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Invited Article

Autism and the double empathy problem: Implications for development and mental health

Peter Mitchell[1,2]*, Elizabeth Sheppard[1] and Sarah Cassidy[1]

[1]School of Psychology, University of Nottingham, UK
[2]School of Psychology, University of Bradford, UK

This article proposes a link between autistic people being misperceived by the neurotypical majority and their being at risk of poor mental health and well-being. We present a transactional account of development in which the misperceptions (and consequent behaviour) of the neurotypical majority influences the perceptions and behaviour of autistic people such that they become increasingly separate and indeed isolated from mainstream society. This jeopardizes their mental health and prevents autistic people from developing to full potential. The situation is not only problematical for the development of autistic people but is also to the detriment of wider society, in so far as autistic people are effectively prevented from contributing fully. This account assumes that some (not necessarily all) autistic people yearn to be included, to be productive and to be useful. It thus directly opposes accounts that view autism as an extreme case of diminished social motivation.

This article explores how the experience of living in a largely neurotypical society could hinder development of abilities which allow smooth interactions between autistic[1] and neurotypical people. Autism is classified as a lifelong developmental condition marked by difficulties with social communication coupled with a restricted range of interests (DSM-5; APA, 2013). However, a particular aim of the article is to explore how being misunderstood or misperceived by other people could create a barrier to participation in social experiences for the minority–autistic people. We argue that this barrier acts to prevent both groups (autistic and non-autistic people) from having otherwise valuable opportunities to learn about each other's social behaviour and about how to interpret signals emanating from the other group. These signals can be informative about inner states (like what the person is thinking or how they feel—e.g. Valanides *et al*, 2017) and traits (such as whether the person is kind, trustworthy, shy, calm, etc.—e.g. Wu *et al*, 2016, 2019).

Correspondence should be addressed to Peter Mitchell, School of Psychology, University of Bradford, Bradford, BD7 1DP, UK (e-mail: P.Mitchell1@bradford.ac.uk).

[1] *We use the term "autistic people" in this paper rather than "people with autism", as this terminology is preferred by a majority of autistic people (Kenny* et al, *2016).*

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A further aim is to explore the developmental consequences of this barrier for each group (autistic and neurotypical). Autistic people, who are in the minority, might respond by trying to hide or camouflage their autism-specific style of social interaction and attempt to emulate the social interaction style of the neurotypical majority (Hull *et al*, 2019). This strategy could enable a degree of access to neurotypical social experiences and indeed a degree of acceptability therein, but at psychological cost owing to the effort that has to be exerted (Hull *et al*, 2017), coupled with the stress associated with the risk of being 'found out' (Cage & Troxell-Whitman, 2019). Worryingly, research is identifying a strong association between camouflaging autistic traits, with poor mental health, well-being, and high rates of suicidal thoughts and behaviours in autistic people (Cassidy *et al*., 2018; Cassidy *et al*, 2019). We urgently need to further understand the risks to mental health arising from the stress associated with this camouflaging behaviour, coupled with the sense of isolation, and consequent feelings of loneliness. Our aim is to explore whether such experiences could lead the individual to feel not valued and unwanted, perhaps leading to a fatal outcome if the individual feels they are a burden on society and that the world would be better off without them, with suicide perceived as the only available option. We propose a new model in order to understand how this process may come about, and how it may be empirically tested in future research.

On the face of it, the consequences of the misperception for neurotypical people, who are the majority group in society, are less damaging. Nevertheless, we argue that exclusion of autistic people from society likely serves to prevent opportunities for neurotypical people to learn from cross-neurological social interactions, and maintains or even increases division within society. This in turn means that society does not fully benefit from the valuable contribution that autistic people could make in many spheres of life, including innovation, the workforce, and culture, to name but a few (Silberman, 2015).

We adopt an approach that recognizes autism as a developmental disability (where *development* is the operative word) situated in a social context—a context that is powerful in shaping development. We aim to contrast this approach with a medical model of autism. Our starting point, then, is to compare and contrast the medical model with a social–developmental account that embraces the 'double empathy' view of autism, as defined below.

The medical model versus a social–developmental account

The medical model assumes that autism exists in the individual as part of their essence, condition or constitution, a view that is likely shared by individuals so diagnosed (Silberman, 2015); that if we could treat this condition (with a kind of medical or therapeutic intervention) to get rid of it, then the individual would be cured and continue life thereafter as a neurotypical person. Our first challenge, then, should be to understand the historical context that explains how the medical model came into existence. Both Leo Kanner and Hans Asperger, the two medical doctors credited with discovering autism, understandably subscribed to medical models of disorders. Indeed, according to Czech (2018), Asperger was situated in a historical context where political imperative (favouring eugenics) encouraged an approach that classified certain 'defects' in order to isolate those affected individuals to prevent them 'contaminating' the wider population. To this end, a programme of euthanasia was pursued in Nazi Austria, the nation in which Asperger worked.

Various cognitive theories of autism (Rajendran & Mitchell, 2007) that came into prominence over recent decades implicitly subscribed to a medical model of autism, the

theory of mind hypothesis being a case in point (Baron-Cohen *et al*, 1985). A particular version of the theory of mind hypothesis, championed by Leslie (1987), viewed autism as a defective module that in a neurotypical person enables one to make calculations of what other people are thinking. This account seemed to imply that if the part of the brain that hosted the affected module could be fixed, then the individual would be 'cured' of their autism. This account was met with an insightful critique from Hobson (1990): He argued that in adopting a modular approach the theory of mind hypothesis is a, 'nondevelopmental, nonsocial, and restrictively cognitive account . . . an alternative thesis is proposed: A young child's knowledge about people is grounded in the experience of . . . interpersonal relations'. (P114). We concur, adding that not only a young child's but everybody's knowledge about people is grounded in the experience of interpersonal relations. That said, we are not intending to deny that an aspect of autism has an innate basis, perhaps relating to attentional preferences or priorities. For example, autistic people may have an innate preference for aspects of the physical over the social world, unlike typically developing people (e.g. Freeth *et al*, 2010); and this might explain the development of heightened visuospatial abilities in autism (Mitchell, 2017).

In contrast to the medical model, a social–developmental account of autism assumes development is shaped by the kind of responses and reactions we experience when encountering others. This is a *transactional* account of development (Mitchell, 2017) that assumes your behaviour influences how others perceive you which in turn determines how they behave towards you which then impacts on how you behave which further influences how others perceive you and so on—Figure 1. The transactional model embraces the view expressed by Karmiloff-Smith (1998), who argued that development itself is key to understanding developmental disorders. López (2015) concurs, noting that social experiences critically influence the way autism develops over the lifespan.

A key priority, then, is to understand how autistic people are perceived and understood by others. Surprisingly, we know little about this, though considerable research effort has been devoted to demonstrating that autistic people have an underdeveloped ability to perceive and understand other (non-autistic) people (e.g. Pillai *et al*, 2014). This research imbalance is probably driven by the medical model, perhaps with the implicit belief that if we can identify the nature of impairment in autistic people then we will be well-placed to reduce or even cure it.

A great volume of research has documented the difficulties autistic people face in inferring other people's inner states (Baron-Cohen, 1995). These difficulties are offered as an explanation for why autistic people experience challenges in social contexts (Frith, 2003). More recently, though, a few researchers have turned the question on its head to enquire how neurotypical people fare in understanding autistic people, especially in inferring their inner states (e.g. Edey *et al*, 2016). Accordingly, Milton (2012) articulated the 'double empathy problem', suggesting that autistic people have difficulty fitting into society not just because they misunderstand others but also because they are misunderstood by others. Hence, considering how autistic and neurotypical people fare in perceiving and understanding each other, there could be a failure of empathy in both directions.

How are autistic people (mis)perceived by neurotypical people?

This is a highly pertinent question but one that is extremely difficult to answer (though not impossible—see below). Specifically, it is hard to determine how accurately people infer

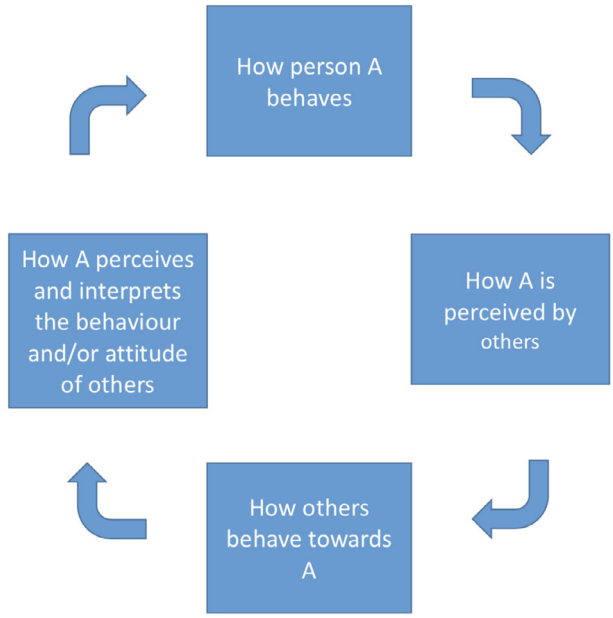

Figure 1. How Person A behaves impacts on how they are perceived by others, which influences how others behave, behaviour which is interpreted by Person A, which in turn influence how A behaves. This is an example of the transactional model of development. [Colour figure can be viewed at wileyonlinelibrary.com]

the inner states of any people, including those who are autistic. The problem concerns the criterion against which we should compare inferences to determine if they are accurate. But surely, we could simply ask the person (the target) what their inner state is and then observe whether another person's (the perceiver's) inference tallies with this (Ickes, 2003). The trouble is that what a target declares as their inner state is not a reliable source of information, as we cannot be certain of the value of introspection in this matter (Wu *et al*, 2019): Implicitly, we would be assuming that the target knows their own inner state through introspection and we would therefore effectively be assuming that introspection is a valid source of information.

Edey *et al* (2016) sought an objective measure of mind-reading accuracy by asking targets to manipulate geometric shapes to enact interactions (between the geometric shapes) that involved interpersonal emotions, such as coaxing, mocking, seducing, and surprising. The movements of the shapes were video recorded and then shown to perceivers who were asked to infer which interpersonal emotions were being depicted (even though they could not actually see the person who was doing the manipulating). Neurotypical perceivers were considerably more accurate in their inferences when the shapes were manipulated by neurotypical targets than when manipulated by autistic targets. The authors concluded on the strength of this that the inner states of autistic people are more difficult for neurotypical people to infer than are the inner states of neurotypical people. Such a conclusion is limited, though, considering that perceivers were not actually asked to infer inner states of targets but rather were asked to interpret the movements of geometrical shapes by selecting from a set of interpersonal emotion terms.

Our research, in comparison, invites perceivers to interpret signals in the behaviour of targets to infer things such as what a person said to the target (Cassidy, Ropar, *et al*, 2014,

2015), what the target is looking at (e.g. a facial expression or a positive/negative image—Kang *et al*, 2018; Teoh *et al*, 2017), what the target is thinking (Valanides *et al*, 2017), and the status of the target's social context (whether they are accompanied or alone—Teoh *et al*, 2017)—see Wu *et al* (2019) for a summary. These inferences qualify as 'retrodictive mind reading' (Gallese & Goldman, 1998), which refers to the process of interpreting signals in another person's behaviour to infer their inner state (the proximal cause of their behaviour) and perhaps the event in the world that triggered the inner state (the distal cause of their behaviour, Teoh *et al*, 2017; Wu *et al*, 2019). For example, on observing a person in a bar behaving in a gregarious and uninhibited manner we might infer that they feel cheerful and tipsy, perhaps, we further infer, because they imbibed some intoxicating beverages. When perceivers make an inference, usually by selecting among plausible alternatives, we the researchers can know with complete certainty whether or not the inference is accurate, as we know factually what the target is reacting to (a particular stimulus, a cue word, what another person said to them, etc). Hence, if the perceiver makes an accurate inference, then it is fair to assume that the event the target is reacting to is signalled in their behaviour—a signal that is readable to the perceiver.

Granted, one might say that inferring what a target is reacting to does not amount to inferring the target's inner states: Perhaps perceivers are able to make inferences from signals in a target's behaviour to make direct inferences of the worldly event that caused the target reaction without giving any consideration to the target's inner states. However, an EEG study conducted by Kang *et al* (2018) suggests that the cortical processing involved in a retrodictive inference is entirely consistent with the involvement of mentalistic processing, suggesting that on viewing signals in a target's behaviour, perceivers make an inference about the causal worldly event via an intermediary inference of the target's inner state (see Wu *et al*, 2019, for further discussion).

The value of retrodictive inference methodology as described above is manifold. It uses spontaneous, natural and unguarded behaviour as the target stimuli that perceivers are invited to interpret. Consequently, it enables us to measure the ability of perceivers to make inferences about the kind of stimuli they are likely to have to work with in everyday life. Second, the method outputs a graded measure of the perceiver's performance, depending on how many accurate inferences they succeed in making. Third, the task is intuitively highly accessible, so much so that it can be presented to young children (Kang *et al*, 2017) who, like older participants, also demonstrate significantly accurate inferences.

In addition, a key value of this method is that accurate inferences depend not only on the ability of the perceiver to interpret signals but also on the quality of signal emanating from the target. It stands to reason that some targets will be more readable than others and this is measurable as the proportion of perceivers who make an accurate inference on what a particular target is reacting to. It is then possible to rank targets in ascending order of their readability, as in Figure 2. The figure is based on pilot work in which targets were observed by multiple perceivers, each of whom made a judgement on what the target was experiencing in a four-way forced choice task. The data appear as standard scores in the figure such that chance is zero. If most targets are readable, as we expect, then the majority will have positive values. If signals emanating from autistic targets are difficult to read, then they will tend to populate the bottom half of the figure, as we see with the thin lines (bold lines represent neurotypical targets). Please note that this figure is for illustrative purposes only and the data depicted have not been submitted to peer review.

Sheppard *et al* (2016) are credited with the first published article to use a retrodictive mind-reading paradigm to demonstrate that autistic people (targets) are less readable than

neurotypical people by neurotypical others. In this version of the task, the experimenter greeted the target in one of four ways when they arrived to participate in an activity they had signed up to do. The targets' reactions to the experimenter's greeting were video recorded. These videos were then shown to neurotypical perceivers, who were tasked with inferring (based on the target's reaction) how the experimenter had greeted them. Neurotypical perceivers were significantly more accurate in making such an inference when viewing neurotypical than autistic targets, suggesting the signal emanating from autistic targets was difficult for neurotypical perceivers to read. Note that perceivers were not informed at any time that some of the targets were autistic.

Is this because the strength or the quality of the signal was different in autistic compared with neurotypical targets? To find out, Sheppard et al asked a different group of neurotypical perceivers to rate the expressiveness of targets (without being informed that some were autistic), and in at least two of the scenarios (in which autistic targets were less readable than neurotypical targets), autistic targets were adjudged to be equally as expressive as their neurotypical counterparts. By implication, then, the signal emanating from autistic targets is not weaker in strength but is of a different quality, compared with neurotypical targets.

The medical model argues that autistic people experience social communication impairments, and predicts that these deficits would be amplified in autistic–autistic interactions. In contrast, the double empathy problem argues that autistic and non-autistic people have different social communication styles, with each group having difficulty empathising with the other. Therefore, the double empathy problem would predict that mixed autistic–non-autistic interactions would experience the most difficulty in social communication, whereas autistic–autistic peer communication would be significantly more efficient in comparison. Research has started to explore these hypotheses. Heasman and Gillespie (2019a) investigated interactions between two autistic people playing a video game. Results showed unique aspects of interaction between autistic people.

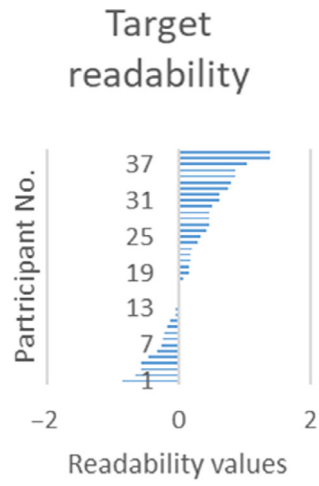

Figure 2. It is possible to assign a readability value to each target, depending on how accurately multiple perceivers are able to interpret that target's behaviour. It is then possible to rank targets from most to least readable, whilst encoding who is autistic (thin lines) and who is neurotypical (thick lines). Note that this figure is for illustration purposes. [Colour figure can be viewed at wileyonlinelibrary.com]

Generous assumptions of common ground and low demand for coordination helped build rapid rapport, even when there were frequent interruptions in the flow of conversation. This suggests a different quality to autistic peer interactions, which does not impede ability to communicate or achieve a common goal. Crompton *et al* (2019) compared the quality of a set of instructions to complete a simple task, communicated through a diffusion chain of participants across three conditions—where the chain consisted entirely of autistic people, entirely of non-autistic people, or a mixed chain of non-autistic–autistic–non-autistic people. Results showed that the quality of the instructions, and successful completion of the task, was significantly higher in the all autistic compared to the mixed diffusion chain. Together, the evidence suggests that, contrary to the predictions of the medical model, and consistent with the double empathy problem model, autistic people have a unique interaction style which is significantly more readable by other autistic people, compared to non-autistic people.

The research conducted by Sheppard *et al* (2016), on how the behaviour of autistic people is interpreted by non-autistic people, is complemented by research by Sasson *et al* (2017) on how the behaviour of autistic people is evaluated by neurotypical people. Non-autistic perceivers watched short videos of targets (some of whom were autistic) performing a brief audition and then rated how much they favoured each target. Although the perceivers were not informed that some targets were autistic, their favourability ratings effectively discriminated between those targets who were autistic and those who were neurotypical. Specifically, autistic targets tended to be rated negatively. Given that we generally like people whose behaviour we can interpret, more so than those whose behaviour we struggle to interpret (Anders *et al*, 2016), it is reasonable to enquire whether there is an association between being difficult to interpret for neurotypical people and being rated unfavourably by this group. Alkhaldi *et al* (2019) presented the target videos used by Sheppard et al to a new group of neurotypical perceivers who rated each target on an adaptation of Sasson et al's social favourability scales. The findings replicated Sasson et al in demonstrating that autistic targets were rated less favourable than neurotypical targets by neurotypical perceivers. Moreover, the findings supported the prediction that targets who were difficult to interpret also tended to be rated unfavourably. Hence, the behaviour of many autistic targets was difficult for neurotypical perceivers to interpret and they also tended to be rated unfavourably by (a different group of) neurotypical perceivers. Interestingly, though, further statistical analysis revealed that this association between interpretability (or readability) and social favourability maintained independently of clinical diagnosis. In short, the finding is consistent with the possibility that autistic targets tended to be rated unfavourably by non-autistic others in a way that is not specifically associated with their being autistic but in a way that is associated with their behaviour being difficult to interpret.

This begs the question whether autistic people tend to rate other autistic people more favourably than non-autistic people, given that autistic people's behaviour appears to be easier for other autistic people to read (Crompton *et al*., 2019), and evidence of a unique shared social communication style (Heasman & Gillespie, 2019a). Two recent studies have explored this question. Grossman *et al*. (2019) and Debrabander *et al*. (2019) both compared how autistic and non-autistic people rated other autistic and non-autistic peers. Results in both studies showed that autistic people rated other autistic people as less socially favourable compared to non-autistic people (similarly to non-autistic raters). However, in Debrabander *et al*. (2019), autistic people's ratings were not perceived as an impediment to future social interaction (unlike non-autistic raters).

How does being misperceived impact on development?

Autistic people have a unique social communication style, which tends to be misinterpreted by neurotypical people, and are associated with neurotypical people perceiving autistic people unfavourably. Neurotypical people thus seem to lack the capacity to empathize with autistic people, just as it is claimed that autistic people lack capacity to empathize with neurotypical people. In this respect, the condition of autism should be understood as a bidirectional failure of empathy—hence, the double empathy problem (Milton, 2012). Consistent with this theory, and contrary to the predictions of the medical model, autistic people communicate more efficiently with other autistic people than they do with non-autistic people.

How do these misperceptions impact on development for each group? Some speculation is involved in answering this question and Figure 3 provides a starting point. We propose that how the behaviour of autistic people is perceived by neurotypical others (negatively), influences how they behave towards autistic people (unwelcoming), which is then perceived by autistic people (that they are not welcome), which then impacts on the behaviour of autistic people (perhaps wariness, mistrust, low self-esteem, lack of social ability due to lack of positive and rewarding social experience). This in turn will impact on how autistic people are perceived by neurotypical others (negatively), and so on. Meanwhile, perhaps neurotypical people tend to perceive autistic people unfavourably because they struggle to interpret signals in their behaviour; or perhaps on perceiving autistic people unfavourably, neurotypical people lack empathy and put little effort into interpreting signals in their behaviour. Either way, because neurotypical people are unwelcoming towards autistic people and exclude them socially, they do not learn to interpret their autism-specific style of social interaction, which might serve to further perpetuate their misunderstanding and misperception.

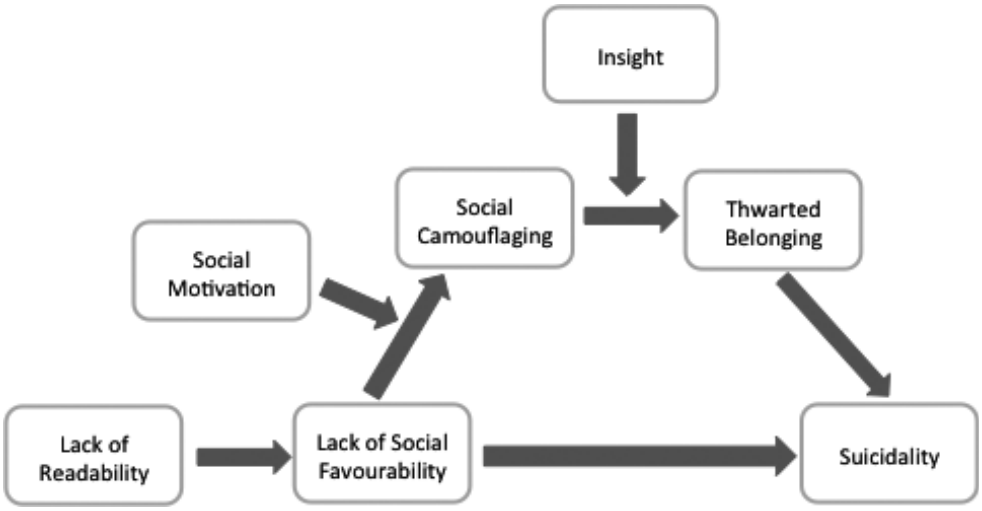

Figure 3. Hypothesized associations between readability, social favourability, and suicidality. The proposed association between lack of social favourability with suicidality is mediated by social camouflaging and thwarted belongingness. Social motivation moderates the association between lack of social favourability and social camouflaging. Insight into one's own difficulties moderates the association between social camouflaging behaviour with feelings of thwarted belongingness.

Hence, we envisage that early-emerging, or even innate, social interaction differences between autistic and non-autistic people act as a starting point for a transactional developmental process across the lifespan, the outcome of which is two ever more distinct groups, each with their own social interaction styles, which do not understand or empathize with each other particularly well. This means that both groups miss opportunities to learn from each other, not just about each other's' style of social engagement, but also fail to benefit from each other's' unique skills and abilities. Although we propose this to be a bidirectional issue, it is plausible that, as suggested by Milton (2012; see also Chown, 2014), neurotypical people might fail to empathize more than autistic people, as autistic people probably have greater opportunity (and need) to interact with and understand neurotypical others than the reverse, because the majority of society is neurotypical.

The argument above raises the interesting possibility that, if increased cross-neurological social interaction and inclusion were to occur from an early point in development, this could alter the developmental course for both autistic and neurotypical people. Fewer misunderstandings might occur, more favourable cross-group impressions could be formed, and ultimately perhaps a distinctive cross-neurological social interaction style could emerge.

One area of evidence which could begin to address our proposed model is to explore whether people who regularly interact with autistic people over the course of development, such as family members and siblings, are better able to interpret autistic people's behaviours, and also rate their behaviour as more favourable. To our knowledge, no research has directly addressed this question, although one previous study has investigated misunderstandings between autistic individuals and their family members (Heasman & Gillespie, 2018). This research asked autistic participants and their family members to rate themselves and each other on various characteristics, as well as to predict how the other would rate themself. It was found that, although both groups perceived that the other group would misunderstand them (i.e. differed in their own rating of self and predicted rating of self by other), neither group experienced significant actual misunderstanding (i.e. did not differ in predicted and actual ratings of self by other). This implies that there is a degree of understanding between autistic people and their family members but, as comparisons with non-family members were not part of this study, it is not clear what role familiarity had in the findings. There is also initial evidence that disclosure of autism diagnosis increases non-autistic people's favourability ratings of autistic people (Sasson & Morrison, 2019), but this may not translate into meaningful and positive behaviour change (Heasman & Gillespie, 2019b).

Consequences for mental health of being misperceived

Being socially isolated is likely to have adverse consequences for mental health (Hämmig, 2019), as is being perceived negatively by others along with the associated damage to self-esteem (Henriksen *et al*, 2017). At the time of writing, a link between how autistic people are perceived and the status of their mental health has yet to be established empirically. Nevertheless, as there is reason to believe such a link does exist, we can expect to find that issues of mental health will be elevated in autism. Sadly, the findings of recent research are entirely as expected. A majority of autistic adults (up to 79%) meet criteria for a psychiatric condition (Lever & Guerts, 2016) and up to 72% experience suicidal desire (Cassidy, Bradley, *et al*, 2014; Cassidy *et al*, 2018). Autistic people are at significantly increased risk

of dying by suicide than the general population, with suicide a leading cause of early death in this group (Hirvikoski *et al*, 2016; Kirby *et al*, 2019, and Cassidy, 2020 for a review).

Humans have an innate desire to be accepted by others, and to establish meaningful social connections—a sense of belonging. Suicide theories developed for the general population, such as the Interpersonal Psychological theory of Suicide (ITS, Van Orden *et al*, 2010) posit that a sense of social belonging is a crucial protective factor against mental health difficulties, and desire for suicide. Autism research has been plagued by the unhelpful assumption that autistic people are socially unmotivated (Chevallier *et al*, 2012), contrary to the testimony of autistic people (Jaswal & Akhtar, 2019; Mitchell, Cassidy & Sheppard, 2019). This has led to little research exploring how autistic people may experience constructs like thwarted belonging, and the consequent impact on mental health through the lens of suicide models such as the ITS. Our participatory research suggests, however, that autistic people painfully feel the consequences of social rejection and isolation, with consequent negative impact on mental health.

Autistic people describe belonging as a crucial aspect of their well-being (Camm-Crosbie *et al*, 2019; Milton & Sims, 2016), and those who are more likely to report external indicators of thwarted belonging, such as loneliness (Hedley, Uljarević, Wilmot, *et al*, 2018), lack of social support (Hedley *et al*, 2017), dissatisfaction with social support (Cassidy *et al*, 2018; Hedley, Uljarević, Foley, *et al*, 2018), and lack of acceptance in society (Cage *et al*, 2018), are also more likely to experience depression and suicidal desire. Pelton *et al,* (2020a) explored whether autistic people were more likely to experience thwarted belonging than neurotypical people, and whether there were similar associations between thwarted belonging and suicidal desire in both groups—as predicted by the ITS. Results showed that autistic people reported significantly higher levels of thwarted belonging than non-autistic people. In fact, thwarted belonging was normally distributed in autistic people, whereas this experience is typically rare, resulting in a skewed distribution in the neurotypical group. Thwarted belonging is thus a far more common everyday experience for autistic people than it is for neurotypical people. Thwarted belonging was also associated with suicidal desire in both autistic and non-autistic people, as predicted by the ITS. However, the associations were significantly attenuated in the autistic compared to the neurotypical group (Pelton *et al*, 2020a). This could reflect the fact that the measures designed to capture thwarted belonging in non-autistic people, do not similarly capture this construct in autistic people (Pelton *et al*, 2020b).

What other constructs may be relevant to understanding why thwarted belonging is associated with poor mental health in autistic people? Research has recently identified that many autistic people try to mask or compensate for their autistic traits in social situations, in an attempt to 'fit in' better with neurotypical people and wider society (Allely, 2019; Cage & Troxell-Whitman, 2019; Hull *et al*, 2017; Lai *et al*, 2017; Livingston *et al*, 2019). Autistic people report that camouflaging is exhausting and stressful (Hull *et al*, 2017). In co-designed research, autistic people described experiences of trying to camouflage their autistic characteristics in social situations, but as a consequence their 'true self' was not accepted, leading to increased feelings of thwarted belonging, and consequently the high rates of poor mental health, suicidal thoughts and behaviours. Consistent with this, the co-produced research showed that camouflaging autistic traits significantly predicted suicidal thoughts and behaviours, even after controlling for a number of other risk factors (Cassidy *et al*, 2018). Cassidy *et al* (2019) also found support for a serial mediation effect, where high autistic traits were associated with increased tendency to camouflage these traits, high levels of thwarted belonging, and suicidal

thoughts and behaviours in non-autistic people. The testimony of autistic people, reflected in research findings, suggest that people who attempt to camouflage their autistic traits are more likely to experience thwarted belonging and consequently experience suicidal thoughts and behaviours (Cassidy *et al*, 2019).

It is important to acknowledge that these proposed associations between readability and social favourability, camouflaging, thwarted belonging, and poor mental health are likely a transdiagnostic pathway, present regardless of autism diagnosis (Figure 3). Indeed, the association between readability and social favourability was present regardless of autism diagnosis (Alkahaldi et al, 2019), and associations between autistic traits with camouflaging, thwarted belonging, suicidal thoughts, and behaviours were found in the general population (Cassidy *et al*, 2019; Pelton & Cassidy, 2017). However, given that autistic people are the minority in society, they appear to be at significantly greater risk of being difficult to read and being perceived unfavourably by the neurotypical majority, which may lead to increased attempts to camouflage their autism to fit in, giving rise to increased feelings of thwarted belonging and suicidality.

It is important to consider what could moderate the associations in our proposed model (Figure 3). The desire to camouflage one's autism in social situations in order to fit in, and subsequent feelings of thwarted belonging that ensue, likely require social motivation and insight into one's own difficulties, including into how one is perceived by others (Cassidy *et al*, 2018; Chevallier *et al*, 2012). Specifically, one must desire social connections (i.e. be socially motivated) in order to camouflage in an attempt to be socially accepted. One must also have insight into one's own difficulties in achieving these meaningful connections with others, despite attempts to camouflage, in order to experience thwarted belonging and associated mental health difficulties. Hence, the associations between variables in the model will likely be present or stronger in those with high levels of social motivation and insight. Notably, the presence of such abilities in autism would stand in contrast to widely held views that autistic people lack social motivation and insight into other minds (Baron-Cohen *et al*, 1985; Chevallier *et al*, 2012). Following Jaswal and Akhtar (2019), we propose that both social motivation and insight are likely to vary among autistic people, who are a very diverse group, much as they presumably do in the neurotypical population. If empirical support is found for the model, it would reveal a complex, sophisticated, and nuanced profile of social behaviour in autism, further challenging 'social deficit' models.

The hypothesized moderating effects of social motivation and insight have not yet been tested in our proposed model. However, associations between social difficulties and mental health in autism are supported by research. For example, (Smith & White, 2020) proposed a model of depression in autistic people on the basis of a systematic review of the available literature in this area. In this model, depression is more likely to develop in autistic people who are socially motivated, alongside pronounced social and communication difficulties that prevent development of meaningful social relationships. Consistent with this model, Gotham *et al* (2014) report that autistic people who had insight into their difficulties were more likely to experience depression. Social motivation and insight are therefore likely to be important moderator variables in the later stages of the model, influencing whether autistic people attempt to camouflage their autistic characteristics in an attempt to fit in, experience increased feelings of thwarted belonging, and thus poor mental health.

How should society change?

In considering how society should change, we begin by identifying societal features that currently prevail. A chief feature of society is the dominance of the medical model which implicitly views autism as a maladaptive condition that needs to be cured. This view locates the problems of autism within the individual, with the assumption that the individual must be treated to effect change in order to make the problem go away. Common approaches have been to apply behaviour techniques, to administer medication, implementing programmes of therapy and offering dedicated teaching on how to understand other people's minds (see Medavarapu *et al*, 2019, for a review). Such interventions are likely to cause autistic people to feel they are defective and that they need to change in order to fit into society. Being subjected to these interventions could lead to a sense of thwarted belonging ('If you can't change then you are not welcome!') and, associated with that, a desire to camouflage autistic features. If so, ironically, and despite all good intentions, these interventions might put the individual at risk of mental health issues and even increased risk of suicide.

The view we espouse, in agreement with Milton (2012), locates challenges associated with autism at the interface between autistic and neurotypical people, with the implication that this is where change is needed in the interest of improving quality of life for all. This interface is problematical in that autistic people are liable to be misperceived by neurotypical people, as detailed above. In summary, neurotypical people are likely to misinterpret signals emanating from autistic people, preventing them from accurately inferring thoughts, feelings and intentions. Connected with this, neurotypical people are liable to perceive autistic people unfavourably.

As with neurotypical people, some autistic people have well-developed self-insight (Mitchell & O'Keefe, 2008) and some are socially motivated (Jaswal & Akhtar, 2019), and these individuals in particular might experience a sense of thwarted belonging coupled with a tendency to camouflage with consequent risk to mental health. Society should change, therefore, to be more accepting of diversity; in so doing, an opportunity would arise for neurotypical people to understand, value, and learn from autistic people. It would thus be highly productive if neurotypical people could be enlightened as to the different kinds of code that are signalled in the behaviour of autistic people, enabling them to interpret the signals more informatively and more positively.

Note, however, that it would not be helpful for society to impose social experiences upon autistic people. As with neurotypical people, presumably autistic people vary in how socially motivated they feel. Perhaps not all autistic people want to socialize and perhaps neither do they necessarily need to socialize in order to maintain good mental health (see Fletcher-Watson & Crompton, 2019). Hence, we are keen to respect diversity among autistic people and we recognize the importance of not imposing unwanted experiences on autistic people.

Questions for future research

There are a number of questions remaining for future research to address, to further understand and tackle the implications of the double empathy problem. In doing so, the aim is to increase autistic people's inclusion in society and prevent the high rates of mental health problems and risk of suicide in this group.

First, there is limited but promising evidence for higher empathy between autistic peers (with similar neurotype and interaction style), in comparison with autistic–non-

autistic peers (with different neurotypes and interactions styles), consistent with the predictions of the double empathy problem. However, the only research to explore whether autistic people are significantly more accurate at interpreting the behaviour of other autistic people (compared to non-autistic people) used a method in which the sample of behaviour was quite different from what one experiences in everyday life (Edey *et al*, 2016).

Second, there is limited evidence regarding whether increased interaction with autistic people, particularly throughout development, is associated with increased empathy with autistic people. One study showed that non-autistic people with increased knowledge of autism also tended to rate autistic people as more socially favourable (Sasson & Morrison, 2019). However, further studies are needed in different groups, including siblings of autistic people (who have increased interaction with autistic people throughout their development), non-autistic pupils in schools including autistic peers, late-diagnosed adults who might not have had many opportunities to interact with other autistic people, parents of autistic children (who are not autistic themselves), and those who support autistic people (e.g. clinicians, support workers).

Third, each autistic person has unique strengths and difficulties. According to the medical model, autistic people are categorized on a spectrum from severely to less severely affected, and these internal aspects of the individual determine that person's outcomes. However, according to the transactional account of development, and social models of disability, how an autistic person is able to access and participate in society depends on the interaction between the autistic person with others in their environment. Further research is needed to determine these implications for the transactional model we outline here. Is it that autistic individuals who inhabit a milieu that is inclusive and tolerant of diversity can expect a more positive developmental outcome? Conversely, is it that individuals who are perceived by neurotypical others to have 'mild' autistic features are more likely to be accepted and included such that their developmental outcome is more positive? How do features of the self and social environment interact to determine outcomes?

Fourth, autistic people change and develop over the course of their lives. How does being misperceived affect autistic individuals at different points in their development? Is the impact uniform across development or does being misperceived impact differently as one grows up and matures?

Conclusion

We are not denying that autism has an innate basis and we accept the evidence on heritability along with its implication for a broader phenotype (Pickles *et al*, 1995). However, it is also very important to recognize and understand how the behaviour of autistic people is misperceived by the neurotypical majority in society and how this misperception could have far-reaching negative consequences for the development of autistic individuals. This misperception could result in autistic people being excluded from the social world to a degree which is detrimental to both autistic and non-autistic groups, as both are denied opportunities to benefit from each others' skills and abilities. Moreover, social exclusion could impact negatively on mental health, leading the individual to camouflage and pretend to be other than they are, leading to low esteem and a sense of thwarted belonging. In some cases, this could lead to suicidal thoughts.

The way forward is not to seek a way of changing autistic people to make them 'fit in' but to change society to make all of us more tolerant of diversity. Doing so will not only improve the quality of life and the productivity of autistic people but will make society a better and more functional place for everyone.

This article makes a start in outlining the issues; it is not an end point. There is much to discover, such as how the experience of living with autistic people improves one's ability to interpret behaviour more accurately and evaluate behaviour more positively. We also do not yet know how the severity of autism impacts on how the individual is perceived by the neurotypical majority; and we do not know how others' perceptions affect autistic individuals differently as they grow and mature. These and other questions are waiting to be explored and the information we gather will surely make society better for all.

Conflict of interests

All authors declare no conflict of interest.

Author contribution

Peter Mitchell (Conceptualization; Methodology; Visualization; Writing – original draft; Writing – review & editing) Elizabeth Sheppard (Conceptualization; Methodology; Visualization; Writing – original draft; Writing – review & editing) Sarah Cassidy (Conceptualization; Methodology; Visualization; Writing – original draft; Writing – review & editing).

Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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