to help ease their anxiety associated with uncertainty at university. As anxiety was found in Chapter Five to have more long-term negative impact on students' university transition experience over the first year, it is important for stakeholders to recognise the continued negative impact that anxiety and lack of structure might have on an autistic students' wellbeing throughout their university career, beyond that of first year. Therefore, the qualitative method used in Chapter Seven serves to provide some context around potential factors affecting students' anxiety at university in addition to the quantitative studies in Chapters Four and Five, and further outlines the need for stakeholders to build in tailored intervention programmes to support autistic students in their ability to manage and effectively cope with uncertainty and anxiety at university.

Chapter Eight

General discussion

The overarching aim of this thesis was to extend our understanding of autistic students' university transition experience relative to their typically developing (TD) peers. The inclusion of TD students as a comparison group is to acknowledge that university transition can be a stressful time for many students, as they leave their familiar social environment behind and face increasing academic, daily living, and social demands through pursuing independent living at university. Whereas previous literature discussed in Chapter One highlighted many challenges that autistic students face during transition to university, it is unclear without a direct comparison group to what extent such challenges are *shared* by most students regardless of autism diagnosis, or *uniquely* affect autistic students only. Understanding shared and unique challenges that affect different student populations will inform stakeholders when formulating different transition planning interventions in an individualised and evidence-based format, in order to best support university transition for different student groups.

In order for university stakeholders to best understand how to support students during the university transition process, it is important to gain an understanding of how students are able to access different sources of support by navigating the social capital available to them within their social networks, as well as students' intrinsic sense of determination to shape their own university experience in a constructive manner. To understand students' perceived quantity and quality of support provided by *other* people across various domains of university life, the current thesis used social network analysis in order to quantitatively capture the changes in both social network structure and perceived social support that autistic and TD students perceived across the first year of university (Chapters Two to Six). To explore to what extent students perceived themselves to be *self-determined* in their university life, the current thesis used semi-structured interviews to qualitatively capture whether students felt autonomous, competent, and had an established sense of relatedness at university (Chapter Seven). The findings from each chapter will be discussed in relation to relevant theory, highlighting similarities and differences between autistic students and their TD peers, as well

as their implications for practice. Future directions and limitations of current research will also be discussed.

1. Understanding social networks through multiple perspectives

Using the Social Network and Perceived Social Support (SNaPSS) tool piloted in Chapter Two, the cross-sectional and longitudinal studies in Chapters Four and Five highlighted that TD students have a relatively larger social network size at the point of entering first year of university compared to their autistic peers. From an evolutionary perspective, the mean social network size identified by both student groups fall within the sympathy group identified in literature, which consists of a cluster of network members whose relationships the individual particularly values and keeps in close contact with (Dunbar & Spoors, 1995; Hill & Dunbar, 2003; Roberts & Dunbar, 2011), and similar to the mean social network size identified in a previous college student study (Hays & Oxley, 1986). The sympathy group identified is consistent with the SNaPSS which asks individuals to identify “people whom they have been in contact with in the past three months and consider to be close to”, demonstrating that the SNaPSS is a useful tool to gain insight into key social network relationships that an individual has over a given period of time.

For both student groups, the relative percentage of family members compared to other network members over time is consistent with previous literature that investigated the network composition of sympathy groups (Dunbar & Spoors, 1995). The importance of maintaining a relatively stable group of close family members over time is in line with the Social Convoy Theory (Kahn & Antonucci, 1980), which suggests that despite the changing dynamics in network structure and quality of relationships over the life course with various network members due to changes in one’s life circumstances, family members who form the inner most circle of the convoy should remain stable over the lifespan. From a developmental perspective, the Social Convoy Theory also draws upon Attachment Theory (Ainsworth, 1978; Bowlby, 1979), such that the social convoy uses key attachment figures from early infancy to form the core inner circle in early childhood, and the security and affection provided by such core figures then form a secure base from which children can begin to explore and expand their social convoy to extended family members in middle childhood, and to external friendships in adolescence and young adulthood (Kahn & Antonucci, 1980; Levitt & And

Others, 1993). Family was identified to provide a source of stability amidst all the changes one experiences during transition to university by autistic students in Chapter Seven, which resonates the idea from both Social Convoy Theory and the evolutionary perspective that because family relationships are somewhat obligatory, they provide stability that is particularly valuable when time and energy are seen as potentially limited resources, as individuals can spend considerably less time and energy in maintaining the same quality of family relationships over time (Dunbar & Spoors, 1995; Wrzus et al., 2013).

Contrary to what previous literature highlighted about potential social disconnectedness of autistic students at university (Gelbar et al., 2014; Jackson, Hart, Brown, et al., 2018; Jackson, Hart, & Volkmar, 2018), the quantitative social network analyses found both groups showed a significant increase in relative percentage of friends that were included in their social networks over time, relative to family members and other university staff members. For TD students, social network size decreased over time, as students pruned their social networks but maintained different social clusters such that the network density also decreased over time. In contrast, autistic students showed relatively stable social network size and density over the first two semesters of their first year at university. The relative increase in friendship composition is consistent with developmental literature, which highlights that over the course of adolescence, young people may begin to increasingly rely on friends for a range of emotional and information support, and decrease their dependence on family members, in order to support more independent living (Lee & Goldstein, 2016). The Social Convoy Theory also suggests that in contrast to obligatory family relationships, friendships are optional, and therefore developing successful friendships independent of family relations may facilitate a sense of autonomy as young people begin to become more confident in their ability to seek emotional comfort and become more socially integrated into society (Antonucci & Akiyama, 1995; Fiori et al., 2006).

Friendships are particularly important for providing a sense of community and social norms outside of the family context for young people, and reciprocal friendships enables one to receive constant social feedback that provides a sense of self-worth, and allows one to feel better integrated into the local community and broader society (Antonucci & Akiyama, 1995; Fiori et al., 2006). From a developmental perspective, previous literature found that autistic children are more likely to be

found on the periphery of social groups in a classroom setting when using a sociomap approach (i.e., all classmates rate their relationships with each other) (Anderson et al., 2016; Chamberlain et al., 2007; Kasari et al., 2011; Locke et al., 2010, 2013; Rotheram-Fuller et al., 2010), and autistic children with a greater level of social connectedness at the start of the school year are also more likely to lose a number of social connections over time, suggesting the quality of such friendships are not perceived to be reciprocal or stable (Anderson et al., 2016). Developmental literature also found differences in the definition of friendship between TD and autistic children, where the former identify friendships that carry greater emotional salience and are more reciprocal in nature, whereas autistic children might employ a more loosely defined sense of friendship and misinterpret social pleasantries for friendship (Chamberlain et al., 2007; Freeman & Kasari, 1998). One striking finding was that whereas school-age TD children consistently reported greater loneliness in the absence of strong social network involvement in the classroom, the relationship between loneliness and social connectivity was not always present amongst autistic children (Chamberlain et al., 2007). However, one study found that amongst autistic children aged 7-14 years who do not have co-occurring learning difficulty (i.e., have an IQ score > 70), loneliness ratings were greater for autistic children compared to their TD peers even when they reported to have at least one friend/best friend (Bauminger & Kasari, 2000). Therefore, developmental literature suggests that some autistic individuals might be particularly aware of their social differences and able to recognise its impact on one's ability to form and maintain good quality social relationships over time, which might be particularly distressing.

Although Chapters Four and Five did not quantitatively measure students' perceived loneliness at university, the qualitative interviews in Chapter Seven did reveal that many autistic students were able to identify their social differences when compared to TD peers and discussed the ideas of being "lonely" versus being "alone" at university. The former being a negative and passive state of being due to poor social connectedness, the latter being a more neutral and often voluntary state of being that is independent of one's relationships with others. The discussions around barriers and facilitators to establish a sense of social relatedness at university also highlighted the varying degrees of sociability of autistic students at university, with some who viewed socialising with same aged peers to be more of an obligation than a source of enjoyment, thus in line with the Social

Motivation Hypothesis of autism that suggests some autistic individuals might lack the intrinsic motivation to socialise with others (Chevallier et al., 2012). Maintaining relationships that are perceived to be necessary but not intrinsically enjoyable can also be exhausting for many autistic students and negatively impact their mental wellbeing (Van Hees et al., 2015). Nonetheless, many autistic students in Chapter Seven did reflect upon their friendships during university positively, suggesting that autistic students who may have a higher degree of sociability at university may be more self-determined and active in pursuing friendships than peers with lower degrees of sociability.

The social pruning seen in TD students' social network size in Chapter Five may be explained by the Socioemotional Selectivity Theory (Carstensen, 2006; Carstensen et al., 1999; English & Carstensen, 2014), which suggests that there are two underlying sources of motivation behind social relationship formation, one is for information seeking and knowledge expansion, the other is for emotion regulation and improving psychological wellbeing. The trade-off between the two sources of motivation is dependent on one's perception of time, such that when one perceives time to be an abundant and unlimited resource, one is driven towards information and knowledge seeking through establishing novel and distinct relationship clusters, which would be expensive timewise to maintain in the long run. Such information seeking behaviour and social initiation is particularly important during times of transition in one's lifetime, as more novel information also brings a wealth of opportunities and new experiences that one may not be able to access otherwise (Scott, 2017). In contrast, when time is perceived to be limited resource, one is more likely to only focus on a small circle of relationships that help an individual maintain a positive outlook and psychological wellbeing and lose the less well known and periphery social network members. Such social selectivity is especially beneficial either during times of stability or for maintaining a sense of stability over time (Scott, 2017).

In contrast, autistic students showed a more stable social network size over time compared to TD students. In Chapter Seven, one striking difference between autistic and TD students' perception of university experience is that for many TD students, university was perceived to offer a wealth of new opportunities for one to explore and forming new social relationships can take precedence over one's academic pursuit. The drive for novelty seeking and knowledge expansion might explain why

social networks for TD students during the first two weeks of first year of university are relatively larger than those of a group matched sample of autistic students in Chapter Four. In contrast, autistic students in Chapter Seven frequently expressed their priority in securing good academic performance, such that they might be more likely to perceive time at university to be a more limited resource when accounting for study time, and therefore new relationships formed may be more selective compared to their TD peers, and driven by maintaining psychological wellbeing or shared interest. Therefore, understanding individual differences in self-determination underlying social behaviours from a qualitative perspective in Chapter Seven provide some contextualisation for the social network changes observed from quantitative findings in first year of university.

In terms of social network density, TD students showed reductions in network density over time suggesting more distinct social clusters between different friendship groups and family. In contrast, autistic students showed relatively stable network density over time suggesting that despite the gain in relative percentage of friendships over time, such friends tend to form one or few clusters, and may also be more integrated with their family relationships. From a social network analysis perspective, social network density offers insight into the potential flow of available social capital or support within one's network relationships (Scott, 2017). For example, a densely connected social network where the majority of social network members are in frequent contact with each other can provide better flow of support, as individuals may in theory approach any single network member and either directly or indirectly receive the information or support they are looking for as network members communicate with each other. Having a strong sense of social cohesion in terms of network density has also been suggested to have protective functions for one's mental health (Durkheim, 1951), to not only buffer against stress during crises, but also to help maintain one's psychological wellbeing through direct social influence and guidance (Cohen & Wills, 1985; Hammer, 1983; Kawachi & Berkman, 2001). However, some studies have suggested that the relationship between social cohesion and social capital is not always linear, such that although social embeddedness can provide individuals with a sense of identity, belonging, and social support, too much social integration can equally lead to social pressures to conform to the group norms due to fear of negative evaluation

by peers, and such social pressure can be detrimental to one's mental wellbeing (Kushner & Sterk, 2005; Mueller & Abrutyn, 2016).

Despite network density differences, both student groups perceived family and friends to provide better quantity and quality of support over time. Therefore, it may be that the potential greater maintenance of social cohesion for autistic students might provide them with easier access to support during times of need, though a lack in network diversity may also place greater strain on their freedom to socialise with specific network members without social pressure or judgement from others compared to TD peers. Qualitative feedback from autistic students in Chapters Six and Seven revealed that autistic students do have a desire to expand the diversity in their social network structure, and for their friendship clusters to be more independent from their families when transitioning to university. Some autistic students expressed that more friendship groups would offer them the flexibility to pick and choose how they would like to spend their social time and with whom, without worrying that some peers might feel left out and unsupported. Therefore, despite both student groups reporting similar patterns of perceived social support from their networks, it may be that the reduced network density over the course of first year of university seen in TD students can buffer against some of the stress induced by social pressure.

Finally, both student groups also perceived daily living support to be greater than socialisation and academic support over the first year of university. Given that Chapter One highlighted that many autistic students might experience difficulties in executive functioning and find daily living tasks that require planning and organisation to be particularly difficult (Barnhill, 2016; Demetriou et al., 2018; Demetriou et al., 2019; Ozonoff et al., 1991), as well as adapting to changes in one's routine (Dipeolu et al., 2014), it is positive to see that many autistic students perceived that they received frequent and good quality support related to tasks such as cooking, budgeting, and self-care and adapting to changes in routine. When taken together with both autistic and TD students' perceptions of daily life at university in Chapter Seven, it is important to highlight that both student groups reported varying degrees of preparedness they had in daily living tasks at university ranging from cooking to doing simple cleaning and housework, suggesting that the experience of moving away from home and realising the daily hassles associated with independent living can be a

transitional milestone for any students, regardless of autism diagnosis and level of executive functioning. However, a striking difference in Chapter Seven is autistic students' greater need for routine and structure compared to their TD peers, who were more accepting of flexibility and spontaneity in their daily living schedule compared to autistic students. Therefore, it may be that despite both student groups experience similar daily living challenges and perceived support, autistic students are less able to cope with the uncertainties and lack of structure at university which can be anxiety-provoking (Boulter et al., 2014), the latter being more autism specific and may be directly addressed by specific interventions targeting how to best cope with uncertainties in everyday situations (Rodgers et al., 2017).

2. Autistic traits or social anxiety?

One of the main aims of the thesis was to compare and contrast to what extent levels of autistic traits and social anxiety might affect changes in students' social networks and long-term transition outcomes during first year of university. Cross-sectional and longitudinal quantitative findings from Chapters Four and Five found that higher levels of social anxiety in the first year of university appeared to have more long-term and widespread negative impacts on transition outcomes for TD students, which resonate with findings from previous studies (Russell & Shaw, 2009; Russell & Topham, 2012; Topham & Russell, 2012), as well as autistic students. In contrast, the negative impact that higher levels of autistic traits have on socialisation transition outcomes at university may be more evident at the start of university transition for autistic students but can affect TD students throughout the first year.

For TD students transitioning to university, one study found that those who were more concerned with their social performance were more likely to minimise social engagement, though this pattern of cognitive, affective, and behavioural appraisal was highly context dependent and varied across individuals, thus suggesting a potential difference between perceived state and trait social anxiety (Campbell et al., 2016). In Chapter Five, the mean level of social anxiety over the first two semesters was used to measure sustained levels of social anxiety over time which bears greater resemblance to that of trait social anxiety. The more widespread negative impact that social anxiety had on transition outcomes for TD students therefore resonate with that found in prior literature,

where greater trait social anxiety led to greater dissatisfaction and poorer attachment to students' undergraduate institutions (Langston & Cantor, 1989; Strahan, 2003), and poorer academic outcomes (Arjanggih & Kusumaningsih, 2016; Brook & Willoughby, 2015). TD students with elevated social anxiety who are more withdrawn might have greater difficulties in taking part in academic discussions and group work, less likely to seek help when needed, and have a relatively smaller social network with limited informational support that would hinder their academic adjustment at university (Brook & Willoughby, 2015; Mackinnon, 2012).

In addition, Chapter Five showed that having higher levels of co-occurring autistic traits alongside heightened social anxiety further reduced socialisation outcome, suggesting an added layer of social vulnerability. A previous study estimated that around 0.7-1.9% of TD students in university have heightened levels of autistic traits that is at the clinical threshold for autism diagnosis, depending on whether the diagnosis is viewed in binary terms or as a continuous spectrum (White et al., 2011), and a degree of high co-occurrence between elevated autistic traits and social anxiety was observed. Amongst TD university students who had higher levels of autistic traits, those with greater social deficit scores also reported friendships of shorter duration and lower quality that contributed towards a greater sense of loneliness, and students showed a reduced social motivation in both initiating new friendships at university as well as maintaining old friendships (Jobe & Williams White, 2007). In contrast, TD students with lower autistic traits showed higher social motivation and reported having more reciprocated and longer friendships (Jobe & Williams White, 2007), suggesting that autistic trait associated social difficulties in TD students might be related to degree of social motivation that can affect their degree of social embeddedness at university, which might also have knock-on effects on their personal emotional wellbeing and sense of institution attachment beyond that of socialisation outcomes.

It is important to note that in Chapter Five, neither social anxiety nor autistic traits were associated with socialisation outcomes for autistic students across first year of university, and individual differences in degree of social motivation and sociability in Chapter Seven might suggest that not all autistic students perceived paucity of social network relationships at university in an equally negative light. More positively, many autistic students in Chapter Seven found that university

provided a helpful window for them to develop their own social skills, and some felt that university helped them establish a greater sense of self which mitigated their fear of negative evaluations in social encounters. Successful social encounters at university also helped many autistic students to be more accepting of their social differences and allowed them to uncover a sense of social motivation by realising how social interactions can have a positive influence on their psychological wellbeing. It may be that independent of levels of autistic traits and social anxiety, the degree of social motivation and sociability underlies autistic students' self-determination in pursuing social connections at university and remains to be a future direction to be explored.

3. The role of self-determination at university

Another main aim of the current study was to explore how autistic and TD students perceived themselves to be effective and self-determined agents that are autonomous, competent, and have developed a sense of relatedness at university that allowed them to shape their own university experiences. Contrary to previous quantitative studies that have suggested autistic young people show poorer levels of self-determination and self-awareness due to their social communication difficulties that affected their ability to develop successful relationships with others (Carter et al., 2013; Chou et al., 2016; Wehmeyer et al., 2010), the use of qualitative interviews in Chapter Seven found many similarities as well as differences in the reports of self-determination between autistic and TD peers. Although there is evidence to support both student groups being able to meet the basic psychological needs of autonomy, competence, and relatedness that underpin one's self-determination and intrinsically motivated actions (Deci et al., 1991; Deci & Ryan, 1985; Ryan & Deci, 2000), more autistic students expressed concerns over the balance between academic achievement and socialisation at university, the difficulties in emotion regulation and managing uncertainty, whilst coping with changes in one's routine when transitioning to university.

Similarities and differences in autistic and TD students' self-determination at university can be interpreted from a developmental perspective, drawing upon literature on human motivation. According to the Cognitive Evaluation Theory (CET; Deci et al., 1991), the motivation behind self-determined actions are either internally located in order to pursue an interest or goal that is intrinsically rewarding, or to pursue an interest or goal that is extrinsically regulated yet aligns with

one's sense of self and intrinsic values. The integration of externally regulated goals into one's own personal values and identity often requires one to develop a good sense of social connectedness with others, such that by adopting the values and goals of those whose relationships they value, a sense of belonging and identity can be fostered in return.

Understanding the conditions that are required for one to act in a self-determined way resonates with Maslow (1943)'s Theory of Human Motivation. Maslow (1943) proposed that in order for an individual to realise one's full potential through personal growth (self-actualisation), one needs to progress through a hierarchy of needs including basic needs for survival (physiological), the need to establish a sense of stability (safety), the need for belonging and relating to others (social), and establish a sense of competence and autonomy to secure achievements and gaining respect from self and others (esteem). In parallel to the self-determination theory (Deci et al., 1991; Ryan & Deci, 2000), autonomy and competence are viewed to be based on establishing a secure sense of social connections which foster the development of self-identity and self-esteem. When interpreted in the context of transitioning to university from a developmental perspective, establishing a sense of identity through exploring one's personal values, beliefs, and goals to fulfil one's psychosocial needs during adolescence, as well as developing intimate and fulfilling social relationships to avoid feelings of social isolation and loneliness during young adulthood are also described in the fifth stage (identity versus role confusion) and sixth stage (intimacy versus isolation) of Erikson's (1950, 1963) eight stages of psychosocial development respectively. Therefore, the value of establishing secure social relationships to help one uncover a more integrated and developed sense of self, as well as mature into the role of a self-determined adult to function in an autonomous and competent way, is highlighted by both developmental and human motivation theories.

Applying the above theoretical constructs to findings from Chapter Seven, it can be seen that the value placed on establishing secure social relationships at university is different between autistic and TD students. Compared to the consensus amongst TD students that meeting new people and having new experiences are both positive aspects of transitioning to university, such clear social motivations are not unanimously voiced by autistic students. Autistic students' account of social experiences at university expressed mixed feelings of gratitude and surprise amongst those who were

able to develop and maintain successful friendships at university despite recognising their social differences, as well as a sense of fear and ambivalence amongst those who remained on the periphery of social networks either involuntarily due to lack of social initiation, or voluntarily due to actively prioritising academic studies over socialising with peers. Translating the contrasting student views back to Maslow's Theory of Human Motivation, it seems that a linear trajectory through this hierarchy of needs that relies on social relationships to reach higher levels of self-esteem and self-actualisation applies more closely to that of TD students' experience at university. For TD students, once their safety and social needs are met through establishing a secure sense of social embeddedness through new social connections, they may then be able to selectively prune their social networks as reflected by Chapter Five to maintain supportive relationships that facilitate growth of self-esteem and self-actualisation, as suggested by the Socioemotional Selectivity Theory (Carstensen, 2006; Carstensen et al., 1999; English & Carstensen, 2014) and Social Convoy Theory (Kahn & Antonucci, 1980) as discussed previously.

In contrast, the progression through the hierarchy of needs by autistic students seem to be much more varied and not always dependent on establishing secure and social connections with one's peers. The identification of family support as a main source of stability for many autistic students in Chapter Seven and a general concern towards adapting to the unstructured nature of university life and changes in one's routine suggests that safety and social needs for autistic students may not necessarily be derived from peer relationships. In addition, autistic students' pursuit of academic mastery due to a combination of fear of failure and following intrinsic motivation associated with studying their subject of interest also suggests that esteem needs for autistic students may also be derived from non-social aspects of university life.

Nonetheless, themes identified under autonomy such as *Finding meaning and purpose* and competence such as *Personal growth and development* highlight that for both student groups, there is progression through the hierarchy of needs and a clear direction towards pursuing the higher goals of esteem and self-actualisation. Relating back to Maslow (1943)'s original conception of the hierarchy of human needs, he discusses that the potential flexibility within hierarchy when an individual is willing to sacrifice and deprive themselves of a lower need, perhaps due to long-term deprivation of

this basic need, in order to achieve the higher need that is more valued. Applying this argument to the previously discussed models underlying social anxiety in autism as proposed by Bellini (2004, 2006) in Chapter One, perhaps increased exposure to negative social experiences throughout an autistic individual's childhood may potentially deprive this individual the satisfaction of safety and social needs based on peer relationships, and thus a fear of negative evaluation by peers combined with increased social withdrawal might therefore drive autistic individuals to prioritise non-socially related goals such as academic performance to underpin a sense of self-competence.

From a developmental perspective, Erikson (1950, 1963) conceptualised that children will begin to form a sense of self-esteem, competence, and purpose through a reciprocal process of initiating social interactions and receiving positive reinforcements from social partners during the third (Initiative vs. Guilt) and fourth (Industry vs. Inferiority) developmental stages. Therefore, the potential lack of early positive social experiences from peer interactions for autistic children might contribute to their increased awareness of their social differences during childhood, and result in compensatory strategies where they learn to prioritise non-socially driven personal values and goals to shape their identity as they seek to find their place when integrating into wider society during the fifth developmental stage (Identity vs. Role Confusion).

Taken together, it therefore begs the question whether potential reduced sociability expressed by some autistic students truly originates from a lack of desire to connect with peers (more intrinsically motivated), or whether such social withdrawal may be a consequence of previous persistent negative social encounters throughout development, such that long term deprivation of successful social connectedness have driven these students to resort to pursuing higher needs of self-actualisation through academic pursuit by forgoing peer connections. Although this distinction cannot be clarified in the scope of this thesis, given that the data collected did not explicitly monitor students' levels of sociability nor assess students' quality and quantity of social relationships throughout their childhood and adolescence, it does highlight the complexity of partitioning the balance between autistic students' social and academic motivation when reaching beyond the surface. Therefore, it may be possible for autistic students to achieve the higher levels of self-actualisation needs purely from a non-social and academic perspective by relying more heavily on family support. However,

these autistic students may bear an added mental health cost such that they may be more anxious in an increasingly complex social world and experience more emotion regulation challenges when coping with the uncertainties in their unstructured daily life at university.

In comparison, those who experienced more positive social encounters at university showed evidence of a more linear progression through the hierarchy of needs analogous to their TD peers, evidenced by the development of social skills identified as an area of personal growth and competence, suggesting that valuable peer relationships contributed towards the achievement of esteem and self-actualisation. Therefore, it seems that there is no uniform one size fits all formula for autistic students to achieve their full potential at university by meeting esteem and self-actualisation needs. It may be that the social vulnerability for some autistic students are much greater than others based on the path they undertake to secure their higher needs.

4. Implications for practice

Taking into account the findings in this thesis surrounding changes in students' social networks during transition to university, identifying social anxiety as a key factor underpinning transition outcomes in first year of university, and helping students feel self-determined and reach self-actualisation at university, some practical implications are discussed to assist stakeholders when planning how to help students to transition *into* and *through* university.

4.1 Social network transition

Based on individual differences in sociability and motivations underlying the state of autistic students' peer relationships, university stakeholders may consider how best to support autistic students to feel autonomous and competent in their ability to scaffold their social environment in a way that enables them to reach their self-determined goals towards self-actualisation at university. Taking into account autistic students' unique and special interests, university stakeholders may consider organising structured activities that take place in small groups as part of the pre-arrival university event, where students can more easily meet with others with shared mutual interest (whether academic or extracurricular activities) as they transition *into* university and construct social relationships over time. In addition, university stakeholders may consider how to support autistic students to plan for and establish distinct friendship clusters through different socialising means whilst

they move *through* university, in order to offer students a range of social opportunities and choices to explore different interests and satisfy their social and emotional needs.

Chapter Six discussed a pilot social network workshop to support autistic students in understanding the structural and functional components of social networks from a theoretical perspective, using visual social network maps to assist students in recognising social changes associated with transitioning to university, and helping students to play an active role when planning how to scaffold their social networks before they transition to university. The positive quantitative and qualitative feedback from Chapter Six highlight the potential usefulness of this workshop as a way to concretely define the meaning and value of different types of social relationships that a student can maintain and develop during university transition. For many, the visualisation of social network maps played to the visual strength as part of their preferred learning style (Rao & Gagie, 2006), making abstract concepts such as social relationships more concrete and reducing uncertainty and anxiety. In contrast, witnessing the paucity of social network relationships served as a bitter reminder for some students who struggled to maintain and develop social networks outside of their family.

Relating back to Maslow (1943)'s hierarchy of needs, the mixed emotional and practical responses expressed by autistic students upon visualising their pre-university social network maps highlight that there may be existing vulnerabilities amongst some autistic young people's social relationships such that they may lack a sense of social security and perceive themselves to be less competent and autonomous in their ability to develop and maintain relationships outside of family. Using social network maps as part of the pre-university transition planning may help university stakeholders identify potential social vulnerabilities amongst incoming students and formulate with students individualised action plans on steps they can take when transitioning to university in order to build towards their desired social network structure over time. Such active planning can also help autistic students take ownership and be more self-determined over their social sphere, and highlighting potential barriers and facilitators towards supporting each individual in reaching their desired social network outcome can also help minimise a component of uncertainty associated with social changes, as well as potentially reduce anxiety associated with transition to university.

The involvement of autistic students in their own university transition planning has been considered to reflect a students' level of self-determination when transitioning to university, and has been found to be associated with better university transition outcomes and employment opportunities (Chiang et al., 2012). However, studies using the National Longitudinal Transition Study-2 data in the USA found that despite official reports stating that up to 85% of autistic students in secondary school had an university transition plan and 71% had received instructions on what skills to gain in preparation for transition, up to 67.3% of autistic young people reported that they were barely involved (and some not were not involved at all) in their transition planning meetings, and 29.4% reported not having received any transition planning discussions at all (Cameto et al., 2004; Shogren & Plotner, 2012), a figure that is comparatively lower than other groups of students with disabilities. Some studies which employed a systemic model involving parents and caretakers and the autistic student during transition planning also identified conflicting goals across different parties when thinking about the purpose of university, with parents identifying university providing more valuable social opportunities to help autistic students improve their social skills, and autistic students identifying university as a place for gaining the relevant skills in preparation for employment (Auger, 2012; Dipeolu et al., 2014). These studies suggest that aside from the need to actively engage autistic students in their transition planning in a meaningful way, it is also important for multiple stakeholders to clearly establish overarching and mutual goals, and help autistic students think more carefully about their social transition planning as well as pursuing academically related objectives. Social network workshops and the use of social network maps therefore can be a valuable tool to develop a concrete understanding any student's existing social network structure across multiple stakeholders, highlighting both strengths and vulnerabilities, and serve as a conversation starter to encourage students to think more carefully about their role to play in the upcoming social network changes they may encounter during transition to university.

Furthermore, the workshop should be further piloted and adapted to be used with other student populations that may benefit from advance social planning before they arrive on campus. For example, planning ways to stay in touch with family and friends from home might be particularly relevant for international students who are unable to frequently visit their pre-university social

networks during term time. In addition, planning new avenues for socialising at university might be particularly useful for students who have high levels of shyness and sociability, such that they can approach new social relationships in a planful way to minimise their anxiety in social situations. Therefore, future studies can look to expand and adapt the use of social network workshop to cater for a larger student body transitioning to university.

In addition to transition planning, another future direction may be to transform the Social Network and Perceived Social Support (SNaPSS) tool into an easily accessible self-monitoring app where students can actively revise and review their existing social network structure on a regular basis. Individualised maps within the app can also be more interactive, where students may drag and drop social network members into different positions to explore how potential structural changes may influence their ability to access functional support within their network. Using social network maps to visually inform students of how small changes in individual relationships may have broader impacts on the overall social network, autistic students can make use of their strength in detail-oriented attention (Frith, 2003; Happé, 1997) without fear of losing sight of the overall picture.

Visualising and exploring changes in social network structure and function through digital technology may help students optimise the use of their limited resources (such as time, energy and finances) to maintain and build sustainable and reciprocal relationships at university, and may be particularly useful for TD students to consider during the social pruning process. By treating social networks as a puzzle that can be solved in a systematic and planful way, such an app might also play to autistic students' deliberate cognitive processing style as suggested by the Dual Process Theory in autism (Brosnan et al., 2014, 2016, 2017). Therefore, although useful for all students, social network maps may be considered a strength-based approach that is particularly beneficial for supporting autistic students to transition *into* and *through* the complex social scenes at university.

4.2 Anxiety, uncertainty, and problem-solving

A main theme that resonated throughout the empirical chapters is the role that social anxiety plays in students' long-term transition outcomes across first year of university in both autistic and TD student groups. In particular, the heightened social anxiety reported by all students during the first two weeks of starting university point to this period may be perceived by many students as a critical time

frame for opportunities. For many students, the desire to establish a sense of safety through new experiences and social relationships might make themselves particularly sensitive to peer evaluations. For autistic students, the need for reducing anxiety at university to support better socioemotional wellbeing has been suggested by previous studies (Anderson et al., 2016; Gobbo & Shmulsky, 2013; Jackson, Hart, Brown, et al., 2018), and the need for students to adapt to the relatively unstructured environment at university can be a particular challenge for many (MacLeod & Green, 2009). The need to create a support system around the autistic student that involves family and peers have been suggested to be a critical factor to support autistic students in emotion regulation, and also to help them maintain a more positive outlook when at university, as well as offset the stress brought on by academic workload and social stimulation (Dyson & Renk, 2006; Madriaga, 2010; Ward & Webster, 2018). Such findings resonate with the importance of actively developing and maintaining a supportive social network during university transition as mentioned above.

Given the prevalence of heightened levels of social anxiety across the student body at the beginning of transition to university, it is important for university stakeholders to consider ways to help students recognise ways to manage and mitigate social anxiety at the start of first year of university. The social anxiety model conceptualised by Clark and Wells (1995) highlight the negative feedback loop such that increased social avoidance and withdrawal as well as rumination over one's perceived social failures in the past over time can maintain one's negative self-appraisal, fear of negative expectations from others, and anticipatory anxiety during social encounters. One systematic review found that self-perceptions of low social competence and negative social experiences contributed towards heightened levels of social anxiety in both autistic and non-autistic individuals (Spain et al., 2018). However, in a focus group study, multidisciplinary professionals who work with autistic individuals across the lifespan also identified a range of predisposing factors that increased autistic individual's vulnerability for experiencing greater social anxiety compared to non-autistic individuals, including lower social motivation, poorer social skills and emotion recognition, and other systemic factors (Spain, Rumball, et al., 2017). Therefore, although both groups may benefit from cognitive behavioural interventions that challenge one's anticipatory social worries and aim to reduce one's negative self-appraisal over time, autistic individuals may benefit from more holistic

approaches with integrated skill-based components that directly tackle social skills and emotion recognition and regulation (Spain, Blainey, et al., 2017). Taking into account that autistic individuals may have been exposed to more frequent negative social judgements for a longer period of time, clinicians should take special care in fostering a good therapeutic alliance and seek opportunities to model compassion, empathy, and validation when helping autistic individuals develop more adaptive social behaviours (Spain, Rumball, et al., 2017).

For example, it may be helpful to support students who are more socially anxious to become less avoidant in their behaviours and change their problem-solving orientation in highly emotionally salient social situations. From a developmental perspective, one study (Blanchard-Fields et al., 1995) found that compared to older adults, adolescents and young people tended to be more analytical and logical when solving problems that carried low emotional valence, but became more passive and avoidant when approaching problems that were more emotionally salient. It may be that students who are more socially anxious perceive problems they encounter at university through a more emotionally salient lens, such that the stress of daily living hassles become more magnified when combined with a pervasive sense of poor self-appraisal and fear of negative evaluation from peers. Students may therefore assume a more passive and avoidant role in their approach to solve problems at university. It may be beneficial for university stakeholders to set up small peer support groups where students are able to discuss their problems, support each other in generating solutions and action plans that allow them to actively solve problems in a planful way rather than being passive and avoidant. Changes in students' overall problem-solving orientation may boost students' confidence, and in turn break the negative cycle that maintains social anxiety by reducing avoidance and negative self-appraisal.

5. Research limitations

This thesis has five main limitations which will be discussed in turn, and readers should take them into account when interpreting current findings. Much of the discussion so far highlighted how potential individual differences in the degree of sociability may affect students' motivation to socialise with peers at university (Cheek & Buss, 1981; Chevallier et al., 2012), and the perceived importance of peer relationships along the path towards self-actualisation and pursuit of knowledge at university. Therefore, the first limitation is the lack of inclusion of a measure of sociability to

investigate to what extent sociability may have affected changes in students' social network structure and function over time, as well as socialisation transition outcome in first year of university.

Next, it should be noted that sex differences in social network structure and support have been found in one previous study amongst TD college students in the US (Hays & Oxley, 1986), which showed that female students engaged in more frequent reciprocal social interactions, exchanged information and provided emotional support to network members compared to male students. However, given the limited sample sizes across the quantitative studies which were also predominantly female, the second limitation is that no investigations were conducted to explore sex differences underlying changes in structural and functional aspects of social networks over time.

In addition, the greater proportion of females in the quantitative studies may have also contributed towards elevated levels of social anxiety measured over time, as previous studies have found that amongst young people aged 18-29 in the US, women are 50% more likely to receive a diagnosis of social anxiety disorder compared to men (Asher et al., 2017). Not only have similar prevalence odds ratios been observed in other European countries including the UK (Ohayon & Schatzberg, 2010), women are also more likely to report greater severity of social anxiety and fear associated with social situations compared to men (Turk et al., 1998). However, in sub-clinical samples, one study found that men experienced and reported greater distress as a result of social anxiety symptoms compared to females (Merikangas et al., 2002), suggesting that there may be sex differences in the clinical and sub-clinical samples. Therefore, the third limitation is the lack of inclusion of a sample of students with a clinical diagnosis of social anxiety as a comparison group, thus it remains unclear whether the current findings related to social anxiety based on a non-clinical sample can be generalised to a clinical sample.

The fourth limitation is that only self-report measures were employed, and the use of self-report measures has been debated in autism research. Some have argued that potential lack of introspection, theory of mind, and emotion regulation might make it especially challenging for autistic individuals to accurately report their own experiences (Ben Shalom et al., 2006; Bird et al., 2010; Mazefsky et al., 2011). However, one systematic review that evaluated literature on autism in higher education commented on the potential flaws of research that neglects autistic students' first-hand

accounts of their experiences at university (Gelbar et al., 2014), and argued that future research should move beyond theoretical conjectures and use autistic students' self-reports of the strengths and challenges they encountered during university to better inform the development of evidence-based interventions tailored to support their needs. Although using the self-report Social Network and Perceived Social Support (SNaPSS) tool allowed an ecomap to be generated based on relationships that students actively established, maintained, and valued at university, it remains unclear to what extent the reported friendships are truly reciprocal based on students' reports only, which may be subject to reporter-bias.

Finally, one interesting commentary suggested that for many autistic individuals, social media might provide an alternative platform that is viewed as a "safe space" where the conventional meaning of friendship can be challenged, and that online communication allows autistic individuals to actively initiate, engage, and maintain friendships in a way that may be more manageable for some (Brownlow et al., 2015). The fifth limitation is that no distinctions were made between online and offline communications during the construction of ecomaps, therefore the current pattern of quantitative findings may provide an overview of students' perceived social network structure and support, rather than reflecting differences between real-life and virtual social relationships.

6. Future research directions

To address the first limitation on measuring sociability, one scale often cited in literature is the Shyness and Sociability scale originally conceptualised by Cheek and Buss (1981). The authors hypothesised that shyness (feelings of discomfort when in the presence of strangers and unfamiliar situations) and sociability (the desire to be in the company of others) are two separate dimensions that are not always diametrically opposing. The authors found that despite the lack of differences in self-reports of individuals' experiences after interacting with a new social partner, those who showed high levels of shyness and sociability (i.e., feeling uncomfortable in new social situations but possessing a strong desire to socialise with others) were more likely to talk less, look away, and expressed greater cognitive concerns and worries in social situations compared to those who showed high levels of shyness but low levels of sociability.

Cheek and Buss (1981) conceptualised that sociability moderates the relationship between shyness and socialising behaviour, such that those who are shy and unsociable may have more deficits in social skills, compared to those who are shy and sociable who may have adequate social skills but experience greater cognitive concerns and excessive worries. This differentiation between shyness and sociability is particularly interesting when considering how social communication difficulties associated with high levels of autistic traits and social anxiety may have different impact on an individual's socialising behaviour when factoring in their levels of shyness and sociability. Understanding how shyness and sociability are correlated with behavioural differences in first year autistic and TD students may provide additional context around the changes in structural and functional social networks over time. It may be that perceived social support from parents and friends are unable to buffer against the negative impact that shyness and sociability has on one's mental wellbeing. For example, one study which used the Shyness and Sociability scale in a US college sample found that students with high levels of shyness and low levels of sociability reported greater levels of loneliness at university (Mounts et al., 2006). The same study found that although students who reported greater levels of parental support experienced better friendship quality, it was loneliness, not friendship quality, that predicted higher levels of depression and anxiety. Therefore, another future research direction can further explore whether changes in students' social network structure and perceived social support may buffer against the negative impact that shyness and sociability may have on students' academic and social university transition outcomes, as well as mental and physical health.

To address the second limitation on sex differences in how autistic students access social capital through their social networks, future studies should seek to replicate the current study results with a larger sample size with sufficient power for allow sex-based comparisons to be made. It should be noted that the constraints in sample size were largely related to the recruitment challenges the studies faced. Given that the quantitative studies required first-year autistic students to complete the first set of questionnaires at the start of transitioning to university, the studies set a very tight recruitment timeframe for recruiting this hard to reach student group during a highly stressful period. Therefore, one practical recommendation for future studies that seek to explore potential sex

differences in autistic students' social network structure at university is to employ a more flexible and extended recruitment time window to reach a larger body of students.

To address the third limitation of generalisability of findings to clinical samples, future studies may also consider including a third comparison group of students who have been clinically diagnosed with social anxiety disorder, in addition to TD control group, to assess whether the current social anxiety related findings may be similar in both sub-clinical and clinical groups. Including a clinical comparison group may also help uncover whether there might be similarities and differences in shyness and sociability between those diagnosed with social anxiety disorder and those with autism, to further disentangle the interaction between social motivation and social communication difficulties in both clinical groups.

To address the fourth limitation of potential reporter-bias in using self-reports, future studies may consider ways of cross-checking the reciprocity of relationships that students have reported by gathering information on frequency and mode of communication from the identified network members. Although the current study focused on gaining insight into autistic students' university experience through their own narratives, it may be helpful for future studies to gather stakeholder perspectives in terms of the support they currently provide to autistic students, and to what extent they believe existing strategies to be effective in supporting successful university transitions for this student group. Gathering stakeholder perspectives may further highlight discrepancies and identify shortfalls where support can be better adapted to cater for autistic students' needs in a way that fosters their self-determination using strength-based approaches.

Finally, to address the fifth limitation, future studies may expand upon current findings to investigate whether differences in students' social anxiety, autistic traits, as well as shyness and sociability may lead to differences in online versus offline social network structure and perceived social support, and whether discrepancies in online and offline communication may be associated with an individuals' mental wellbeing and transition outcomes during first year of university.

7. Conclusion

This thesis had a number of strengths, such as using the newly developed Social Network and Perceived Social Support (SNaPSS) tool to visualise structural and functional changes in student's

social networks over time, understand how social anxiety and autistic traits have shared and unique impacts on transition outcomes, as well as similarities and differences in self-determination at university across both autistic and TD students. The mixed-method approach also enabled the qualitative results gathered from Chapters Six and Seven to provide further insight into student perspectives on their university experience, which helped to contextualise some of the quantitative social network changes observed cross-sectionally and longitudinally in earlier chapters. The workshop study also highlighted real world implications of how transforming previously abstract concepts of social relations into concrete social network maps allowed autistic students to learn more about social changes in relation to university transition in a way that played to their visual learning strength.

Previous studies have highlighted many challenges that autistic students face at university, ranging from social difficulties and executive dysfunction, to sensory difficulties and poor mental health (Adreon & Durocher, 2007; Gelbar et al., 2014; Jackson, Hart, Brown, et al., 2018). However, little was known about to what extent autistic students perceived themselves to be autonomous and competent agents that could foster a sense of relatedness (and hence act in a self-determined way) at university. The current thesis aimed to reduce the conflation between challenges commonly associated with development and independence experienced by the majority of students transitioning irrespective of autism diagnosis and highlight ways that autistic students differed in their university experiences when compared to TD peers. The finding that social anxiety was a key factor that negatively affected student transition outcomes for both groups in a similar fashion also highlight that it may be co-occurring conditions beside that of autism diagnosis that may further render some students more vulnerable than others during transition to university. The many similarities identified across the three pillars of self-determination, namely autonomy, competence and relatedness, between autistic and TD students also highlight that there are many positives in the ways that students perceive themselves to be actively shaping their university experiences. Allowing university stakeholders to recognise, encourage, and foster the growth of self-determination amongst autistic students may be an important way to improve their satisfaction and retention at university.

In conclusion, stakeholders helping autistic students to successfully transition to university need to adopt strengths-based approaches that put the student at the centre of their transition plan, and help them become self-determined in their ability to shape their social, academic, and daily living experiences at university in a balanced way. Ultimately, the use of social network analysis provides one promising way that utilises autistic students' strengths in order to help them scaffold an increasingly complex social world and may pave the way for many other innovative strength-based approaches to support autistic students to transition *into, through* and *out* of university.

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APPENDICES

I. Information and consent form (Study 1 – Chapter 3)

Social Network and Support for Students with ASD (17-200)

INFORMED CONSENT

Please consider this information carefully before deciding to take part in the project.

Purpose of the project: To help researchers develop an online assessment tool to assess social network and support received by students with ASD.

What you will do in this project: Provide feedback about an assessment tool. To provide this feedback you will be asked to complete an online assessment. The assessment asks about the people in your social network, and the types of support they may provide you with in terms of your academic studies, daily living (e.g., cooking, doing laundry, managing money etc), and socially. Once you have completed the assessment tool, you will be invited to take part in a discussion group with others who have completed the tool too. You can provide feedback on your thoughts about the assessment tool in writing or verbally. We will ask for feedback about how clear the language on the assessment tool was, how easy it was to complete and how relevant were the questions. We will also be very welcoming of any suggestions you have to improve the content, format or appearance of the assessment tool. If you prefer to give your feedback individually rather than as part of a group, this is also fine and the researcher will arrange an individual feedback slot with you.

Time required: The online assessment should take approximately 15-20 maximum to complete and you can then record your feedback in writing. The discussion group will run for 30-60 minutes. The total session will last for 90 minutes maximum in total.

Risk: There are no anticipated risks associated with taking part in this project. If you feel uncomfortable at any time, please feel free to stop and ask for help.

Benefits: At the end of the project, we hope to use the new online assessment to effectively measure the size of social networks, and the types and quality of support received by students with ASD. Developing this new assessment may help researchers to better identify areas and types of support that may be most relevant to students with ASD, and guide development of support and transition programmes to help students with ASD to transition to university.

Confidentiality: Your responses to the online assessment, and any written and/or verbal feedback provided in response to the question sheet will be kept **confidential** and be used for research purposes by the project researchers.

Participation and withdrawal: There is no payment for taking part in the study. Our participation in this study is completely voluntary, and you may withdraw at any time without penalty. You may withdraw by informing the researcher that you no longer wish to take part. If you decide later that you don't want your answers to be used or be seen by anyone, you can email the project researcher at: j.lei@bath.ac.uk

Data publication: The data will be used for academic purposes such as publication in journal articles or presentation at conferences.

Feedback and Contact: If you would like to receive feedback and updates on the development of the assessment tool, or have any other questions regarding your participation in the project after taking part in the study, you can email the project researcher at: j.lei@bath.ac.uk

If you are happy to take part in this project, please sign the next page... (You keep this page!)

Consent Agreement

By signing this page, I agree that the nature and purpose of this project have been sufficiently explained to me, and information can be found on the sheet accompanying this form.

I agree to the University of Bath keeping and processing the data I have provided during the course of this study. I understand that these data will be used only for the purpose(s) set out in the information sheet, and my consent is conditional upon the University complying with its duties and obligations under the Data Protection Act.

Signed:

Print in BLOCK letters:

Date:

Your participation is entirely voluntary, and therefore highly valued. Thank you for participating in this research.

II. Feedback questionnaire for Social Network and Perceived Social Support Tool development

(Study 1 – Chapter 3)

Social Network and Support for Students with ASD

The project: What do I do?

Please read through and if you have any questions, please ask.

1) Access the assessment online using the unique email link sent to me.

2) Complete the assessment, answering all questions – to understand what questions are being asked in the assessment about my social network, and type of support I receive. The instructions on how to complete the assessment are provided online.

3) Provide verbal and/or written feedback to the researcher about what I think about the assessment.

→ Do all the questions make sense to me? If not:

- Which questions didn't make sense?
- How can I change them to make them clearer to myself and other students with ASD?

→ Was this assessment form easy to use online? If not:

- What exactly did I find difficult to use/navigate?
- How can I make it better and easier to use?

→ In hindsight, did the questionnaire enable me to identify and report all the people that I consider to be within my social network?

If not:

- Who are left out? (Please identify how these individuals may be related to you – e.g., family member, peer etc).
Note: If the reason for leaving out the individual is due to not enough space to list everyone, please write: **Insufficient Space**.
- How can I change the question to make sure those who are currently left out can be included?

→ Did the questionnaire assess all the areas where I currently receive support from other people?

If not:

- Which areas are not included in the questionnaire that should be added? Please provide any example questions that you think may be helpful in assessing the missing areas.

→ Any other thoughts?

III. Social Network and Perceived Social Support Tool

Social Network - Transition to University T1 - FINAL v1

Social Network - Ego

Text This questionnaire is designed to help us understand the people you consider important to you within your social network, how you interact with them, and your perception of the quality and types of support they may provide you with across different domains of your life. Please read the instructions and each question carefully before answering.

1. Distress so/freq Over the past 3 months, how often did you experience feelings of distress (e.g., stress, anxiety, depressed/low mood) related to each of the following areas?

	Never (1)	Once a week or less (2)	2-3 times a week (6)	4-5 times a week (7)	6 or more times a week (8)
Course workload (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Course difficulty (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meeting course deadlines (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doing group work (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time management and planning (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes in my routine (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooking (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
House chores (laundry, cleaning/tidying/organising room) (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manage/budget my finances (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Self-care/seeking medical advice (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Living in shared accommodation (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting on with people I live with (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fitting in (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being bullied/feeling isolated (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Socialising with other students/making friends (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Distress spt aval Over the past 3 months, when you experienced feelings of distress (e.g., stress, anxiety, depressed/low mood) in each of the following areas, to what extent did you feel like there were people you could turn to for help and support?

	Never (1)	Rarely (9)	Sometimes (10)	Most of the time (2)	Always (6)
Course workload (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Course difficulty (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meeting course deadlines (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doing group work (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time management and planning (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes in my routine (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooking (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
House chores (laundry, cleaning/tidying/organising room) (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manage/budget my finances (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Self-care/seeking medical advice (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Living in shared accommodation (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting on with people I live with (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fitting in (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being bullied/feeling isolated (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Socialising with other students/making friends (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Distress spt qlty Over the past 3 months, how often did you feel supported when you experienced feelings of distress (e.g., stress, anxiety, depressed/low mood) in each of the following areas?

	Never (1)	Rarely (9)	Sometimes (10)	Most of the time (2)	Always (6)
Course workload (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Course difficulty (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meeting course deadlines (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doing group work (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time management and planning (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Changes in my routine (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooking (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
House chores (laundry, cleaning/tidying/organising room) (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manage/budget my finances (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Self-care/seeking medical advice (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Living in shared accommodation (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting on with people I live with (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fitting in (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being bullied/feeling isolated (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Socialising with other students/making friends (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Living status Where are you living for your first year of university?

- ☐ On Campus - University accomodation (1)
- ☐ Off Campus - not with family (2)
- ☐ Off Campus - with family or at home (3)
-

5. Rel status Are you currently in a relationship?

- ☐ Yes (1)
- ☐ No (3)
-

6. Gap year Have you taken a gap year before starting university? (after secondary education)

- ☐ Yes (1)
- ☐ No (2)

Social Network Size

(List goes up to 20 – only 3 shown here)

7. Network size Think of all the people with whom you have contact with (at school, at work, at home, in social or religious settings, etc) over the past three months. Select those people whose relationships are particularly important and worthwhile to you in some way, and write their names in the list provided below.

Up to 20 names MAXIMUM.

- ☐ Name 1 (1) _____
- ☐ Name 2 (2) _____
- ☐ Name 3 (3) _____

Social Network - Alter

Carry Forward Entered Choices - Entered Text from "Think of all the people with whom you have contact with (at school, at work, at home, in social or religious settings, etc) over the past three months. Select those people whose relationships are particularly important and worthwhile to you in some way, and write their names in the list provided below. Please provide minimum 5 names, and up to 20 max."

NOTE: for each of the following questions, it will only appear for those people named in the social network (not necessarily up to 20 people). I've put three names down for each person in this paper version as an example to show the types of questions the participants will answer.

8. Alter gender What is the gender of each of the following people?

	Male (1)	Female (2)
Name 1 (x1)	<input type="radio"/>	<input type="radio"/>
Name 2 (x2)	<input type="radio"/>	<input type="radio"/>
Name 3 (x3)	<input type="radio"/>	<input type="radio"/>

9. Alter relation How would you categorise your relationship with each of the following people?

	Family (1)	Friend or Acquaintance (2)	Boyfriend/Girlfriend (3)	Teacher/Tutor/Lecturer (4)	Support worker/Social Worker (5)	Other (6)
Name 1 (x1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (x2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (x3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. Family relation How are each of the following people related to you in your family?

	Mother (1)	Father (2)	Sister (3)	Brother (4)	Cousin (5)	Uncle (6)	Aunt (7)	Grandparent (8)	Other (9)
Name 1 (xx1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (xx2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (xx3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. Friends relation How did you come to know each of the following people whom you consider to be your friend/acquaintance?

	Before University - Friend from School / Childhood (1358)	Before University - Neighbour (1359)	Before University - Religious events (1360)	Before University - Work / Job (1361)	Before University - Social events / Clubs / Societies / Camp (1362)	Before University - Other (1363)	Since University - Friend from course / lecture / other academically related tasks (1364)	Since University - Neighbour / flat mate (1365)	Since University - Religious events (1366)
Name 1 (xx1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (xx2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (xx3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11.1 Friends other Please briefly describe in a few words how you came to know each of the following people whom you consider to be your friend/acquaintance.

☐ Name 1 (1) _____

☐ Name 2 (2) _____

☐ Name 3 (3) _____

12. Rel duration For how long have you known each of the following individuals? Please specify time in (year), (month)

☐ Name 1 (1) _____

☐ Name 2 (2) _____

☐ Name 3 (3) _____

13. Similarity How similar (ways of thinking and/or living, hobbies, likes/dislikes, moral reasoning etc) do you perceive each of the following people to be when compared to you?

	Not at all (1)	Below average (2)	Average (3)	More than average (4)	Very much (5)
Name 1 (x1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (x2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (x3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. Comm mode Over the past three months, what mode(s) of communication have you used when communicating with each of the following people? Please circle AS MANY choices as applicable for each person.

	Face to Face (1)	Phone Call/Skype/Facetime or equivalent (2)	Text, Message, Whatsapp or equivalent (3)	Social Media (e.g. Facebook) (4)	Other (e.g., email, letter etc) (5)
Name 1 (x1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name 2 (x2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name 3 (x3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. Comm freq Over the past three months, how frequently have you communicated with each of the following people?

	Once/Twice in total (1)	Once/Week (2)	2-3 times/week (3)	4-5 times/week (4)	6 or more times / week (5)
Name 1 (x1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (x2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (x3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16. Academic spt typ Over the past 3 months, have the following people provided support to you in any of the following academically related tasks? Please select ALL that apply.

	Manage coursework load (1)	Improve understanding of subject and coursework (2)	Manage coursework deadlines (3)	Help with group projects (4)	Help with time management (5)	None of the previous (6)
Name 1 (x1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name 2 (x2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name 3 (x3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. Academic spt qty Over the past 3 months, how often did each of the following people provide support in academically related areas (coursework, time management, group projects) to you?

	Once or twice in total (1)	Once/week (2)	2-3 times/week (3)	4-5 times/week (4)	6 or more times/week (5)
Name 1 (xx1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (xx2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (xx3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18. Academic spt qlt Over the past 3 months, when each of the following people provided support to you with regards to academically related tasks (coursework, time management, group projects etc), how supported did you feel?

Please rate on a scale of 1 to 5.

1 = Not at all supported; 5 = Very much supported

	1 (Not at all supported) (1)	2 (2)	3 (3)	4 (4)	5 (Very much supported) (5)
Name 1 (xx1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (xx2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (xx3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. DLS spt type Over the past 3 months, have the following people provided support to you in any of the following tasks related to daily living? Please select ALL that apply.

	Changes in my routine (1)	Cooking/preparing food (2)	Household chores (laundry, cleaning etc) (3)	Managing my own finances (4)	Self-care/seeking medical attention (5)	None of the previous (6)
Name 1 (x1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name 2 (x2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name 3 (x3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. DLS spt qty Over the past 3 months, how often did each of the following people provide support in areas associated with daily living (cooking, cleaning, coping with changes in schedule, managing finances, self/care and seeking medical attention) to you?

	Once or twice in total (1)	Once/week (2)	2-3 times/week (3)	4-5 times/week (4)	6 or more times/week (5)
Name 1 (xx1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (xx2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (xx3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21. DLS spt qty Over the past 3 months, when each of the following people provided support to you in areas associated with daily living (cooking, cleaning, coping with changes in schedule, managing finances, self/care and seeking medical attention) , how supported did you feel?

Please rate on a scale of 1 to 5.

1 = Not at all supported; 5 = Very much supported

	1 (Not at all supported) (1)	2 (2)	3 (3)	4 (4)	5 (Very much supported) (5)
Name 1 (xx1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (xx2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (xx3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

22. Social spt type Over the past 3 months, have the following people provided support to you in any of the following tasks related to socialisation? Please select ALL that apply.

	Living in my accommodation (1)	Making friends/getting to know new people (2)	Fitting in (3)	Feelings of being bullied/isolated (4)	Socialising with other students (5)	None of the previous (6)
Name 1 (x1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name 2 (x2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name 3 (x3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. Social spt qty Over the past 3 months, how often did each of the following people provide support in areas associated with socialisation (settling into accommodation, meeting and socialising with other students, fitting in, reduce feelings of being bullied/isolated) to you?

	Once or twice in total (1)	Once/week (2)	2-3 times/week (3)	4-5 times/week (4)	6 or more times/week (5)
Name 1 (xx1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (xx2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (xx3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

24. Social spt qlty Over the past 3 months, when each of the following people provided support to you in areas associated with socialisation (settling into accommodation, meeting and socialising with other students, fitting in, reduce feelings of being bullied/isolated) , how supported did you feel?

Please rate on a scale of 1 to 5.

1 = Not at all supported; 5 = Very much supported

	1 (Not at all supported) (1)	2 (2)	3 (3)	4 (4)	5 (Very much supported) (5)
Name 1 (xx1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (xx2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (xx3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25. Conflict Over the past three months, how frequently have you encountered conflict(s) with each of the following people?

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	All the time (5)
Name 1 (x1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 2 (x2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3 (x3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block

Social Network – Density

NOTE: for the following questions – participants will answer whether each pair of the people they have named in their social network know and is in contact with each other. Therefore – the number of questions answered will be proportional to the number of people named in their network – not necessarily up to 20 people. I've put down the first two questions as an example – the list will continue until all potential pairs of the network have been addressed and the list is exhausted.

26. Density 1 To the best of your knowledge, which of the following people does (insert name 1) know and is in contact (e.g., face to face, via text/phone/skype/social media or equivalent) with?

	Yes (1)	No (2)	Not sure (3)
Name 2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

26.1 Density 2 To the best of your knowledge, which of the following people does (insert name 2) know and is in contact (e.g., face to face, via text/phone/skype/social media or equivalent) with?

	Yes (1)	No (2)	Not sure (3)
Name 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Name 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

IV. Information sheet, consent form, and debrief for Study 2 & 3 (Chapters 4 & 5)

Ethical approval code 17-220

Changes in Social Network and Perceived Social Support during Transition to First Year of University

Before you decide to take part in this study, it is important for you to understand why the research is being done and what it would involve. Please take time to read the following information carefully, and email the primary researcher (Jiedi Lei: j.lei@bath.ac.uk) if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Background

Beginning a course of study at University can be a challenging time. People undergo changes in their social network, whilst also adjusting to the academic, social, and other practical living domains of university life. This research study aims to assess any changes in your social network, and your perception of the sources, types, and quality of support you receive from people whom you consider important to you during this time of transition. We are attempting to understand how changes in both social network and perceived social support may be linked to quality of life, and transition outcome during the first year of university. Our results may eventually be published in a scientific journal, and may also be reported at scientific meetings.

Am I eligible for this study?

We are looking for new University students who are:

- Aged 17-19
- Have attended secondary education within the UK
- Attending university for the FIRST time and entering the FIRST year of their studies
- NOT married
- NOT co-habiting with a romantic or marriage partner at the time of moving to university

What will taking part in this study involve?

If you decide to take part in this study, you will be asked to complete questionnaires online on 3 occasions, **September/October, December, and March** during your first academic year of university. The first session (Sept/Oct) will take around 45min to 1.5 hr to complete, and the second (Dec) and third (March) sessions will both take 20 to 30 min.

For each session, you will be contacted by the primary researcher (Jiedi Lei) who will send you a unique link to access all of the questionnaires online.

You can choose to complete the questionnaires in your own time. Alternatively, you can arrange a time by emailing j.lei@bath.ac.uk to come to the Department of Psychology at the University of Bath, and complete the questionnaires in a computer laboratory either online, or through a verbal interview where the primary researcher (Jiedi Lei) can read the questions to you, and transcribe your responses.

Upon completion of each online assessment session, you will be entered into a prize draw for a chance to win one of two £50 Amazon gift vouchers.

At the end of each session, we will also provide you with a short debrief to remind you of the background and aims of this study. You are also welcome to contact the primary researcher if you have any questions about the study. We do not anticipate any risks to you in taking part in this study.

We will also ask your permission to obtain your 1st year examination records, and whether or not you have terminated or continued with your studies.

What else do I need to know about taking part?

- Taking part in the study is entirely voluntary. It is up to you to decide whether or not to do this.
- If you do decide to take part, we will ask you to sign a consent form online.
- If you would like us to send you a copy of this information sheet and/or consent form to keep, please let us know when you sign the consent form.
- If you decide to take part, and change your mind later, you are still free to withdraw from the study at any time.
- If you decide not to take part, or to withdraw, you do not have to give a reason, and it does not affect your relationship with the University of Bath or your right to take part in other future research projects.

What will happen to the information I provide?

- All information provided by your taking part in this study, including your examination and continuation of study records, will be kept strictly confidential, anonymized and used for research purposes only.
- Any identifiable information you provide (i.e., the signed consent form) will be kept in a separate locked cabinet to any other personal data you provide when completing the questionnaires.
- Only researchers who are working on this research project will have access to identifiable information.
- You will be assigned an anonymous research ID upon enrolment, which will be used for research analyses, publication, or conference presentation purposes.
- You are free to withdraw your data from the study at any point.
- Data protection is in accordance with both the data protection guidelines at the University of Bath, and also the Data Protection Act 1980.

If you have any questions at any time about the study, please do not hesitate to contact Jiedi Lei:
j.lei@bath.ac.uk

CONSENT FORM **Changes in Social Network and Perceived Social Support during Transition to University**

Please answer the following questions to the best of your knowledge

	YES	NO
DO YOU CONFIRM THAT YOU ARE:		
• Age 17-19	<input type="checkbox"/>	<input type="checkbox"/>
• Attending University/Higher Education for the FIRST time	<input type="checkbox"/>	<input type="checkbox"/>
• Attended secondary education (or equivalent) in the UK	<input type="checkbox"/>	<input type="checkbox"/>
• NOT Married (If Married – please tick NO)	<input type="checkbox"/>	<input type="checkbox"/>
• NOT living with romantic partner at the time of moving to university (If living with partner/significant other – please tick NO)	<input type="checkbox"/>	<input type="checkbox"/>
HAVE YOU:		
• been given information explaining about the study?	<input type="checkbox"/>	<input type="checkbox"/>
• received enough information about the study for you to make a decision about your participation?	<input type="checkbox"/>	<input type="checkbox"/>
DO YOU UNDERSTAND:		
that you are free to withdraw from the study and free to withdraw your data prior to publication		
• at any time?	<input type="checkbox"/>	<input type="checkbox"/>
• without having to give a reason for withdrawing?	<input type="checkbox"/>	<input type="checkbox"/>
DO YOU GIVE PERMISSION FOR THE RESEARCHER TO GAIN ACCESS TO:		
• Your examination results during first year of university	<input type="checkbox"/>	<input type="checkbox"/>
• Attrition record (if you decide to terminate your studies)	<input type="checkbox"/>	<input type="checkbox"/>

Please note that both sources of information are kept strictly confidential, and will be anonymised.
Records will be used for research purposes ONLY.

<p>I hereby fully and freely consent to my participation in this study</p>
<p>I understand the nature and purpose of the procedures involved in this study. These have been communicated to me on the information sheet accompanying this form.</p> <p>I understand and acknowledge that the investigation is designed to promote scientific knowledge and that the University of Bath will use the data I provide for no purpose other than research.</p> <p>I understand the data I provide will be kept confidential. My name or other identifying information will not be disclosed in any presentation or publication of the research.</p> <p>I understand that the University of Bath may use the data collected for this project in a future research project but that the conditions on this form under which I have provided the data will still apply.</p> <p>Participant's signature: _____ Date: _____</p> <p>Name in BLOCK Letters: _____</p>

If you have any concerns related to your participation in this study please direct them to the Department of Psychology Research Ethics Committee, via Nathalia Gjersoe, Psychology Research Ethics Officer (Tel: 01225 38 3251 email: N.Gjersoe@bath.ac.uk).

Changes in Social Network and Perceived Social Support during Transition to University Participant Debrief Form

*Thank you for taking part in our research project, and for completing all the online questionnaires. We are trying to gain a better understanding of if and in what way the changes you experience in both your social network and perceived social support may be related to adjustment to university life during the first year. We hope you find the information below helpful, and should you have any questions, or wish to withdraw from the study at any point, please do not hesitate to contact the primary researcher: **Jiedi Lei (j.lei@bath.ac.uk)**.*

Further Support

Completing the questionnaires may have brought up some difficulties you are experiencing. If you are encountering any difficulties or have any concerns related to academic, personal/emotional, or social adjustment during your studies at the University of Bath, here are some student support services (free of charge) that you may wish to contact:

- Student Support General:
<http://www.bath.ac.uk/study/pg/support/index.html>
- Health and Wellbeing:
<http://www.bath.ac.uk/study/pg/support/welfare/>
- Student Services:
<http://www.bath.ac.uk/departments/student-services/>
- Living/Finance management/Accommodation:
<http://www.bath.ac.uk/study/pg/support/living/index.html>
- Disability services and advice:
<http://www.bath.ac.uk/study/pg/support/disability-advice/index.html>

If you are from another university, you may wish to seek help from the student support and disability services at your university. You can also seek help through your GP.

If you are experiencing mental health difficulties and would like to seek support from outside your university and/or GP, below are a few charities that you may find helpful:

- Mind:
<https://www.mind.org.uk/>
- Sane:
<http://www.sane.org.uk/>
- Rethink Mental illness:
<https://www.rethink.org/>

If you have been diagnosed with (or suspect a diagnosis of) a specific learning disability, and/or Autism Spectrum Disorder, or and would like to find additional support services, below are a few resources that you may find helpful:

- National Autistic Society (National charity for autism):
<http://www.autism.org.uk/>
- Autistica (charity for autism):
<https://www.autistica.org.uk/>
- Scope about disability (website with lots of support resources for learning and physical impairments/disabilities):
<https://www.scope.org.uk/support>

V. SNaPSS workshop worksheet and feedback form for working from one's own social network map (Study 4 – Chapter 6)

Understanding my social network (OWN)

Thank you for completing the Social Network Analysis and Perceived Social Support (SNaPSS) questionnaire online, as part of the questionnaires prior to your arrival.

This workshop is designed to offer you a chance to visualise the network map created based on your responses.

Using the guided questions below, this exercise is designed to:

- 1) Help you think through different aspects of your social network, and potential changes when going to university.
- 2) Hear your feedback on your social network map.

BEFORE YOU START: Please read through the house rules, and instructions carefully.

House rules:

- 1) If you have any questions, or want clarification on any of the questions – please let one of the instructors know, and we can come and help you.
- 2) If you would like to discuss with a neighbour – please:
 - ask them first if they would be happy to chat with you about your social network
 - note that it is up to them if they want to also share their own network map, so please respect your fellow students' decisions
- 3) If you have finished – please raise your hand to let one of the instructors know. You can then either complete another activity we have prepared, or simply sit and wait for others to finish.
- 4) If you find any questions or any part of this activity distressing – please raise your hand to let one of the instructors know. We can then help you to find out more about why this is distressing – and can offer you another activity or the quiet room if you would to have some time by yourself.

Key terms

Size	How many people there are named within a social network (e.g., how many people have you kept in contact with, and consider to be important to you, over the past 3 months?)
Degree of connections	<p>For each member named, how many other network members do they know and are in contact with?</p> <p>Note: the BIGGER the size of circle – the MORE degrees of connections a network member has.</p>
Density	The overall extent to which network members named know each other. Density is calculated ranging from 0 (LOW density - no one knows or is in contact with anyone else), to 1 (HIGH density - everyone knows and is in contact with everyone).
Cluster	Do some members know each other better than others? (i.e., all of family might be in one cluster, friends from school might be in another cluster)

Please write YOUR NAME in FULL:

PART 1 – Thinking about my social network

Please look at the social network map that has been produced based on your responses on the online questionnaire which you have completed prior to arriving at the Bath Autism Summer School.

- 1) Can you identify anyone, or a few people, particularly important in your social network structure? Who is he/she, or who are they?

Clue: Bigger circles, and have lots of connections with other people?

- 2) Do you think any part of the social network map might change when you go to university? How might it change?

- 3) How *satisfied* are you with the current social network structure as depicted by the social network map?

Very unsatisfied	Somewhat unsatisfied	Neutral	Somewhat satisfied	Very satisfied
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- 4) Looking at your social network map now, what would you wish to stay the **same** when you go to university? Why?

Think about family, friends, and anyone else you find in your social network.

- 5) Looking at your social network map now, what would you wish to be **different** when you go to university? Why?

Think about family, friends, and anyone else you find in your social network.

PART 2 – Feedback on your social network map

Please read through the questions carefully and let us know your thoughts on the workshop session today, and your social network map.

About the workshop:

- 1) How *enjoyable* was the workshop today?

Very not enjoyable	Somewhat not enjoyable	Neutral	Somewhat enjoyable	Very enjoyable
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- 2) What did you find enjoyable / not enjoyable today? Any suggestions on improvement?

- 3) How *helpful* was the workshop today in helping you understand social networks in general?

Very unhelpful	Somewhat unhelpful	Neither helpful nor unhelpful	Somewhat helpful	Very helpful
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- 4) How *helpful* was the workshop today in helping you think about social network transitions when going to university?

Very unhelpful	Somewhat unhelpful	Neither helpful nor unhelpful	Somewhat helpful	Very helpful
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- 5) What did you find helpful / not helpful today? Any suggestions on improvement?

they have with each other?

Very inaccurate	Somewhat inaccurate	Neither accurate nor inaccurate	Somewhat accurate	Very accurate
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- 2) Can you explain what was accurate / inaccurate? Any suggestions on improvement?

Very difficult	Somewhat difficult	Neutral	Somewhat easy	Very easy
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- 4) How would you describe the experience of viewing your social network map? Please use as many words as you wish.

- 5) Which aspects of the social network map did you like / didn't like? Any suggestions on improvement?

- 6) Which aspects of the social network map did you find particularly useful or not useful for helping you think about social transitions when moving to university?

VI. SNaPSS workshop worksheet and feedback form for working from an example social network map (Study 4 – Chapter 6)

Understanding social network – EXAMPLE (Jack)

This workshop is designed to offer you a chance to visualise and interpret a social network map.

Using the guided questions below, this exercise is designed to:

- 3) Help you think through different aspects of one's social network, and potential changes when going to university.
- 4) Hear your feedback on social network maps.

BEFORE YOU START: Please read through the house rules, and instructions carefully.

House rules:

- 5) If you have any questions, or want clarification on any of the questions – please let one of the instructors know, and we can come and help you.
- 6) If you would like to discuss with a neighbour – please:
 - ask them first if they would be happy to chat with you about your social network
 - note that it is up to them if they want to also share their own network map, so please respect your fellow students' decisions
- 7) If you have finished – please raise your hand to let one of the instructors know. If you would now like to see your social network map (provided you have completed the pre-arrival questionnaire), then please ask an instructor. Otherwise, simply sit and wait for others to finish.
- 8) If you find any questions or any part of this activity distressing – please raise your hand to let one of the instructors know. We can then help you to find out more about why this is distressing – and can offer you another activity or the quiet room if you would to have some time by yourself.

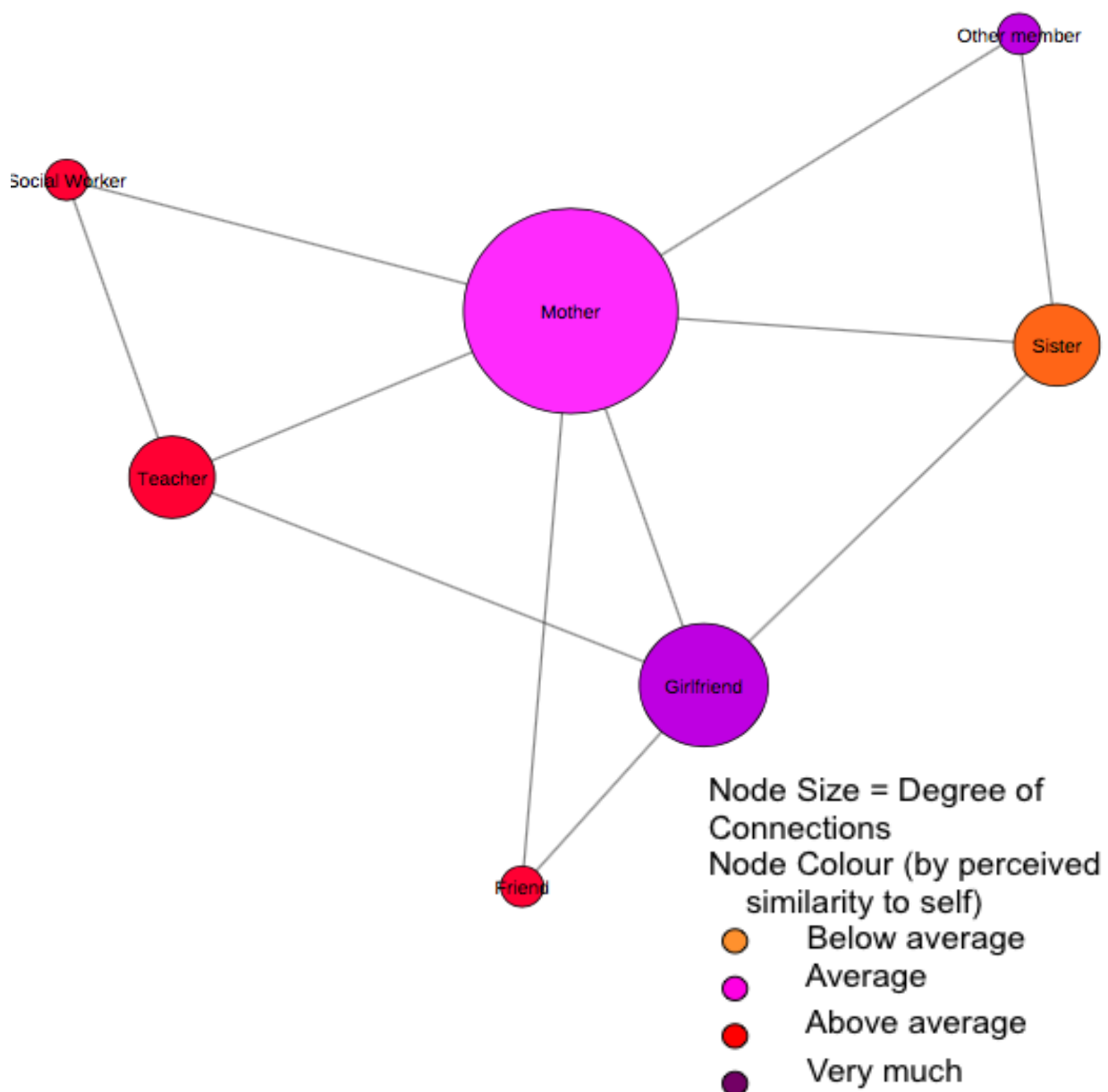
Key terms

Size	How many people there are named within a social network (e.g., how many people have you kept in contact with, and consider to be important to you, over the past 3 months?)
Degree of connections	<p>For each member named, how many other network members do they know and are in contact with?</p> <p>Note: the BIGGER the size of circle – the MORE degrees of connections a network member has.</p>
Density	The overall extent to which network members named know each other. Density is calculated ranging from 0 (LOW density - no one knows or is in contact with anyone else), to 1 (HIGH density - everyone knows and is in contact with everyone).
Cluster	Do some members know each other better than others? (i.e., all of family might be in one cluster, friends from school might be in another cluster)

Please write YOUR NAME in full below:

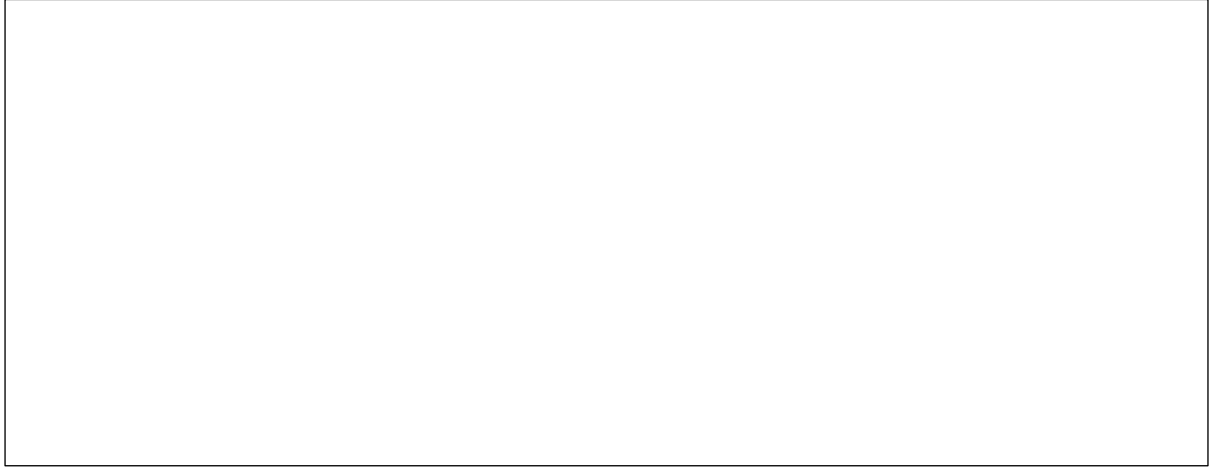
PART 1 – Thinking about a social network example - Jack

Jack has just completed his A-Levels and will be going to university in September. The university is in a new city that is about 2 hours train ride away from Jack's home, and Jack will stay in student accommodation on campus. Jack's mum and sister will continue to live at home. Jack's girlfriend will be staying in his home city for her gap year. Jack's friend (listed below) will not be studying in the same city as Jack next year. Jack seeks most of his academic support from his teacher in school (Mr. X – listed below). Jack's social worker (Tom – listed below) has been visiting Jack in his home once every month to check in on Jack's support needs for the past five years, and Jack has become quite close to his social worker. Jack's social worker will not be able to travel to visit Jack at his university next year.



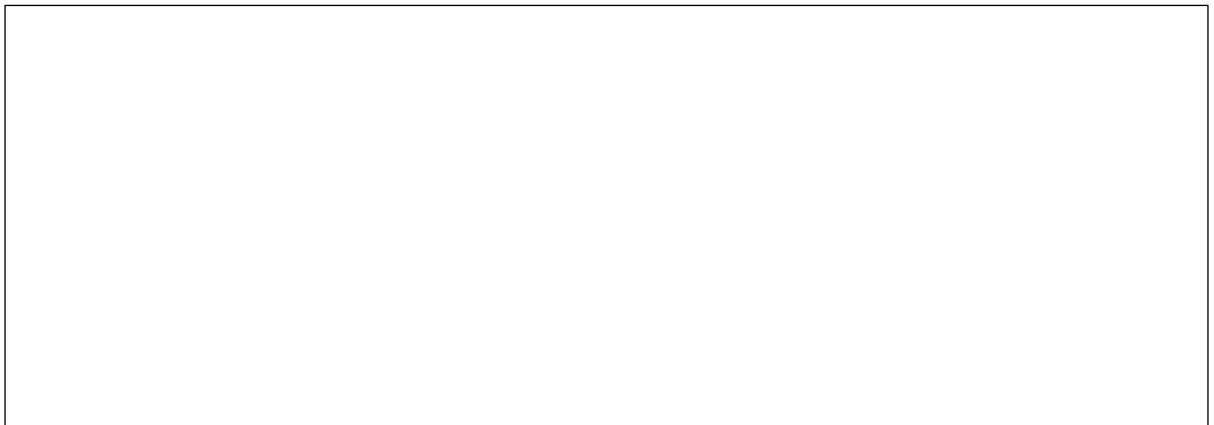
- 1) Can you identify anyone, or a few people, particularly important in Jack's social network structure? Who is it, or who are they?

Clue: Bigger circles, and have lots of connections with other people?




- 2) Looking at Jack's social network map now, what do you think might stay the **same** when Jack goes to university? Why?

Think about family, friends, and anyone else you find in Jack's social network.



- 3) Looking at Jack's social network map now, what do you think might be **different** when Jack goes to university? Why?

Think about family, friends, and anyone else you find in Jack's social network.



PART 2 – Feedback on social network map

Please read through the questions carefully and let us know your thoughts on the workshop session today, and the social network map exercise.

About the workshop:

1) How *enjoyable* was the workshop today?

Very not enjoyable	Somewhat not enjoyable	Neutral	Somewhat enjoyable	Very enjoyable
--------------------	------------------------	---------	--------------------	----------------

2) What did you find enjoyable / not enjoyable today? Any suggestions on improvement?

[illegible]

3) How *helpful* was the workshop today in helping you understand social networks in general?

Very unhelpful	Somewhat unhelpful	Neither helpful nor unhelpful	Somewhat helpful	Very helpful
----------------	--------------------	-------------------------------	------------------	--------------

4) How **helpful** was the workshop today in helping you think about social network transitions when going to university?

Very unhelpful	Somewhat unhelpful	Neither helpful nor unhelpful	Somewhat helpful	Very helpful
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5) What did you find helpful / not helpful today? Any suggestions on improvement?

[illegible]

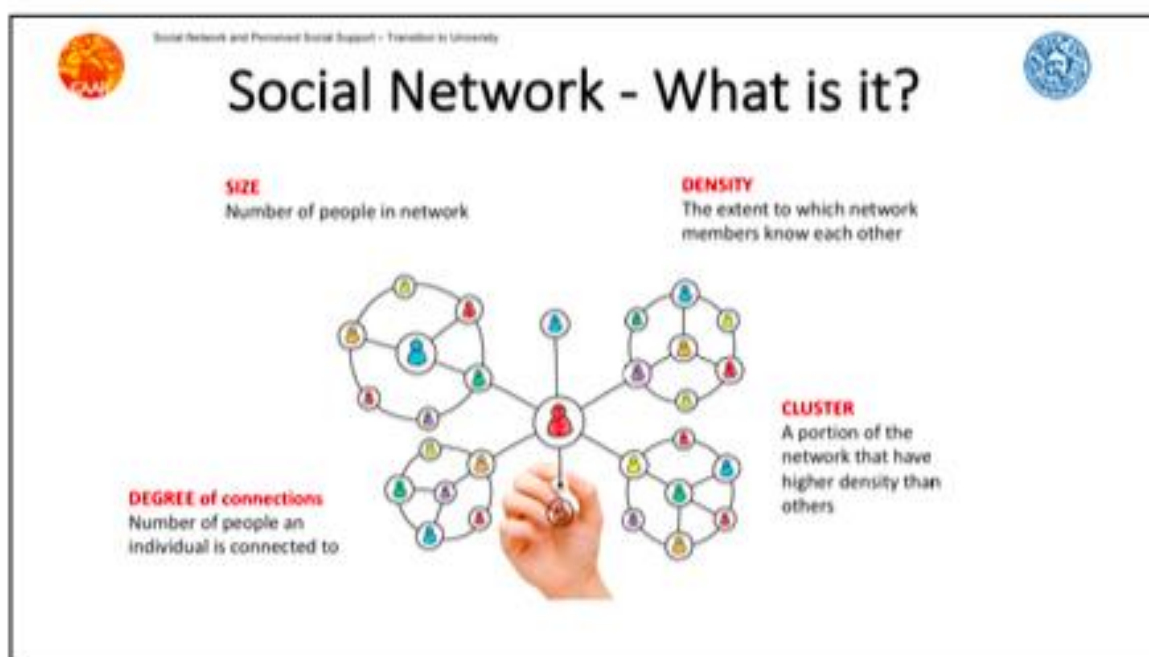
Very difficult	Somewhat difficult	Neutral	Somewhat easy	Very easy
----------------	--------------------	---------	---------------	-----------

- 2) How would you describe the experience of viewing someone's social network map? Please use as many words as you wish.

- 3) Which aspects of the social network map did you like / didn't like? Any suggestions on improvement?

- 4) Which aspects of the social network map did you find particularly useful or not useful for helping you think about social transitions when moving to university?

VII. Social Network Workshop presentation material with notes for presenters (Study 4, Chapter 6)



Explain basics of social networks:

Social network analysis is a way for us to map out who we know, and the relationships people have with each other. There are two types of social networks:

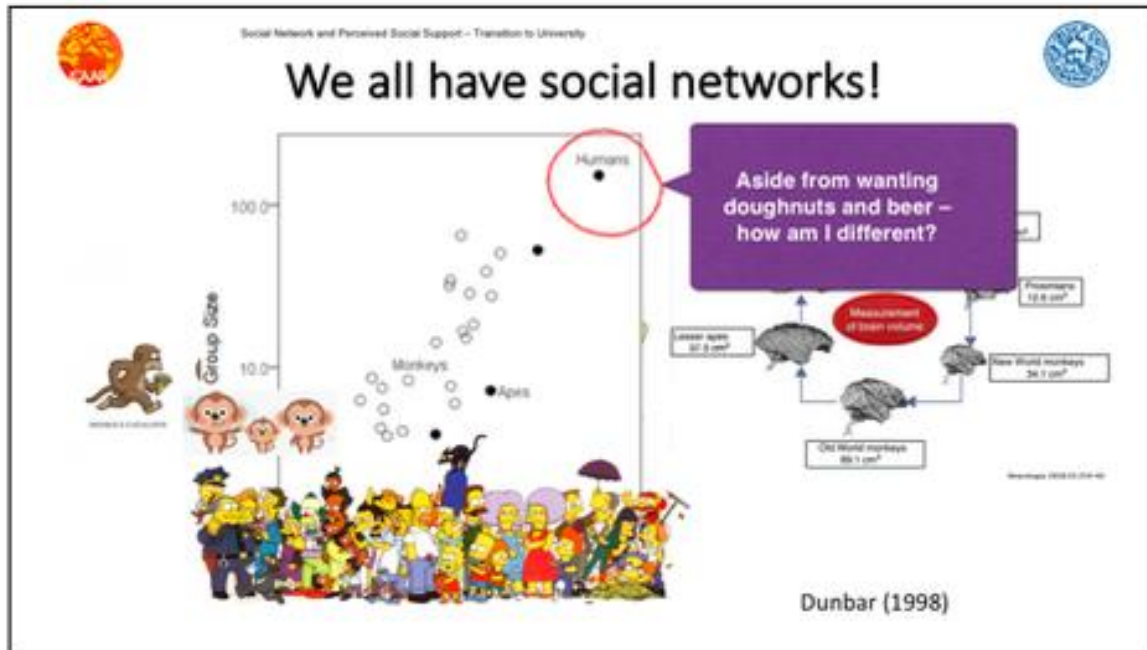
- 1) Sociomaps – where everyone within a predefined social setting (e.g., a classroom) each rate who they are in contact with, and the relationships they observe both between self and others, but also between other people (i.e., do you identify friendship clusters?)
- 2) Ecomaps – where a specific individual name all the people they are in close contact with across multiple social contexts, and the relationship status between self and each person named. Participants can also approximate whether the members they have named know of and are in contact with each other (i.e., do your colleagues at work also know and keep in touch with some of your friends from university?)

Main difference: SELF is included in sociomaps – because all other individuals within that social setting (e.g., all your classmates) will be rating their relationship to you, and you will rate your relationship with them. SELF is NOT included in ecomaps – because it is all about the people you are in contact with, and to what extent these people might be in contact with each other!

For today – we will focus on ECOMAPS, which is related to the questionnaire you have all completed online prior to coming to the Bath Autism Summer School.

There are some key metrics:

- 1) Size = how many people there are named within a social network (e.g., how many people have you kept in contact with, and consider to be important to you, over the past 3 months?)
- 2) Degree of connections = for each member named, how many other network members do they know and are in contact with?
- 3) Density = the overall extent to which network members named know each other
- 4) Cluster = do some members know each other better than others? (i.e., all of family might be in one cluster, friends from school might be in another cluster)



Evolutionary origin of social networks:

Why is social networks particularly important to us?



From an evolutionary perspective - our ancestors who lived in a hunter/gatherer setting – all lived in communities of varying sizes!

This is because we are all fundamentally social animals and living in a community not only allows you to pool and share your resources together with each other but can also give you access to new sources of information, offer greater protection, and also support!

Some scientists think that the way our communities grew actually shaped the way that our brain structure evolved – especially looking at the neocortex (outer most layer of the brain), and the complexity of its folding (gyrification). The increase in gyrification is thought to enable us to have greater capacity to process social information, as our community sizes grew!

You can see on this graph – which looks at group size versus relative neocortex volume (i.e., how much folding and surface area there is in the outer most layer of the brain, relative to the overall brain size). You can see that as group sizes increases, so did our relative neocortex size. Monkeys have a relatively smaller social network and community size, so have relatively smaller neocortex volume.


For humans – we are almost an outlier! We have far greater community sizes, and our neocortex volume is significantly larger than any our apes or monkeys!


Social Networks and Perceived Social Support - Transition to University


Why is Social Network Analysis useful?

Size and density is linked to flow of resources and is a useful way to measure **social support**

→ **High density:** social identity, flow of support, better well-being
(Cohen & Underwood, 2000)



The link between social networks and social support

The importance of mapping out our social network structure (so who we are in contact with, and our relationships with them), is that it gives a clear visualization of what resources are available to us when we need a bit of support.

There are some established relationships between some key metrics of social networks, such as size and density, in relation to how much support and resource is available to an individual.

For example – in a network with high density – so all the people you are in contact with also know of and are in direct contact with each other independent of you – then there is a good flow of information across all the network members at any one time. For example, imagine if someone within your close family have just found something out (such as a new job or university offer), then assuming that your family members are close to each other and all talk with each other (i.e., high density), then it is likely that news will travel quite quickly, and everyone will be updated on that information quickly.

For support, high density networks also can be more supportive! Imagine if you encountered a maths problem and didn't know who to go to in order to help you solve it, but dad happened to be in the kitchen, then you might ask him for support. Dad might either be able to help you right away, or he might think actually your older sibling who has just studied this topic last year might be more helpful, and can therefore point you to the right person, or find out the solution from the right person, before getting back to you. This means that if everyone in your network is in close contact with each other, then you can theoretically go to any single individual within the network for support, and still end up having access to the same level of support, whether directly or indirectly.

A high-density network is especially helpful if you are in stable phase of your life, such as going to the same school for a few years, having stayed in the same house or neighbourhood for a few years, and not going through any significant life transitions.

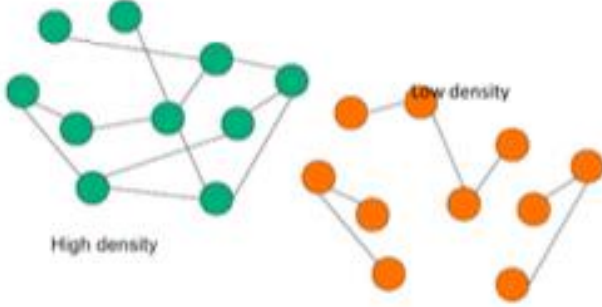
Can you think of situations when having a high-density network (where everyone is in close contact with each other, or good friends with each other) might not be so helpful?

Social Network and Perceived Social Support – Transition to University

But Social Network is not always stable!

Social network structure is sensitive to changes over the lifespan

→ **Low density:** maintain support during times of **transition** (Cohen & Underwood, 2000)



Understand that social networks is a dynamic structure – and there is no one size fits all!

Whereas a high density network can be particularly helpful during a stable phase of your life – it may not always be as beneficial when you are going through a life transition, such as starting a new school, or moving to a new area, or even when you face a break up!

This is because in an ecomap – all of the relationships are related to you – so you are really at the heart of all of your relationships! In a high density network where everyone knows of, and are in contact with most other people (e.g., all your friends are from school, or you have a very big family who all live close to each other and visit regularly), then if go through a life transition (say move to a new neighbourhood, or start a new school), then you might lose close contact with a lot of your network members all in one go.

Having a low-density network where some network members do not know of or are not in contact with each other directly might be helpful during times of transition. For example, say you might have a few pockets of friends from work, school, clubs and societies, church, or even family living in different cities, then if you quit your part-time job, or changed schools, or can no longer go to that club or society, you wouldn't risk losing touch with a lot of the people in your network, perhaps only those related to the particular social situation you no longer find yourself in.

Therefore, if your life is going through some transition changes, it might be a good idea to think about who is in your social network, how they are related to each other, and how those relationships might change when thinking about the transition you are about to go through.

Social Network and Perceived Social Support - Transition to University

How does this apply to transitioning to university?



Well everyone, I don't mean to get emotional but everything in my life has led to this moment.

Social Network and Perceived Social Support - Transition to University

Lots of changes @ University!



Living in shared accommodation



I can't do this on the first day!

Organise your own time

"Also on my to do list..."

- Daily living: cooking, laundry, manage your finances
- Academic: group work, exams
- Leaving family and friends behind



Socialise / Make Friends

Think about some of the challenges they might face when going to university – what's new?

1) You are moving to a new living arrangement.


→ This means you might be leaving home for the first time (at least for an extended period of time) and saying bye to your parents and family you live with.

2) You gain more independence compared to before – you will need to be able to organize your own time, budget your own finances, and do your own housework.


→ This means you might need to access new sources of support, to help you with tasks that you may or may not have completed by yourself before.

3) You are also meeting lots of new people – course mates, flat mates, or through societies and clubs, as well as lecturers, tutors and anyone else that you might come across!

→ This means you might be making some new relationships at university, and might not have as much to keep up your old ones from before university.



Social Network and Perceived Social Support - Transition to University

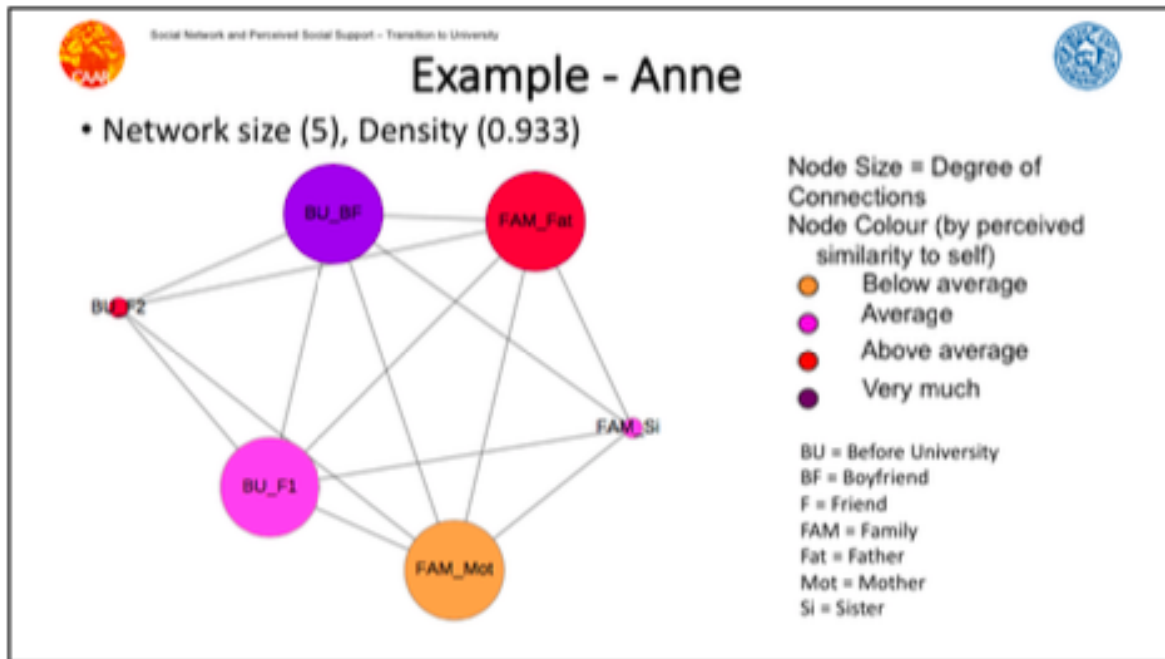


Social Network Map = Helpful tool?

- **Who** are you in contact with, and can provide support *now*?
 - Family
 - Friends
 - Others (e.g., teachers, lecturers, support workers, staff)
- **What** kinds of support do they provide to you now?
 - Academic (meeting deadlines, planning, understanding)
 - Daily living (cooking, cleaning, seeking medical help)
 - Socialisation (meeting new people, making friends etc)
- **How** will this change when you go to university?
 - Family
 - Friends (before university; since university)
 - Others (before university; since university)

Social network maps might be helpful when preparing for this transition, as it can help you map out:


- 1) **Currently** – who you are in contact with and is providing you with support.
- 2) **Currently** – what types of support are they providing you with?
- 3) **Moving to university** – how will your relationships change? Will this affect how you will be able to access support?




Maybe work together as a class or in pairs:

Example: Anne – just completed her A-Levels, and will be going to university in September

- 1) Who is in Anne's social network? (size)
 - are there family members?
 - are there friends?
 - are there other network members – such as support workers, teachers, or others?
- 2) How are network members connected to each other? (density) - are they well connected?
 - any clusters?
- 3) Can you spot anyone that is particularly important in Anne's social network (bigger circles = more connections with other members) – might be more than one person!
- 4) Anne is going to university in her hometown, although will be living 20 minutes' drive away from home in student accommodation. Both of Ann's friends, and her boyfriend will be studying in different cities next year.
 - How do you think Ann's network map might change?



Social Network and Perceived Social Support – Transition to University



Social Network Exercise

- Now it's time for you to have a go at examining social networks!
- Choose one of the below to complete:
 1. Your **PERSONAL** social network map (based on your online questionnaire response)

Online link: <https://tinyurl.com/SNAPSS-Own>
 2. Another **EXAMPLE** social network map

Online link: <https://tinyurl.com/SNAPSS-Example>
- Answer all questions either on paper worksheets, or online using the links above.

Please inform students that now it is time for them to choose one of the two exercises below to do.

1. Choosing their personal social network map to analyse:
Prior to arrival, all students completed a social network questionnaire online – and based on their responses, a social network map specifically for each student has been created. Students selecting this option will get a chance to see the network map created based on their pre-arrival questionnaire and answer some questions about it.
2. Choosing example social network map to analyse:
For some students who might not want to see their own map, or for those who have not completed the social network questionnaire pre-arrival – they can complete the example exercise based on "Jack" – very similar to the Anne example.

Please note that students have the option to complete the exercise either on paper, or online (from their mobile phone).

Please go around the group and give students assistance if needed and try to make sure that all complete this exercise and submit answers either via worksheet or online.

References

- Cohen, S., Underwood, L. G., & Gottlieb, B. H. (2000). *Social Support Measurement and Intervention: A Guide for Health and Social Scientists*. Oxford University Press.
- Dunbar, R. I. M. (1998). The social brain hypothesis. *Evolutionary Anthropology: Issues, News, and Reviews*, 6(5), 178–190. [https://doi.org/10.1002/\(SICI\)1520-6505\(1998\)6:5<178::AID-EVAN5>3.0.CO;2-8](https://doi.org/10.1002/(SICI)1520-6505(1998)6:5<178::AID-EVAN5>3.0.CO;2-8)
- Groening, M. (Producer) (2013). *The Simpsons*. [Television series] USA: Gracie Films, 20th Century Fox Television
- Rae, K. (Producer) & Scanlon, D. (Director) (2013). *Monsters University*. [Motion Picture] USA: Walt Disney Pictures, Pixar Animation Studios.

VIII. Information and consent forms (Study 5, Chapter 7)



Information Sheet

Investigating self-determination amongst university students (18-309)

Who is doing the research?

My name is Jiedi Lei and I am a researcher in the Department of Psychology at the University of Bath. I am conducting this study as part of my PhD project to gain a better understanding of the relationship between self-determination and students' university experience amongst both students with Autism Spectrum Disorder, and typically developing students.

What is this study about?

Who will take part?

I am looking for students over 18 years old, who are either currently enrolled in a university for their undergraduate or graduate studies or have recently completed their undergraduate studies. Students may **either**:

- Have a clinical diagnosis of Autism Spectrum Disorder (ASD) provided by a clinical professional
- OR**
- Do NOT have a clinical diagnosis of ASD, or any other current diagnosis of mental or chronic physical health conditions, or any developmental/specific learning disability.

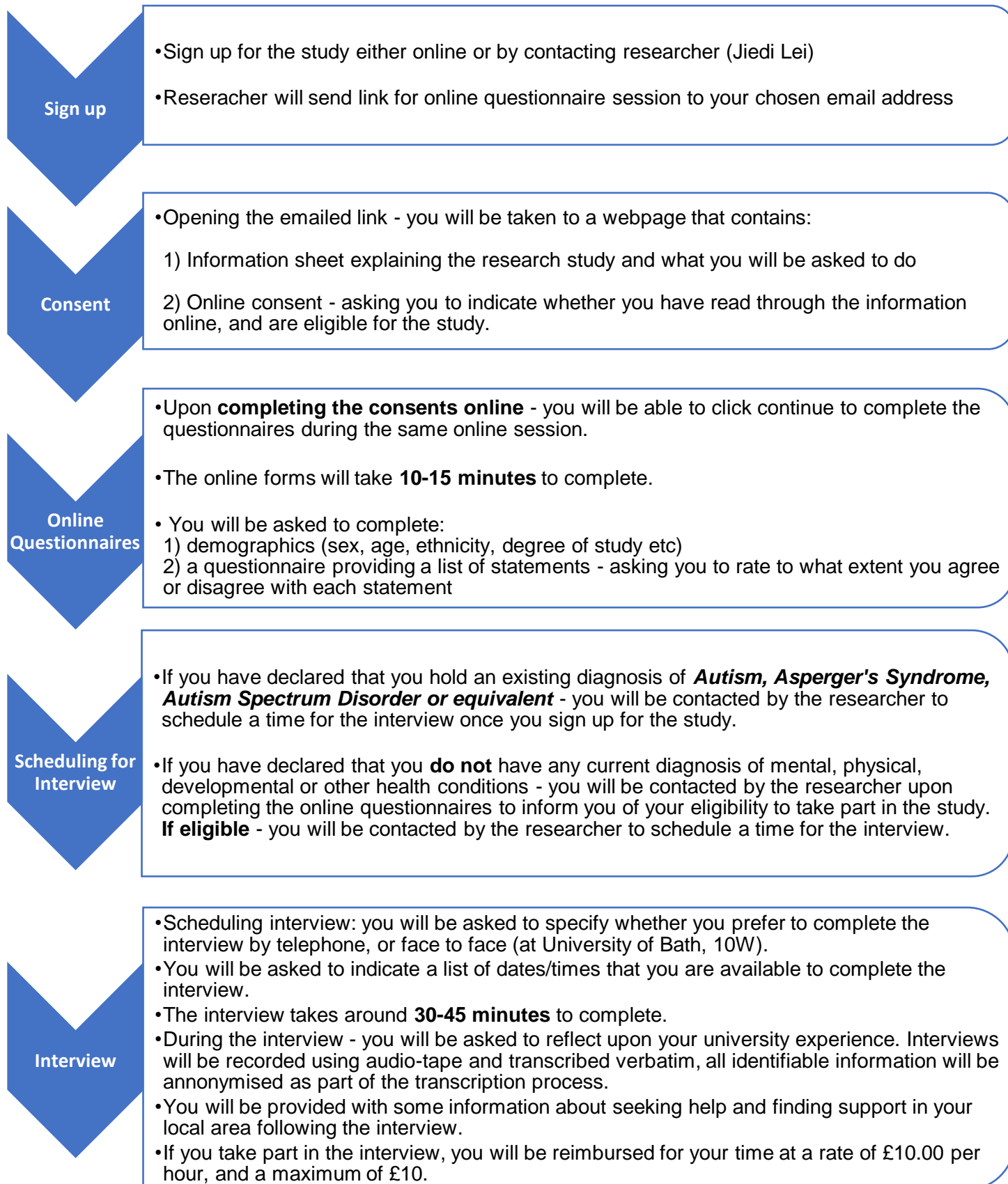
What is the procedure?

Students will be asked to first complete an online screening questionnaire session (10-15 minutes) to help the researcher determine whether this study is suitable for them. For those who are eligible for the study, students will be asked to complete a guided interview (30-45 minutes) either in person with the researcher, or via telephone.

Please see next page for a detailed outline of the steps involved in taking part in this research project.

What is the interview about?

In this interview I will be asking you some questions about your experience of transitioning to university, what university life is/was like for you, and ask you to reflect on how this experience may compare to other university students. I am particularly interested in understanding to what extent you feel that your experience at university is shaped by you, and whether there are any things you've done, or qualities you have, that you believe are important in helping you shape your life.



Do I have to take part?

Taking part in this research is entirely voluntary, and you are free to make your own choice about whether you want to participate. If you agree to take part you can choose not to answer any questions that you do not want to and you are free to withdraw at any time, and prior to June 2020 - after which any data you have provided will be fully anonymised, and it will no longer be possible for the researcher to remove your data from the database

What will happen to the information I provide?

Should you decide to take part, the interview will be recorded. These recordings will then be typed up and the files stored on an encrypted password-protected computer. Any potentially identifying details, including your name, will be removed. The interview information and website recording will not be linked to any contact details that you provide and will be stored separately so you cannot be identified.

Recordings and transcripts will be kept securely with strict access by the research team and will not be shared with any third-party. The data will be solely used for research purposes, which may include the use of anonymised quotations from interviews in research presentations and publications. Once the project is completed, the information you have given to me will be kept safely by the University of Bath. If you give your consent, it may be used by other genuine researchers, with the University of Bath's approval, under the strict rules governing the confidentiality of your information. So again, your name, or any material that might identify you, will never be used or given to anyone.

What will happen to the results of this research?

What you tell me will inform our understanding of the extent to which university students feel in control of their lives at university and help us identify any areas where support may be helpful in helping students to feel more autonomous at university. I may use extracts taken from what you have told me, however these would not identify you to anyone. The findings of the research may also be published in research journals or used in presentations. If you would like to be sent a summary of the findings, we can arrange for this.

What do I do if I would like to take part or have any more questions?

You can contact me, Jiedi Lei, to arrange a suitable time or to discuss any questions you might have.
Email – j.lei@bath.ac.uk

You can also speak to the supervisor of the project, Dr. Ailsa Russell
Email – a.j.russell@bath.ac.uk Phone – 01225 38 5517

If you have any concerns about the ethics of this research study, please contact the Bath University Psychology Department Research Executive Officer, Dr. Jie Sui
Email: psychology-ethics@bath.ac.uk Phone: 01225 38 4322

Our address is:
Department of Psychology,
University of Bath
Claverton Down
Bath, BA2 7AY

Many thanks for taking the time to read this. I would be delighted if you would be willing to take part.

CONSENT FORM

Investigating self-determination amongst university students

Please answer the following questions to the best of your knowledge

	YES	NO
DO YOU CONFIRM THAT YOU:		
• Currently enrolled at an undergraduate degree course or equivalent at a UK based institution?	<input type="checkbox"/>	<input type="checkbox"/>
• Are 18 years old or above	<input type="checkbox"/>	<input type="checkbox"/>
• <i>If you have Autism Spectrum Disorder (ASD):</i> You have previously received a diagnosis of ASD, Autism, Asperger's Syndrome from a clinical professional, and can provide proof of your diagnosis if requested?	<input type="checkbox"/>	<input type="checkbox"/>
• <i>If you do NOT have Autism Spectrum Disorder:</i> Do you have any other current mental health or physical health conditions and/or any other developmental or specific learning disability diagnoses?	<input type="checkbox"/>	<input type="checkbox"/>

HAVE YOU:		
• been given information explaining about the study?	<input type="checkbox"/>	<input type="checkbox"/>
• been given the contact information of the researcher to ask questions?	<input type="checkbox"/>	<input type="checkbox"/>
• received enough information about the study for you to make a decision about your participation?	<input type="checkbox"/>	<input type="checkbox"/>

DO YOU UNDERSTAND:		
that you are free to withdraw from the study and free to withdraw your data prior to anonymisation		
• at any time?	<input type="checkbox"/>	<input type="checkbox"/>
• without having to give a reason for withdrawing?	<input type="checkbox"/>	<input type="checkbox"/>

I hereby fully and freely consent to my participation in this study

I understand the nature and purpose of the procedures involved in this study. These have been communicated to me on the information sheet accompanying this form.

I understand and acknowledge that the investigation is designed to promote scientific knowledge and that the University of Bath will use the data I provide for no purpose other than research.

I understand that the data I provide will be kept **confidential**, and that on completion of the study my data will be **anonymised** by removing all links between my name or other identifying information and my study data. This will be done during the transcription process following my interview, and before any presentation or publication of my data.

I understand that the University of Bath may use the data collected for this project in a future research project but that the conditions on this form under which I have provided the data will still apply.

Participant's signature: _____ Date: _____

Name in BLOCK Letters: _____

Final consent

Having participated in this study

I agree to the University of Bath keeping and processing the data I have provided during the course of this study. I understand that these data will be used only for the purpose(s) set out in the information sheet, and my consent is conditional upon the University complying with its duties and obligations under the Data Protection Regulation.

Participant's signature: _____ Date: _____

Name in BLOCK Letters: _____

If you have any concerns related to your participation in this study please direct them to the Department of Psychology Research Ethics Committee, via email: psychology-ethics@bath.ac.uk.

Debriefing Information (post Interview) - Investigating self-determination amongst university students

Thank you for taking part in this project, which has been investigating the relationship between self-determination and students' experience at university.

In case that completing the questionnaires and the interview brought up difficult feelings for you or if you are encountering any concerns related to academic, personal/emotional, or social adjustment during your university studies, here are some links to students support services that you may wish to contact. All the services listed below are free of charge.

1) At University of Bath:

Student Support General: <http://www.bath.ac.uk/study/pg/support/index.html>

Health and Wellbeing: <http://www.bath.ac.uk/study/pg/support/welfare/>

Student Services: <http://www.bath.ac.uk/departments/student-services/>

Living/Finance Management Accommodation: <http://www.bath.ac.uk/study/pg/support/living/index.html>

Disability services and advice: <http://www.bath.ac.uk/study/pg/support/disability-advice/index.html>

2) If you are from another university, you may wish to seek help from the student support and disability services at your university. You can also seek help through your GP.

3) If you are experiencing mental health difficulties and would like to seek support from outside your university and/or GP, below are a few charities that you may find helpful:

Mind: <http://www.mind.org.uk/>

Sane: <http://www.sane.org.uk/>

Rethink Mental Illness: <http://www.rethink.org/>

4) If you have been diagnosed with (or suspect a diagnosis of) a specific learning disability, and/or Autism Spectrum Disorder, or and would like to find additional support services, below are a few resources that you may find helpful:

National Autistic Society (National charity for autism): <http://www.autism.org.uk/>

Autistic (charity for autism): <http://www.autistica.org.uk/>

Scope about disability (website with lots of support resources for learning and physical impairments/disabilities):
<http://www.scope.org.uk/support>

Thank you again for participating. If you would like to speak to us about the project please get in touch.

IX. Self-determination study interview topic guide (Study 5, Chapter 7)

Self-Determination Interview Guide

INTRODUCTION

Thank you for taking part in this study today.

For this study, we are interested in finding out more about your university experience, and in particular, to what extent you feel that you are in control and self-determined at university. We want to learn more about what aspects of you/your personality has helped you at university, and we will also ask you to reflect on whether you have observed anything that other students do, which in your opinion has helped them at university.

There are no right or wrong answers for any questions. We want to better understand *your* experience at university. It is alright to answer, “I don’t know”, or let us know if you think the question does not apply to you.

Please do feel free to interrupt or pause the interview such as by asking the interviewer or raising your hand at any time if you would like some more time to think and ask questions if you are unsure of any questions. The interview should take around 30-45 minutes.

Do you have any questions before we start? Is it okay for me to switch on the audio-recorder now?

WARM UP QUESTIONS

1. Which course are you studying?
2. Which year of study are you in? How long is your programme?
3. How did you reach the decision to start university? How old were you?

INTERVIEW QUESTIONS

1. Thinking back to first starting university, what was transitioning to university like for you?

Think back to moving in, Freshers' Week, introductory lectures, meeting your flatmates for the first time?

2. Were there any previous experiences, or things that you've done, which you felt were helpful in preparing you for making the transition to university?

3. How has university life been like for you?

Can you tell me about some of the positive and negative experiences you have had?

Has anything changed since first transitioning to university? How have things changed?

Prompt for academic, daily living, and social domains.

4. To what extent do you feel like your university life is being shaped by you? (or in other words, to what extent do you feel like you are in control of your university life?)

Which personal qualities or strengths do you think have helped you?

Are there other people that have helped you along the way?

Any formal / informal support? If yes, what has helped you in seeking support?

5. How do you think your university life might compare to other students?

Prompt for academic, daily living, and social domains.

6. Are there things you wish would be different in your university life? What are they?

Prompt for academic, daily living, and social domains.

7. In what ways do you think autism has had an impact on your university life?

8. What do you think life might be like when you graduate from your current degree or when you leave university?

How do you think it will compare to your experience of transitioning to university?

9. Do you think there are things you've done, or skills you've gained during your time at university that will help prepare you for transitioning out of university?

10. Is there anything else about your experience of university life (transition to and from university) that you would like to add / that you think is important and we have not mentioned yet?

11. What do you understand by the term "Self-Determination"?

12. How do you think the concept of "self-determination" apply to your university life?

QUESTIONS AND CLOSING

Thank you so much for answering those questions. Our interview has come to an end.

Are there any questions that you would like to ask me about this interview or related to the study?

Thank you again for taking the time today to take part in our study. Please do contact me if you have any questions or concerns later or would like to withdrawal from the study at any time. My email is: j.lei@bath.ac.uk

THE END.