



## Special Issue "Neurodevelopmental Neurodiversity": Review

# What can neurodiversity tell us about inner speech, and vice versa? A theoretical perspective

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### ABSTRACT

Inner speech refers to the experience of talking to oneself in one's head. While notoriously challenging to investigate, it has also been central to a range of questions concerning mind, brain, and behaviour. Posited as a key component in executive function and self-regulation, inner speech has been claimed to be crucial in higher cognitive operations, self-knowledge and self-awareness. Such arguments have traditionally been supported with examples of atypical development. But variations in inner speech – and in some cases, significant diversity – in fact pose several key challenges to such claims, and raises many more questions for, language, thought and mental health more generally.

In this review, we will summarise evidence on the experience and operation of inner speech in child and adult neurotypical populations, autistic people and other neurodivergent groups, and people with diverse experiences of linguistic and sensory development, including deafness. We will demonstrate that the relationship between inner speech and cognitive operations may be more complex than first assumed when explored through the lens of cognitive and neurological diversity, and the implications of that for understanding the developing brain in all populations. We discuss why and how the experience of inner speech in neurodivergent groups has often been assumed rather than investigated, making it an important opportunity for researchers to develop innovative future work that integrates participatory insights with cognitive methodology. Finally, we will outline why variations in inner speech – in neurotypical and neurodivergent populations alike – nevertheless have a range of important implications for mental health vulnerability and unmet need. In this sense, the example of inner speech offers us both a way of looking back at the logic of developmental psychology and neuropsychology, and a clue to its future in a neurodiverse world.

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## 1. Introduction

Inner speech – or talking silently to yourself in your head – is an experience familiar to many. The subjective nature of inner speech makes it notoriously hard to define and operationalise, but it is an activity central to several cognitive, developmental, and philosophical theories, and has been posited as a key component in abstract and higher order thought. Arguments for the importance of inner speech to human cognition have traditionally drawn upon either evidence from neurotypical individuals, or comparisons between neurotypical individuals and cases from neuropsychology and the field known as ‘developmental psychopathology’, including examples such as post-stroke aphasia (Langland-Hassan et al., 2017) and autism (Vissers et al., 2020). But in the past decade, increasing recognition of neurodiversity<sup>2</sup> raises a range of new and challenging questions for such arguments.

In this *Viewpoint* article, we summarise recent evidence for the importance of inner speech to neurotypical cognition in children and adults, before highlighting how autism and other examples of neurodiversity paint a more complex picture for language and thought. We also outline how asking the right questions of inner speech and neurodiversity may have key implications for mental health, cognition, and neuroscience. Our overall aim is to add to a broader conversation about the importance of recognising developmental diversity as an inherent feature of cognition as opposed to binary distinctions around ‘typical’ and ‘disordered’ development (Hens & Van Goidsenhoven, 2023), aligning with recent calls for both neurodiversity-affirming cognitive science (Manalili et al., 2023) and decolonising developmental psychology (Forbes et al., 2022).

## 2. Why care about inner speech?

Inner speech (IS) is central to several models of working memory, cognitive development, and speech production (see Alderson-Day & Fernyhough, 2015, for a review). While the latter has focused on IS as a specific component of speech planning and monitoring (Scott, 2013), cognitive and developmental research has often positioned IS as a multi-purpose cognitive tool. In much of working memory research, IS has been conceptualised as rehearsal within the phonological loop (Baddeley & Hitch, 1974); that is, it forms a core part of an executive process. IS has also been studied as a strategy that can be used to support a range of other executive functions, such as cognitive flexibility, categorisation, and planning, while still being independent of them (Kray et al., 2008;

Wallace et al., 2017). Along with acting as a memory aid, IS has been argued to be a key tool in representing additional information extrinsic to a task (Miyake et al., 2004) and as a means of enabling abstract and flexible labelling of stimuli, by virtue of its linguistic basis (Lupyan, 2009). The relevance of IS to executive function has also been explored in developmental research, primarily via the theories of Vygotsky (1987) and, more generally, work on IS as a tool for self-regulation (Winsler, 2009).

Under a socio-developmental model of IS, inner language forms a core part of human cognitive development (Vygotsky, 1987). In brief, early communicative interactions between children and caregivers are claimed to provide a scaffold for play, exploration, and creativity, before gradually becoming part of the child’s own repertoire, first via private speech<sup>3</sup> (aged 3–5) and then being internalised to become IS by roughly 7 years of age. From this age, when faced with tasks that require mentally rehearsing information, it is common to find that children use silent, self-directed speech, and they are more susceptible to memory errors that are thought reflect verbal encoding (such as the phonological similarity effect; Flavell et al., 1966). What IS then affords beyond this point varies across different theoretical viewpoints. As a flexible code available for various kinds of abstract representation, it has been argued that IS is then available as a tool for problem-solving, meta-cognition, and self-reflection (Carruthers, 2002; Morin, 2005). Such a role for inner speech overlaps with claims that the default mode network, in facilitating verbal mind-wandering, can act as a forum for introspection decoupled from external perception (Fox et al., 2015). It’s also been argued that the form and nature of IS retains its developmental roots: in the work of Fernyhough (1996), for example, the qualities of earlier external interactions are reflected in the phenomenological qualities of inner speech, including dialogues, other voices, and self-criticism (McCarthy-Jones & Fernyhough, 2011). Recent neuroimaging work has supported the idea that inner speech may involve a number of such “social” components, including distinct neural substrates for internal monologue and dialogue with the latter engaging regions typically linked to Theory of Mind (Alderson-Day et al., 2016; Grandchamp et al., 2019).

Some philosophical approaches to IS have argued that it may be the actual “basis” of conceptual thought (Gauker, 2018), echoing long-standing debates about the role of language in thought. In this paper, we focus specifically on the idea that inner speech – as a specific cognitive strategy that people can consciously report on – facilitates cognitive performance. This is typically distinguished from structural language skills that individuals might have (such as vocabulary, or external speaking ability), and from more general debates about the impact of language on cognition, even though all of these issues are necessarily interconnected. Empirical evidence for IS playing such a role has often relied on cognitive

<sup>2</sup> Neurodiversity refers to the variation across humans that manifests in different ways of thinking, and processing information, including neurotypicality (the assumed ‘norm’ or average), and neurodivergence [anything that diverges from this assumed norm whether developmental or acquired, e.g. autism, post-traumatic stress disorder (Pellicano & den Houting, 2022)]. The Neurodiversity paradigm is an emancipatory approach to understanding these differences that emphasises a value neutral conceptualisation, and rejects normativity as the objective standard.

<sup>3</sup> Private speech (out-loud speech directed at oneself) and IS are sometimes grouped together as “self-directed speech” and are often argued to share similar functions and qualities. Therefore while we focus on IS in this review, where literature only exists on private speech or self-directed speech for specific groups (e.g. ADHD), we have included it here.

paradigms in which verbalised strategies are thought to be beneficial to use. In some cases, dependence on inner speech can be empirically tested by blocking such a strategy. For instance, in paradigms like the Tower-of-London planning task, planning a series of moves must be attempted i) while repeating irrelevant words, and therefore interfering with verbal rehearsal (a technique known as articulatory suppression). To control for dual-tasking demands, this is often contrasted with a second condition that would in theory interfere with non-verbal strategies, such as foot tapping (e.g. [Lidstone et al., 2010](#)). Such methods have clear and specific negative effects on rehearsal in working memory, and are thought to disrupt inner speech due to its shared reliance on speech-motor processes required for speech – that is, engaging articulation for external speech blocks internal speech ([Alderson-Day & Fernyhough, 2015](#)). In general, neurotypical children show a range of verbal interference effects on EF tasks, suggesting use of verbal strategies via IS ([Cragg & Nation, 2010](#); [Fatzer & Roebbers, 2012](#)).

Adults, in contrast, often show more selective difficulties when challenged with articulatory suppression, with the strongest evidence for IS playing a role coming from studies involving complex rule-switching ([Miyake et al., 2004](#)) or labelling of novel categories ([Lupyan, 2009](#)). Despite the idea that inner speech facilitates higher order cognitive processes that require strategic thinking and problem-solving, there is inconsistent evidence that verbal interference disrupts planning skills. While [Williams et al. \(2012\)](#) and [Wallace et al. \(2017\)](#) documented articulatory suppression having a negative effect on performance on Tower-style tasks, [Phillips et al. \(1999\)](#) previously observed enhanced performance in adults under the same conditions. Notably, there is evidence that neither verbal nor non-verbal reasoning is specifically impaired by blocking inner speech ([Gilhooly, 2005](#); [Rao & Baddeley, 2013](#)). In some cases, using inner speech might actually hinder performance on simple tasks: for instance, [Roebuck and Lupyan \(2020\)](#) observed slower responses on picture-to-word matching task for people who reported generally using more inner speech in everyday life.

In summary, while there is evidence to support a central role for IS in executive functioning, this may vary with respect to specific executive functions, specific tasks, stage in life, and across individuals. The relations between IS and cognitive performance on complex tasks is therefore neither settled, nor straightforward – raising potential problems for accounts that make IS central to cognition. As we will go on to argue, this level of potential heterogeneity – even for typical development – is only magnified when considering examples from neurodivergence, raising the question of how crucial IS really can be to cognition.

### 3. Inner speech and autism

Autism has been a key focus of developmental science (more so than any other form of developmental neurodivergence, such as dyslexia), with research suggesting that autistic social interaction, language, and executive functions may progress along very different trajectories to the assumed norm. IS research is no exception. Many autistic people show delays in

their language development, and some do not use spoken language at all to communicate, thus differences in the existence, quality, or use of IS have long been posited ([Russell et al., 1999](#); [Whitehouse et al., 2006](#)). Whereas research with neurotypical people has highlighted variation in regard to the relationship between IS and higher-order cognition, IS research with autistic people poses a more fundamental challenge to this relationship. While early studies documented absent or reduced use of inner speech, other research found no differences between autistic and neurotypical children in IS use on executive functioning tasks (see [Mulvihill et al., 2020](#); [Petrolini et al., 2020](#), for recent reviews).

Taking planning as an example, [Holland and Low \(2010\)](#) observed no overall differences between autistic children and neurotypical children on Tower of Hanoi task, even though the latter group took more time under articulatory suppression (i.e. their approach was more susceptible to interfering with a verbal strategy). [Larson et al. \(2021\)](#), in contrast, did observe evidence of articulatory suppression having an effect on a similar task for autistic children, but only if they had strong language skills: those with a structural language impairment seemed less likely to draw on a verbal strategy. In adults, verbal interference would appear to have task-specific effects for autistic individuals. For example, [Williams et al. \(2012\)](#) observed similar phonological similarity effects (i.e. a proxy for verbal encoding in working memory) in autistic and neurotypical adults, but only the latter showed verbal interference effects on a Tower of Hanoi planning task. This was interpreted as evidence that autistic adults may use a certain kind of inner speech to support memory, but not necessarily for planning or more open-ended problem-solving. Crucially, in the above studies differential susceptibility to verbal interference did not necessarily determine success, i.e. the apparent lack of verbal strategy in autistic participants did not make them worse at the task. This is consistent with a broader range of evidence highlighting that structural language skills and verbal IQ do not predict cognitive performance in autistic adults in a similar way to neurotypical individuals (e.g. [Constable et al., 2018](#)), suggesting that language in general may occupy a different place within autistic cognition.

Such evidence raises the question of how autistic people use inner speech, and what other strategies and resources they may draw upon. One possibility – discussed by [Williams et al. \(2012\)](#), among others – is that autistic people may differ in the kinds of inner speech they deploy, drawing upon monologue for things like verbal rehearsal, but not engaging in inner conversations in the way [Fernyhough \(1996\)](#) has proposed reflects the social or “dialogic” side of inner speech. Another is that IS use for autistic people will track language skills rather than autism per se: in [Larson et al. \(2021\)](#), for example, autistic children with structural language difficulties were less likely to use verbal mediation than other autistic children (see [Alderson-Day, 2014](#), for a similar example of early language development affecting later problem-solving in autistic people).

It is also possible that IS of any kind is not the preferred strategy or default inner experience for autistic people when faced with a range of challenges, either in the lab or in everyday scenarios. Confoundingly, and for a variety of

complex reasons, this question has often not been asked of autistic individuals themselves (barring a few notable exceptions). Prominent autobiographical and anecdotal accounts have emphasised that for some autistic people inner experience may involve more visual than verbal representation (i.e. “thinking in pictures”; Grandin, 1995; Kunda & Goel, 2010). What little phenomenological research has been conducted on the topic with autistic individuals also emphasises the visual domain. Using the in-depth Descriptive Experience Sampling method, Hurlburt et al. (1994) worked with three autistic adults to provide highly detailed accounts of autistic inner experience. These were primarily visual and non-verbal with a strong sensory focus, with one participant describing images as being “the shape of my thoughts” (p. 390). More recently, a questionnaire study of autistic and neurotypical adults reported more frequent and more detailed use of visual representations in autism, although detailed measures of inner speech were not collected (Bled et al., 2021).

A greater tendency to draw upon visual rather than verbal resources in autism is supported by fMRI evidence: for example, when completing matrix reasoning tasks, autistic people show enhanced use of extrastriate visual cortex and reduced use of lateral prefrontal cortex compared to neurotypical individuals, suggesting a shift towards visual strategies in the former (Soulieres et al., 2009). Similar patterns have been observed for autistic children when using pictorial reasoning that could draw upon verbal or visual strategies: compared to neurotypical children, autistic children show greater activation in occipito-parietal regions alongside enhanced structural connectivity in similar areas (Sahyoun et al., 2010).

However, such work is likely to only be scratching the surface on IS in autistic people, given the considerable within-group variation (Chen et al., 2019; Geurts et al., 2014). There are multiple issues to consider when attempting to explain these potential differences in IS among autistic people. One issue is the relationship between spoken language and inner speech. Taking into account the diversity in both receptive and expressive speech and language among autistic people, we might expect to see a similar diversity in the use of inner speech. However, we may also want to consider the possibility that our existing ways of measuring inner speech might not be tailored with enough sensitivity to explore inner speech in autistic people who do not use spoken communication, for example, and look for ways to develop tools that are sensitive enough to inform our knowledge of IS in these individuals.

Another issue is that historically there has been a broad reluctance to utilise introspective and self-report methods with autistic people, on the grounds that they may lack self-insight (e.g. the ability to reflect on their own strengths and challenges; Bishop & Seltzer, 2012). This is not for want of claims as to what might be happening for autistic people and how that may explain other aspects of autistic behaviour and cognition (e.g., Granato et al., 2022). Some reasons for this may be pragmatic (with high-impact journals and funding generally favouring cognitive and neurobiological work), but one key reason for this has arguably been the long-standing influence of theory-of-mind on autism theory (Baron-Cohen et al., 1985). By placing a deficit in the representation of others at the core of autistic cognition, a theoretical

consequence is that processes such as metacognition and self-reflection were also claimed to be disrupted in some way in autism (Carruthers, 2009). As a result, autistic narratives and autobiographical accounts of autistic experience were viewed as the exception to the rule and to be taken with caution (Frith & Happé, 1999), despite evidence for impaired self-knowledge often being inconsistent (Zahavi, 2010). Relatedly, communicative variation among autistic people (i.e. many autistic people may not use spoken language to communicate) led to an assumption that those who were unable to voice their inner experiences lacked them (Dinshak, 2021; Hacking, 2009). This has in turn led to the exclusion of non-speaking people from much phenomenological autism research, either because researchers have assumed they lacked the capacity to communicate (Lebenhagen, 2020), or have themselves lacked confidence in developing meaningful ways to include non-speaking autistic people.

However, the last decade in particular has seen a step-change in understanding autistic social experience, largely driven by autistic thinkers themselves. Double empathy theory (DEP; Milton, 2012), for example, has radically reoriented how differences and misalignments in social cognition are interpreted; placing their emphasis on mutual mismatches between autistic and neurotypical experiences of the social world. Milton argued that social interaction is inherently bi-directional in nature, with misinterpretations and misunderstandings situated between interlocutors. Any two people drawing upon differing interpretations (e.g. cultural norms, or developmental experiences), may struggle to understand each other fully. The positioning of such mismatches is relational – rather than being inherent in the individual – suggesting that the continuing prioritisation of theory-of-mind “difficulties” to understanding autistic inner experience are misplaced. Empirical research has supported the DEP: Whereas historically research has focussed on how autistic people may struggle to recognise non-autistic emotions from facial expressions (Uljarevic & Hamilton, 2013), Alkhaldi et al. (2019) found that the reverse also holds true; non-autistic people struggle to recognise autistic emotions accurately from facial expressions. Likewise, Morrison et al. (2020) found in-group preferences for future social interaction between autistic and non-autistic people based on short dyadic interactions, with non-autistic people rating autistic people less favourably.

Therefore, strong claims about metacognitive and self-reflection being in some way impaired or deficient need to be re-evaluated. The growing recognition of other aspects of autistic experience – such as self-monitoring in social situations – is largely dependent on autistic people's acute awareness of their own mental experience and how inner and outer presentations of self will often need to differ (Ai et al., 2022; Pearson & Rose, 2021). Additionally, life writing from autistic authors (including those who are non-speaking) have highlighted the rich inner experiences that autistic people have, emphasising the inconsistency between inner voice and outer appearances (Higashida, 2014; Mukhopadhyay, 2003). Given this context, not asking autistic people about their own experience of inner speech – and mental imagery more generally – seems particularly egregious. However, the opportunity to remedy this issue with cognitive research that is

underpinned by first-hand accounts would strengthen both conceptual and empirical work in this area, and align with broader calls for neurodiversity informed cognitive science (Manalili et al., 2023).

#### 4. Inner speech and the boundaries of neurodiversity

The issues highlighted in research on inner speech and autism are supported by similar observations, challenges, and discrepancies in other examples of neurodivergence. Here, we apply this term in a broad sense to include any example of neurocognitive variation which is associated with being part of a marginalised or minoritized group (Walker, 2021). This includes people with traditional diagnoses of developmental differences (such as ADHD or developmental language disorder), but also examples of variations in sensory and communicative experience – namely deafness and aphantasia (a lack of mental imagery, or the ability to ‘think in pictures’).

Although ADHD is not associated with communication challenges in the same way as autism traditionally is, the close theoretical link between self-talk and self-regulation makes ADHD important to consider when exploring inner speech and neurodiversity. Research on self-directed speech and ADHD is generally meagre and largely limited to private speech studies. Several studies have observed continued use of private speech in children with ADHD at later ages (7–11) than seen for typically developing children (Mulvihill et al., 2020) alongside a greater tendency to use more externalised private speech on tasks (e.g. Corkum et al., 2008). This concurs with evidence from developmental language disorder (Lidstone et al., 2012) and children who display early characteristics of neurodivergence (Mulvihill et al., 2022). Taken together, such findings have been interpreted as evidence of self-directed speech showing similar functions in neurodiverse examples of development, but being delayed in its transition from private to inner speech (Mulvihill et al., 2020).

Similar to autism research, there is also evidence that children with developmental language difficulties may use a range of strategies beyond IS to complete planning tasks, and without clear overall differences in task success compared to neurotypical children (Larson et al., 2019). However, to our knowledge almost no studies have explored self-directed speech in adults with ADHD, dyslexia, or a history of language difficulties. The role of this process in diverse examples of cognition is therefore at best underexplored, and at worst assumed.

Historically perhaps the best example of this kind of knowledge gap comes from deafness. As recently as the 1960s, researchers and theorists actively discussed whether Deaf people fundamentally lack in specific cognitive faculties because of the presumed absence of language in their mental experience (Furth, 1964). Given that 95% of Deaf individuals have hearing parents, many Deaf children have relatively fewer opportunities to engage in high-quality communicative interactions due to the lack of communicative alignment between caregiver and child (R. E. Mitchell & Karchmer, 2004). An emphasis on spoken language and interpretation (e.g. lip reading) as opposed to alternative forms of communication

such as signing can cause communicative barriers for Deaf people (Hall et al., 2019). Deaf children of Deaf parents, or those given early access to sign language, often have better developmental outcomes than Deaf children of hearing parents and those who aren't encouraged to use sign language (Courtin, 2000; Hassanzadeh, 2012; Peterson, 2009).

The differing sensory and linguistic experience of the world that Deaf people have is associated with a variety of neural and cognitive differences (Courtin, 2000; Twomey et al., 2020; Wilson & Emmorey, 1997). The extent to which this is reflected in differences in inner speech specifically – or inner language more generally – is unclear, but as in autism, often these questions have either not been asked, or have been explored in suboptimal ways. In one exception, Zimmermann and Brugger (2013) used questionnaire methods to document extensive use of self-directed speech and signing in Deaf adults. This was reported particularly in solo situations or for planning daily activities, supporting the claim that this essentially functioned as private speech for this group. Because of their dependence on written language comprehension, questionnaires are often not the preferred format for Deaf individuals taking part in research (Chatzidamianos et al., 2021); instead methods that allow for clarification and dialogue are important, especially for asking about inner experience. Designing questionnaires and interview methods that take into account the multilingual and multimodal experiences of Deaf individuals is particularly challenging – meaning that there is a general dearth of research on inner language and mental imagery in deafness – but it is possible. An example of this is seen in research on apparent auditory hallucinations in deaf psychosis (du Feu & McKenna, 1999), which when assessed by Deaf psychologists using British Sign Language, in fact represent multimodal, cross-linguistic experiences (Atkinson et al., 2007). Aligning with a double empathy approach, this evidence highlights the importance of recognising and facilitating diverse forms of communication, as opposed to defaulting to normative practices. Further, it also emphasises the importance of recognising that between-groups communicative barriers are not an indication that one party lacks competence, but an invite to develop better methodologies for exploring inner experience.

If strong claims continue to be made about necessary and fundamental relationships between inner language (or any form) and complex forms of cognition, the above examples of developmental diversity must be studied, explored, and understood further. Recently a similar argument has been made by Lupyan et al. (2022) that “hidden” differences in inner experience have much to tell researchers about cognition in general, in which they drew upon examples of variation in inner speech and also aphantasia. Aphantasia – or the inability to form mental images – is a phenomenon which has only recently begun to be studied in any depth. A range of studies have demonstrated that some individuals have little or no capacity to create visual images in particular (Keogh & Pearson, 2018). This often occurs, however, in the absence of difficulties with visuospatial cognition: visual working memory, for example, is intact in aphantasia despite aphantasic individuals reporting no conscious experience of its apparent contents (Knight et al., 2022). In this instance, assumed overlaps and co-dependencies in cognition and inner experience

do not necessarily hold up, and neurocognitive variation exists with no apparent decrement to functioning or flourishing. Experiences of aphantasia are not typically perceived as detrimental: for example, [Monzel et al. \(2022\)](#) argue that aphantasia does not constitute a disorder, despite being statistically rare (3–4% of the population), as it generally does not impact negatively on daily functioning. Logically, aphantasia provides a parallel example to autism in which heterogeneity and diversity in inner experience can proliferate alongside “intact” cognitive skills – but the conceptual histories of both ideas means that one is more likely to be interpreted via a pathological lens.

Taking this view is an example of what some would call the neurodiversity “paradigm” or approach ([Dwyer, 2022](#)). Rather than suggesting that we should simply recognise the existence of neurodiversity, neurodiversity theory challenges researchers to re-examine what is considered the norm in neurocognitive functioning, and what gets marked as a problem, or a disability. This shift is sometimes characterised as a move from “deficit” to “difference” in interpreting heterogeneity, but that dichotomy can stereotype the range of views and models that fall within the neurodiversity paradigm. For example, an ecological approach to neurodiversity – as advocated by [Chapman \(2021\)](#) and others – recognises that diversity can still result in disability, depending on the social and material conditions that a person finds themselves in. In the case of inner speech, what might appear crucial for language and cognition may just reflect the norm for a neurotypical, speaking majority. A neurodiversity approach forces us to consider that the central role of language in the brain for all of us is likely to be contingent, rather than necessary.

## 5. Inner speech, neurodiversity, and mental health

If inner speech isn't clearly always needed for higher-order cognition, a reasonable response would be to dismiss it as merely epiphenomenal and not worthy of further study. But inner speech and mental imagery more broadly are of crucial and continuing relevance to the understanding and treatment of mental health, for neurotypical and neurodivergent people alike. As inner speech is sometimes treated as the equivalent – or at least, a measurable proxy – for verbal thinking, it has been a focus of research for rumination, worry, depression, anxiety, and psychosis ([Alderson-Day & Fernyhough, 2015](#)).

When asked about the phenomenology of their inner speech, neurotypical adults are diverse and will frequently endorse phenomena such as dialogue and condensation in their inner speech ([McCarthy-Jones & Fernyhough, 2011](#)), and in some cases this can be demonstrated on a neurophysiological level ([Alderson-Day et al., 2016](#)). Of these variations, inner speech which is evaluative in quality and features other people is consistently associated with higher traits for anxiety, depression, low self-esteem, hallucination-proneness, and dissociation ([Alderson-Day et al., 2014, 2018](#); [McCarthy-Jones & Fernyhough, 2011](#)). These data suggest that a Vygotskian perspective may be correct in suggesting that inner speech reflects social and communicative experiences – but

that some of the more social elements of inner speech are actually associated with more negative aspects of mental health. Rumination – i.e. repetitive negative thinking – is often assumed to be verbal in nature, although its relationship with inner speech is a complex one ([Moffatt et al., 2020](#)). Nevertheless, there is evidence that different kinds of verbal and visual imagery have differential effects when used in psychological therapy. For instance, [Holmes et al. \(2006\)](#) have demonstrated that depressive rumination is worsened by instructions to engage in verbal imagery as opposed to visualisation, with similar effects for worry ([Stokes & Hirsch, 2010](#)). What we do when (or if) we talk to ourselves, and how we do it, is highly relevant to feelings, emotions, and mental ill health. Where this may be particularly significant is for autistic mental health. Levels of anxiety, depression, and suicidality are far higher in the autistic compared to neurotypical population and there is increasing awareness that a range of mental health conditions – including those previously prohibited by diagnostic criteria, such as schizophrenia – occur in autism. Likewise, autistic people appear particularly prone to rumination, which in turn is associated with these poor mental health outcomes ([Williams et al., 2021](#)). Though the relationship between autistic rumination and inner speech is yet to be explicitly investigated, the rumination response scale ([Treyner et al., 2003](#)) used by [Williams et al. \(2021\)](#) was focussed on thinking and inner analysis.

Despite awareness of these issues, there is a lack of specialist services to support autistic people with their mental health and – beyond a handful of exceptions – relatively few examples of treatments and interventions being tailored to this group or preferably co-produced with them (for an exception see [Stark et al., 2021](#)). The same is true for many other forms of neurodivergence, such as ADHD. Neurodivergent scholars have themselves called for a shift towards “neurodivergence informed therapy” that moves away from a deficit-based approach ([Chapman & Botha, 2023](#)). Many CBT approaches have – by default – been developed with a particular model of the neurotypical mind, drawing upon intuitive conceptions of thoughts and feelings to highlight patterns of negative and automatic thinking ([Linden et al., 2023](#)). But if we don't ask questions about neurodivergent inner experience – if we don't explore inner speech and mental imagery in the same way that people readily do for neurotypical experience – then one could question what the empirical basis is for tailoring treatments for neurodivergent individuals. This will be particularly key for assessing and working with experiences which are hard to explain and describe, such as psychotic phenomena. Some efforts have been made to tailor assessment tools for autistic populations – such as the PAUSS, an adaptation of the PANSS ([Kästner et al., 2015](#)) – but these largely seek to amend existing standardised measures rather than first attempting to explore the potential heterogeneity and phenomenology of the underlying experience. An example of the kind of tailoring possible is Managing Unusual Sensory Experiences (MUSE); a CBT toolkit for working with distressing voices and visions in psychosis which focuses psychoeducation based on individual variability in inner speech and hallucinations ([Dodgson et al., 2021](#)). Overall, a shift towards including knowledge

about neurodivergent inner experiences in the tailoring or creation of mental health supports will provide more meaningful and impactful treatment and intervention options.

## 6. Future directions

Recently, autism researchers have emphasised the importance of going beyond asking about first-hand autistic experiences, emphasising the value that co-creation and autistic-led research has in ensuring both epistemically just and empirically valid theory and practice (Botha, 2021; Pellicano et al., 2019). This cultural shift in research practice can facilitate space for autistic people to reclaim their own narratives (Bertilsdotter Rosqvist et al., 2022), and to facilitate the development of more appropriate and suitable tools that meet the needs of the groups that they are designed to serve. The uptake of a participatory approach has much to offer (psychology) researchers more broadly, but particularly those working with neurodivergent populations. Work underpinned by a lived experience perspective can ameliorate some of the issues that arise when researchers make assumptions based on normative expectations of what a particular mechanism should look or operate like. This can only strengthen our work in the long run.

The perceived contribution of a neurodiversity approach has sometimes been to remove cognitive approaches and replace them with sociological or experiential questions. However, there is no reason why cognitive or neuroscientific methods cannot continue to be used to understand heterogeneity in cognitive profiles and their neurological basis, especially when done in partnership with neurodivergent researchers. Manalili et al. (2023) have recently argued that recognising neurodiversity provides an opportunity to develop a richer concept of cognitive neuroscience more generally. In practice, this can mean reframing key concepts but still within a cognitive framework: Ai et al. (2022), for example, have offered a computational account of masking or camouflaging in autism that frames it in terms of transactional impression management. Cognitive paradigms that draw upon double empathy theory and explore reciprocal interactions between dyads will also be important for moving social cognition away from a deficit-focused approach (e.g. Xie et al., 2023). For inner speech, the challenge will be to integrate novel self-report tools – developed with neurodivergent groups – with paradigms that assume variety and heterogeneity in the role, function, and organisation of language in the brain.

## 7. Conclusion

A move towards a conceptualisation of cognitive difference through the lens of diversity, rather than deficit, provides us with a remarkable opportunity to expand our knowledge, drawing upon recent advances in theory and (participatory) practice. Inner speech is one such area where the integration of a phenomenological approach and a neurodiversity perspective will create not only exciting new avenues for understanding cognition, but for embedding this understanding in practice. These developments have the potential to underpin

tailored mental health treatments, and effective support to facilitate flourishing in neurodivergent populations.

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