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ORIGINAL ARTICLE

Autistic Adults Anticipate Simple and Complex Narrative Events

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Abstract

Narratives are characterized by a temporal sequence of events and characters' causally connected actions. Thus, predicting forthcoming events is central to narrative understanding. Here we report an experiment that investigated anticipation of narrative events in autistic adults, who have previously been shown to have atypical narrative cognition. Using the visual world paradigm, $N=25$ autistic and $N=25$ neurotypical adults (matched on age, sex, and IQ) listened to non-social and social narratives in which a simple or complex context elicited anticipation of a subsequent outcome. For each narrative event, eye movements were tracked to four pictures, including two that depicted potential context-relevant outcomes. For non-social narratives, autistic (relative to neurotypical) adults were delayed in anticipating simple (i.e., factual), but faster in anticipating complex (i.e., counterfactual), narrative events. For social narratives, autistic adults were faster to anticipate simple narrative events (requiring basic mentalizing of a character's desires and intentions), and neither group successfully anticipated complex narrative events. Both tasks revealed a stronger constraint from real-world knowledge in anticipating narrative events in neurotypical adults, leading to delayed anticipation of non-real events and persistent interference from reality. Results show that autistics adults can successfully anticipate events in narratives, but do not achieve this consistently across narrative types; difficulties are not specific to social contexts. Instead, different predictive strategies are adopted, with autistic adults tending to be less grounded in real-world knowledge and more adaptive to imagined alternatives than neurotypical adults.

Keywords Autism · Prediction · Narrative · Eye-tracking · Visual world paradigm · Counterfactual · Mentalising

> Drama is anticipation mingled with uncertainty (Archer, cited according to Stanton, 2012).

Given that drama can be considered an authentic narrative genre (Fludernik, 2008), the preceding quote by writer William Archer alludes to the point that anticipation is essential for how narratives work—recipients' anticipatory skills fundamentally shape narrative cognition and comprehension (Brooks, 2002; Liveley, 2017). Narratives are regarded as "delineat[ing] actions and events which causally unfold in time, e.g., stories and tales" (Graesser et al., 1980, p. 283). In this paper, we report an experiment that investigated whether the time-course by which autistic adults anticipate non-social and social narrative events differs from that of neurotypical controls.

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterised by difficulties in social interaction and communication as well as restrictive, repetitive, and inflexible behaviours and interests (World Health Organization, 2019). Narrative skills are thought to be atypical in autistic individuals: tasks requiring production or comprehension of narratives are considered to be sensitive to symptoms of autism. For instance, the child and adolescent version of the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 1999), which forms part of the current diagnostic 'gold standard' (Kamp-Becker et al., 2021), involves a storytelling activity. Here, participants are instructed to narrate a story based on a wordless picture book (see Kenan et al., 2019). The Strange Stories (Happé, 1994; White et al., 2009) exemplify a narrative comprehension task; participants are presented with short linguistic

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vignettes and need to explain why a story character behaved in certain way or why particular things happened to them. The Strange Stories Film Task (Murray et al., 2017) and the Stories for Everyday Life (Kaland et al., 2002) present further instances of such narrative comprehension tasks. In all of these narrative comprehension tasks, autistic people have been shown to perform less accurately than neurotypical people (Happé, 1994; Kaland et al., 2002; Kenan et al., 2019; Murray et al., 2017; White et al., 2009).

The extant research on narrative skills of autistic individuals has primarily focused on child samples, with an emphasis on their story production. The findings in this regard tend to suggest lower performance for autistic compared to typically developing children. For example, while Dillon and Underwood (2012) did not observe any differences between autistic and comparison children regarding their ability to establish coherence (i.e., the temporal and causal structure of a story; Karmiloff-Smith, 1985) in self-generated narratives, Diehl et al. (2006), Goldman (2008), Hilvert et al. (2016), and Sah and Torng (2015) reported difficulties narrating coherent stories. A meta-analysis synthesising autistic children's abilities to produce narratives (Baixauli et al., 2016) revealed group differences on all outcomes under investigation, in particular number of words, number of different words, number of utterances, mean length of T-units (i.e., the shortest grammatically permissible sentences verbalizations can be split into; Hunt, 1965), syntactic complexity, coherence, cohesive adequacy (i.e., an index assessing whether referents can be unambiguously identified; Liles, 1985), and internal state language.

A considerably smaller research literature investigating story production in autistic adults (Bylemans et al., 2023) has yielded heterogeneous findings as to whether they have general difficulties telling stories (Colle et al., 2008; Rollins, 2014), using temporal expressions (Colle et al., 2008; Pham et al., 2024) or describing characters' mental states (Barnes & Baron-Cohen, 2012; Lee et al., 2018; Pham et al., 2024; Rollins, 2014). These studies have revealed challenges in autism in terms of employing complex syntax for the purpose of narrative integration (Lee et al., 2018), more frequent self-corrections and lower speech rates (Pham et al., 2024), less frequent use of personal pronouns, referential expressions and propositions with conjunctions (Colle et al., 2008; McCabe et al., 2013), a preference for local over global story details (Barnes & Baron-Cohen, 2012), constructing a suboptimal highpoint macrostructure (McCabe et al., 2013), and not offering a clear conclusion at the story end (Rollins, 2014), but also advantages in terms of stating conflicts, their resolutions, other critical events and reactions to them (Pham et al., 2024).

The body of evidence regarding story comprehension in autistic children—though smaller in volume than that for story production—seems to be indicative of lower levels of performance compared to neurotypical controls, and that across different modalities and media (Adornetti et al., 2020; Davidson & Fleming, 2023; Manfredi et al., 2020). Although one study by Nuske and Bavin (2010) did not reveal difficulties answering comprehension questions accurately, several other studies did (Adornetti et al., 2020; Norbury & Bishop, 2002; Westerveld & Roberts, 2017). Autistic children have also been found to have difficulties drawing inferences—excluding deductive inferences (Norbury & Bishop, 2002; Nuske & Bavin, 2010) —and meaning integration more broadly (Manfredi et al., 2020). Beyond this, there is evidence to suggest challenges with comprehension monitoring (Davidson & Fleming, 2023). Still, predictive processing has been found to be comparable between autistic and typically developing children (Brennan et al., 2019).

Comparably less empirical work has tested real-time narrative comprehension in autistic adults, drawing on two contemporary methods. First, eye-tracking allows researchers to assess comprehension difficulties based on how long readers look at (or: fixate) portions of text and how often they redirect their gaze back to those portions after initial scanning (or: commit regressions; see, e.g., Mitchell, 2004; Rayner, 1998). Eye-tracking research has revealed that autistic adults are delayed relative to age- and IQ-matched neurotypical peers in detecting passage level anomalies in text (i.e., where global coherence is required; Au-Yeung et al., 2018) and implausible words in a sentence (Howard et al., 2017a), and that they experience greater difficulty processing text (Howard et al., 2017b; Sansosti et al., 2013). However, some researchers have examined processing of more complex counterfactual narratives, i.e., micronarratives depicting alternatives to reality, and found that autistic participants largely did not differ from neurotypical controls (Black et al., 2018; Ferguson et al., 2019). Second, event-related brain potentials (ERPs) are a non-invasive way to measure the post-synaptic activity of groups of neurons that fire in synchrony in response to specific stimuli (Luck, 2014). They offer precise, millisecond-level insight into the timing of neurocognitive processes involved in understanding language (e.g., Mitchell, 2004). Utilising ERPs, Ferguson et al. (2022) confirmed that the processing of counterfactuals is comparable in autistic vs. neurotypical adults. Relying on the same method, results by Coderre et al. (2018) have suggested comprehension difficulties in autism for both linguistic and visual narratives. Since autism is considered a lifelong condition (but see Whiteley et al., 2019), more research in this area is needed.

A crucial aspect of narrative reception that is under researched for both autistic children and adults is anticipation (for exceptions see Barzy et al., 2020, and Brennan et al., 2019). Narratives are constituted by a temporal sequence of events and characters' causally connected actions (Bylemans et al., 2023). This causal chain makes anticipation of forthcoming events a primary component of narrative understanding. (Micro-)narratives that exploit humans' constant use of anticipation, for instance certain types of humour (Shultz, 1996), serve as an illustration—many jokes build up anticipation which is suddenly falsified at the punchline, resulting in surprise and laughter (Shatz & Helitzer, 2016). In terms of narrative anticipation among autistic people, different predictions about performance can be derived from the available autism theories. A central distinction can be drawn between theories regarding whether they explain symptoms of autism as originating from domain-general differences (henceforth termed domain-general theories) or differences that are specific to the social domain (henceforth termed social-primacy theories; Vivanti & Messinger, 2021; see also Leekam, 2016). In brief, domain-general theories would predict that autistic people have global difficulties with narrative anticipation, whereas social-primacy theories would make this prediction only for social narratives, in particular if they require more complex social understanding.

The HIPPEA (high, inflexible precision of prediction errors in autism; Van de Cruys et al., 2014; see also the predictive coding theory of autism: Pellicano & Burr, 2012; van Boxtel & Lu, 2013; for an overview of these so-called Bayesian theories of autism see Angeletos Chrysaitis & Seriès, 2023) model represents a domain-general theory in which autism is regarded as a condition of atypical information processing. Humans are assumed to usually navigate the world based on predictions. In case of prediction errors, they need to distinguish between important errors requiring correction and irrelevant ones—neglecting the latter supports abstract inferences. According to the HIPPEA model, autistic individuals generally overestimate prediction errors, without the vital distinction between the two error types. As a result, they do not build up strong predictions about approaching stimuli, including narrative events. This results in lower levels of narrative anticipation for autistic compared to typically developing individuals, regardless of the degree of social cognition needed for comprehension. Additionally, in line with theories of complex information processing (Minshew et al., 1997; Minshew & Goldstein, 1998; Williams et al., 2006), this account suggests that autistic people would show particular difficulty anticipating complex (vs. simple) narratives. In sum, domain-general theories predict that autistic people show generic reductions in narrative anticipation, which should be exacerbated for complex (as opposed to simple) narrative events.

An instance of social-primacy theories is the mindblindness theory (also known as the theory-of-mind hypothesis; Baron-Cohen et al., 1985; Baron-Cohen, 1995; see Long et al., 2025, for a review), which proposes that autistic individuals do not reach the level of theory of mind (an umbrella term referring to various components of mental state understanding; Ferguson & Wimmer, 2023; Preston et al., 2020) achieved by most neurotypical people. Together with the finding that theory of mind is more important for understanding narratives with social content than texts without social content (Kim et al., 2021), the mindblindness theory leads to the hypothesis that autistic people would face difficulties anticipating narratives only for social events.

The Current Experiment

The current experiment aimed to: (1) investigate the time-course by which autistic adults—compared to neurotypical controls—anticipate simple and complex narrative events, and (2) test the predictions derived from domain-general vs. social-primacy theories of autism by examining anticipation in both non-social and social narratives. In our experiment, participants listened to narrative events in which the first sentence established a context that should elicit anticipation and the second sentence described an outcome that was influenced by this context. Participants' anticipatory processes were assessed using the visual world paradigm (Tanenhaus et al., 1995), in which eye movements to pictures on a computer screen were tracked while participants listened to the narratives. There is a long history of psycholinguistic research that has used the visual world paradigm, showing that language-mediated eye movements reflect linguistic processing as well as dynamically updated mental representations of the event that the visual scene *and* the spoken utterance refer to (e.g. Altmann & Kamide, 1999, 2007, 2009; Kamide et al., 2003; Knoeferle & Crocker, 2006, 2007; Knoeferle et al., 2005). Thus, listeners' predictions about upcoming linguistic input can be inferred from the direction of their eye gaze in this paradigm (Huettig et al., 2011).

Two tasks (non-social vs. social narratives) were run alongside each other, with each presenting two types of context (simple vs. complex), resulting in four levels of increasing demands for the listener: simple (factual) context in non-social narratives, complex (counterfactual) context in non-social narratives, simple (open) context in social narratives, and complex (secret) context in social narratives.

In the non-social task, the context sentence described either a real-world (e.g., "Because cats are carnivores, high quality food can be expensive for owners.") or a counterfactual-world alternative to reality (e.g., "If cats were vegetarians, they would be cheaper for owners to look after."; as in Ferguson & Sanford, 2008; Ferguson et al., 2010). Each auditory non-social narrative was accompanied by images including a real-world target object and a counterfactual-world target object, and eye-tracking monitored anticipatory looks towards each. We expected the factual context to elicit early and consistent anticipation of the real-world target since it requires only basic levels of speech comprehension and general world knowledge; non-social factual (simple) narratives put relatively low demands on the listener. In contrast, anticipation in the counterfactual context is more complex. This is because a counterfactual statement (e.g., "If polar bears had evolved to favour hot climates") involves both an imagined alternative-world scenario (that polar bears evolved to favour hot climates) and the implied reality (that polar bears did not evolve to favour hot climates). According to the dual mental models account of counterfactual processing (see Byrne, 2002; Fauconnier, 1994), comprehenders mentally represent both the hypothetical and factual alternatives, but must inhibit their knowledge of reality to infer the counterfactual version of the world. Empirical evidence suggests that counterfactual utterances place higher cognitive demands on the comprehender relative to factual utterances and may incur a delay in processing (e.g., de Vega et al., 2007; Ferguson, 2012; Ferguson & Sanford, 2008; Kulakova & Nieuwland, 2016).

In the social task, the context sentence depicted a character's personal preference for something, which they were either open about (e.g., "Mike is happy for people to know that he collects model trains") or wanted to keep secret from others (e.g., "Mike is embarrassed for people to know that he collects model trains"; as in Ferguson & Breheny, 2011). Each auditory social narrative was presented with images including an open target object and a secret target object. Compared to non-social narratives, social narratives are more demanding because they impose higher requirements on listeners' theory of mind to mentalise with the character (Kim et al., 2021). Understanding an open context requires relatively simple comprehension of the character's mental states since there is no conflict between shared knowledge of the character's personal preferences and intentions. However, anticipation is likely to be disrupted in a secret context since it involves more complex understanding about the character's true preference, their desire to keep this preference secret, and their intention to behave in a way that is opposite this preference (i.e., to disguise their true preference).

In sum, across two tasks, we tested the time-course with which participants preferentially fixate the context-relevant target object in simple and complex narratives that depict non-social and social events, before the onset of a disambiguating word (i.e., real-world target in a factual context, alternative-world target in a counterfactual context, open target in an open context and secret target in a secret context). We expected these anticipatory fixations towards targets to emerge earlier and stronger within simple compared to complex contexts in both non-social (counterfactual) and social (mentalising) narratives. At a group-level, domain-general theories would be supported if autistic adults showed a larger delay than neurotypical controls in anticipating complex (vs. simple) contexts within both non-social and social narratives. In contrast, social-primacy theories would be supported if this delayed anticipation within complex (vs. simple) contexts was limited to or greater in social narratives compared to non-social narratives.

Method

Participants

Participants were recruited from the Autism Research at Kent database, consisting of a community sample in the areas of Kent, Essex and London in the U.K., using a variety of recruitment strategies (e.g., newspaper adverts, contacting local groups, autism support groups and word-of-mouth). A total of 25 autistic adults and 25 neurotypical adults took part in this experiment. All autistic participants had a formal diagnosis of an autism spectrum condition from a trained clinician (8 autistic disorder, 4 autism spectrum disorder, 13 Asperger's syndrome). Neurotypical participants did not report any current psychiatric diagnoses. All participants were aged over 18 years old, were native English speakers, had full scale IQs greater than 70 (measured by the Wechsler Abbreviated Scale of Intelligence, WASI; Wechsler, 1999), and had normal or corrected to normal vision.

The two groups were matched on age, sex, and IQ but the autistic group self-reported a higher number of autistic traits (measured by the Autism-Spectrum Quotient, AQ; Baron-Cohen et al., 2001; see Table 1 for demographic details). Autistic participants additionally completed Module 4 of the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 1999) to assess current autistic symptomology. Videos were double coded by an additional trained, research-reliable researcher to ensure reliability of scoring (inter-rater reliability was found to be excellent with intraclass correlation of 0.89). Fifteen of the 25 autistic participants met the clinical ADOS cut-off (i.e., a score of 7 or above), indicating significant autistic traits[1].

Ethical approval for this study was received from the University of Kent School of Psychology Ethics Committee. Participants provided written informed consent and were fully debriefed following completion of the experiment.

[1] We note that while the ADOS total score is widely used as a 'gold standard' measure of autism severity, it is influenced by chronological age, language aptitude and co-occurring clinical conditions (Gotham et al., 2009).

Table 1 Demographic information of participants in each group

	Autistic (N=25)	Neurotypical (N=25)	t
Sex (m: f)	17:8	18:7	
Age (years)	32.76 (10.91)	33.00 (10.56)	0.08
Perceptual Reasoning (WASI)	103.28 (22.38)	104.28 (8.81)	0.21
Verbal Comprehension (WASI)	103.72 (12.27)	104.28 (12.86)	0.28
Full-Scale IQ (WASI)	103.60 (16.97)	105.20 (10.48)	0.40
Total AQ score	31.16 (7.50)	19.64 (4.76)	6.49***
ADOS-2 Module 4 algorithm total	8.28 (4.79)	–	

WASI Wechsler Abbreviated Scale of Intelligence, *AQ* Autism-Spectrum Quotient, *ADOS* Autism Diagnostic Observation Schedule

For metric variables, the table contains means (standard deviations). t-values refer to independent samples t-tests comparing group means. ***p < .001

Table 2 Example items for counterfactual and mentalising narratives

Context	Narrative
Factual	Because cats are carnivores, high quality food can be expensive for owners Families can feed their cat a bowl of *fish/carrots* and listen to it purr happily
Counterfactual	If cats were vegetarians, they would be cheaper for owners to look after Families could feed their cat a bowl of *fish/carrots* and listen to it purr happily
Open	Tom is always telling people that his favourite colour is pink. Last week Tom bought a new car, and he deliberately chose a *pink* car
Secret	Tom does not want anyone to know that his favourite colour is pink. Last week Tom bought a new car, and he deliberately chose a *green* car

One example is shown per context condition. The disambiguating words are printed in italics here for illustration

They received £10 per hour of their participation, plus additional travel expenses.

Materials

Counterfactual narratives: Audio and visual stimuli were adapted from those used in Ferguson et al. (2010). Twenty-four audio stimuli presented narratives in two sentences. The first sentence described either a factual world or counterfactual world context, and the second sentence continued the narrative with an event that was either consistent or inconsistent with the preceding context (see Table 2 for example items and https://osf.io/s8drb/ for the full set of materials). This second sentence was identical across context conditions until the disambiguating word. Real-world context sentences from Ferguson et al. (2010) were adapted for the present study to be simple factual rather than conditional statements (i.e., "Because x then y" as opposed to "If x then y"), as in Black et al.'s (2018) more recent study. Visual stimuli for each item contained four images depicting the subject of the narrative (e.g., cat), the real-world target (e.g., fish), the alternative-world target (e.g., carrots) and a distractor.

Mentalising narratives: Sixteen audio and visual stimuli were taken from Ferguson and Breheny (2011). Audio stimuli presented narratives in two sentences. The first sentence described a character's preference for something, which they were either happy for people to know (open context) or they wanted to keep hidden (secret context). A second sentence then described an event or action that was consistent with the character's open or secret preference (see Table 2 for example items and https://osf.io/s8drb/ for the full set of materials). As in counterfactual narrative items, the second sentence was identical across context conditions until a sentence-final disambiguating word. Visual stimuli contained four images depicting the subject (e.g., John), the open target (e.g., pink car), the secret target (e.g., green car) and a distractor.

Procedure

Participants were tested in a quiet laboratory at the University of Kent and were seated with their eyes approximately 60 cm from the centre of the computer screen. Head movements were minimised with the use of a fixed chin rest. Eye movements were recorded with an EyeLink 1000 Plus desk-mounted eye-tracker and audio was presented through on-ear headphones. Participants' dominant eye was tracked, and the eye-tracker was calibrated at the start of the task and at the half-way point using a nine-point procedure.

Counterfactual (N=24) and mentalising (N=16) narratives were presented in a random order alongside ten filler items to distract from the experimental manipulations. Fillers consisted of a first context sentence and a second sentence describing an action performed by a character (e.g., "There is a Europe-wide shortage of some vegetables. The grocer has sold all of the onions from the display in his shop."). The first two items were filler trials to ensure participants understood the task, then the remaining 48 experimental and filler items were presented in two blocks (participants were offered a break half-way through). Participants saw each item once, in one of the two context conditions. Item order and condition was randomised across lists, and the presentation of each list was randomised among participants. Half of all filler and experimental items were followed by a comprehension question with two possible answers. Half of all questions related to the images participants had seen and half to the narrative they had heard.

As shown in Fig. 1, each trial began with a central drift correction to verify the calibration accuracy. A central fixation cross was presented while participants listened to the first context sentence. A blank screen followed for 100 ms, followed by the corresponding experimental image. Images appeared on screen 1000 ms before the onset of related audio (sentence two) and stayed onscreen until 1000 ms after audio offset. In trials with a question, this was displayed onscreen after the offset of the experimental stimuli and participants were required to use the mouse to click on the correct answer. The next trial began following a 500 ms blank screen.

Eye Movement Data Processing

Eye movements were time-locked to the onset of the disambiguating word (e.g., 'carrots/fish' or 'green/pink car'), and analyses focused on the 1500 ms anticipatory period *before* the disambiguating word onset (i.e., reflecting listeners' expectations about forthcoming language input). Four areas of interest (AOIs) were defined around the objects in each visual scene: real-world target (the object that is consistent with the factual or open context), alternative-world target (the object that is consistent with the counterfactual or secret context), subject (the main subject or character in the story events), and a distractor (unrelated to the story events).

Eye movements compared the two context conditions in each task. For counterfactual narratives, data was combined across consistent and inconsistent narrative outcomes, since the second sentence was identical until this disambiguating word, so expectations should be solely driven by inferences from the preceding narrative context before bottom-up language input influenced eye movements. Thus, anticipatory analyses tested whether participants in each group differed in their likelihood of fixating the context-relevant target picture, and whether this preference emerges over a different time course for each group and context condition.

To fulfil this aim, fixations during the 1500 ms anticipatory period were broken down into 20 ms time bins, and the spatial coordinates were mapped onto AOIs as a function of time. Visual preferences to real-world/open or alternative-world/secret target pictures were represented by a binary term in each 20 ms time bin, where '1' indicated a fixation on the real-world/open or alternative-world/secret target and '0' indicated no fixation. The resulting data was analysed separately for real-world/open or alternative-world/

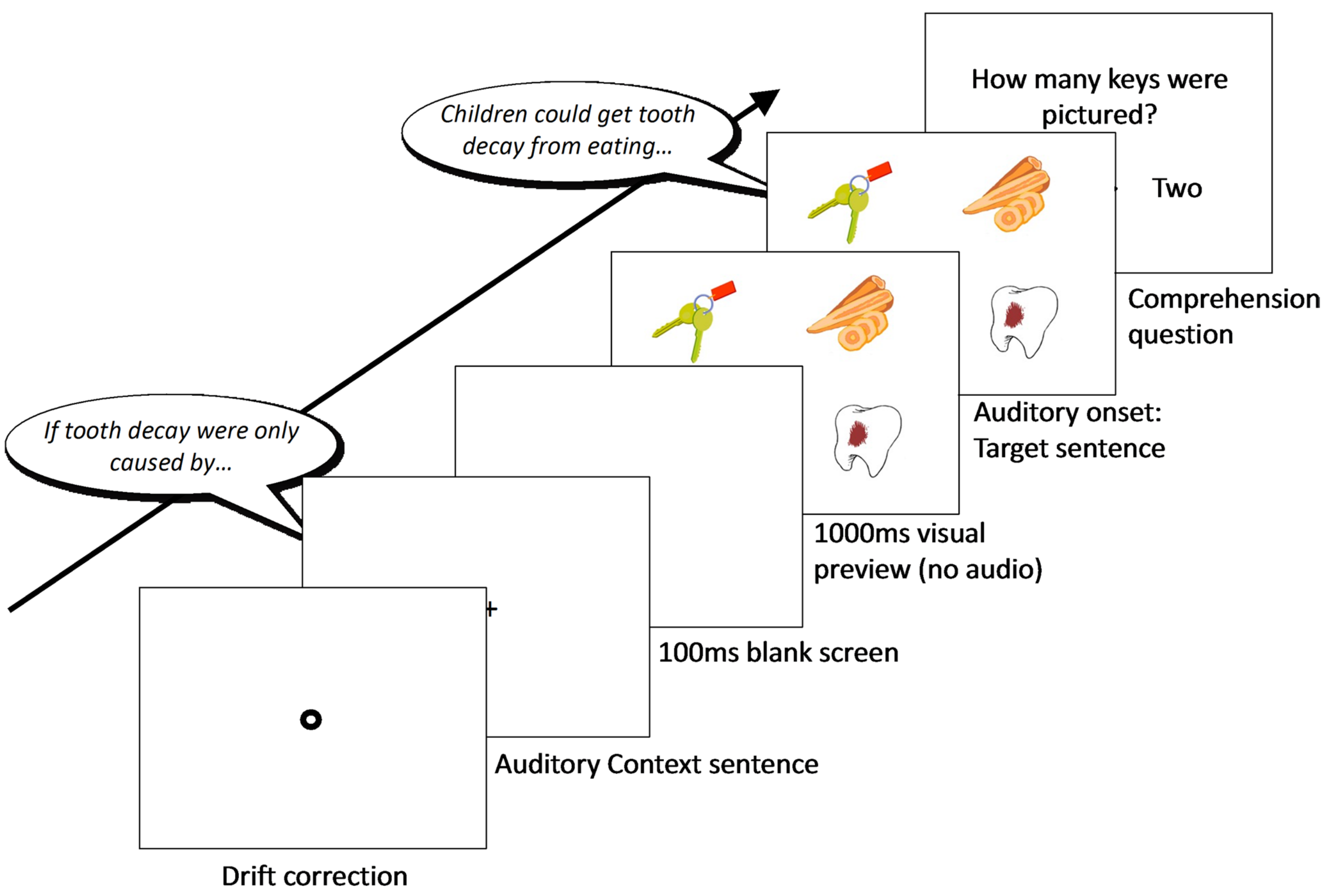

Fig. 1 Trial procedure for the visual-world task

secret target fixations using generalised mixed models and growth curve analysis (Mirman et al., 2008), using the 'lme4' and 'eyetrackingR' packages in RStudio. We chose to use growth curve analysis to examine anticipatory effects of linguistic context following statistical norms in the field. Fitting models to the data to test different shapes of visual bias over time allows us to capture effects of group as the sentence unfolded, while also testing for variance between and within individuals. In this study, second-degree orthogonal polynomials, incorporating intercept, linear and quadratic components, were included to model the timecourse of anticipatory bias over the 1500 ms period (see Barzy et al., 2020; Mirman et al., 2008). Thus, final models included contrast coded fixed effects for Group (neurotypical vs. autistic; −0.5 vs 0.5) and Context (factual vs. counterfactual or open vs. secret; −0.5 vs. 0.5) alongside linear and quadratic time polynomials, and random effects of participants and items. The final models also included Context as a random slope within participants, and the Group × Context interaction term as random slope within items.

Follow-up analyses explored *whether* and *when* anticipatory biases to the real-world/open or alternative-world/secret target exceeded chance level for each group and context. To do this, we ran cluster-based permutation analysis by participants (Barzy et al., 2020; Maris & Oostenveld, 2007), comparing the proportion of fixations on the real-world/open or alternative-world/secret target during the anticipatory period to chance, using the 'eyetrackingR' package in RStudio. First, we computed a 1-sample test statistic for each of the 20 ms timebins, comparing each sample to chance (0.25[2]; i.e., assuming that each object was equally visually salient, so any differences reflect influence from the linguistic input). Next, we clustered together adjacent timebins for which the test statistic was significant at the 0.05 level and calculated a cluster-level test statistic as the sum of the test statistics for the individual timebins within a particular cluster. Finally, a simulation with 2000 randomly permuted samples was run to determine the likelihood of obtaining a significant cluster by chance. Permutation analyses included random effects for participants.

Results

All datasets and analysis scripts are available at https://osf.io/s8drb/.

[2] As we intended to achieve comparable levels of visual saliency between the four images displayed simultaneously, dismissing the distractor was not to be taken for granted but required at least rough visual scanning. Thus, following Laplace's rule in assuming that each image was to be looked at with the same probability seemed justified.

Non-Social Counterfactual Narratives

Figure 2 plots the proportion of fixations to the real-world and alternative-world target pictures in each group and context condition for every 20 ms time bin from 1500 ms before disambiguating word onset. Statistical effects for the growth-curve analysis are shown in Table 3 and effects for the permutation analyses are shown in Table 4.

Anticipatory Fixations Towards Real-World Target

Overall, fixations on the real-world target object increased over the 1500 ms anticipatory period (significant linear effect of time), however this effect was modulated by Context such that fixations on the real-world target tended to increase over time within a factual context but showed the reversed tendency within a counterfactual context (significant interactions between Context and both linear and quadratic time). Group significantly interacted with both linear and quadratic time (reflecting an early real-world target preference among neurotypical vs. autistic adults) and appeared in a significant 3-way interaction with Context and quadratic time. Post-hoc analyses by Group and Context showed that within a factual context, neurotypical adults showed greater curvature (i.e., significant effects on the quadratic time term)- looks towards the factual-world target initially increased then plateaued (Est. = − 0.33, $SE=0.16$, $z=-2.04$, $p=.04$) while autistic adults showed a consistent linear increase in looks to the factual-world target (Est. = 1.64, $SE=0.17$, $z=9.83$, $p<.001$). Within a counterfactual context, looks to the real-world target were stable across time among neurotypical adults (Est. = − 0.17, $SE=0.17$, $z=-0.97$, $p=.33$), but autistic adults showed a decrease then increase in looks to the real-world target prior to disambiguation (Est. = 0.84, $SE=0.17$, $z=-4.82$, $p<.001$).

Permutation tests revealed that within a factual context, neurotypical participants showed an early and consistent bias to fixate the real-world target from 1500 ms before disambiguation onwards. In contrast, autistic participants first showed a significant bias to fixate the real-world target from 660 ms before disambiguation, but this subsequently plateaued between 480 and 360 ms, then increased again from 360 ms onwards. Neither group showed a significant anticipatory bias to fixate the real-world target within a counterfactual context. Thus, the gaze trajectories reported above for the two groups and this type of context never exceeded chance level.

Anticipatory Fixations Towards Alternative-World Target

The significant linear fit of time revealed that overall fixations on the alternative-world target object increased over

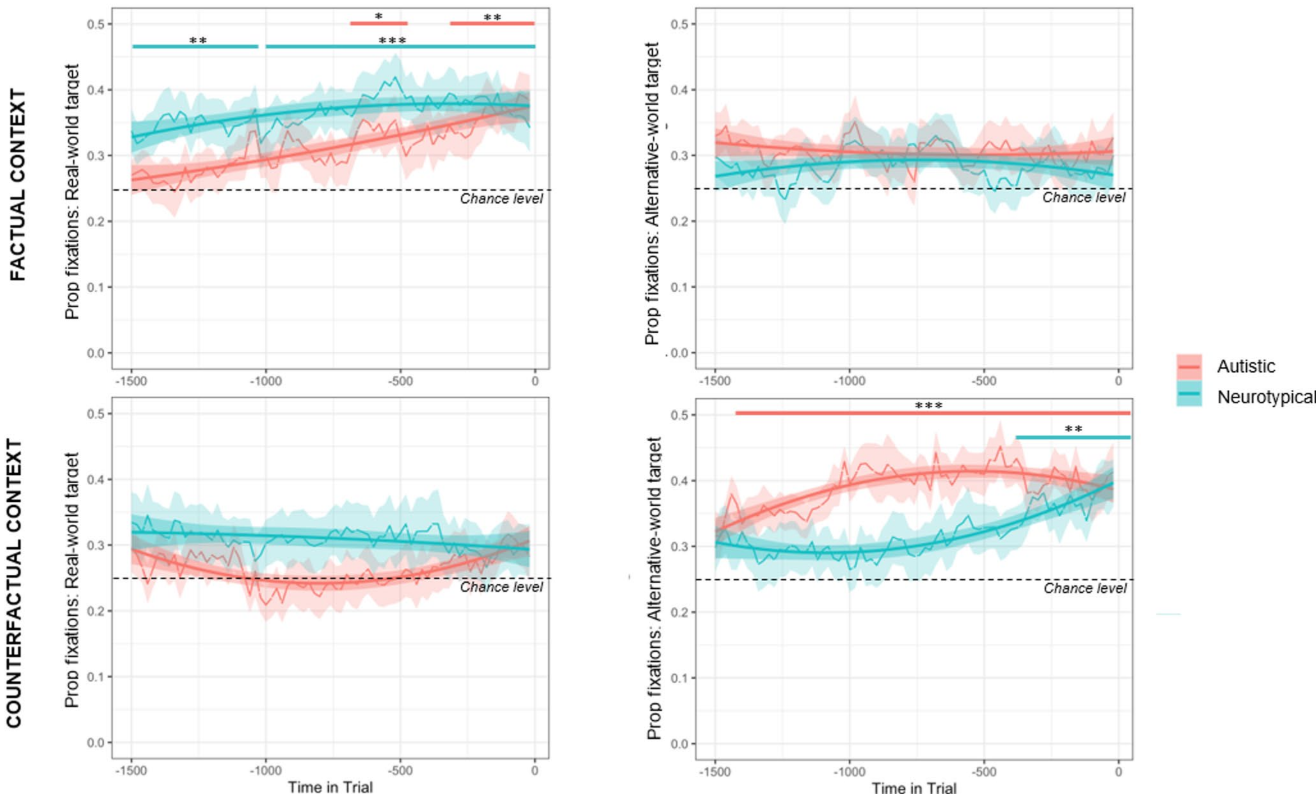

Fig. 2 Timecourse of anticipatory fixations towards the real-world target (left panel) and alternative-world target (right panel) for each group, in a factual context (top panels) and counterfactual context (bottom panels), showing the best fit curves for the data and 95% confidence interval shadow. Horizontal lines at the top of each plot show time clusters where fixations towards that target exceeded chance (*$p<.05$, **$p<.01$, ***$p<.001$)

Table 3 Statistical results from the growth curve analysis examining anticipatory fixations towards the real- or alternative-world target objects in the counterfactual task

	Real-world target			Alternative-world target		
	Est.	*SE*	*z* score	Est.	*SE*	*z* score
Group	− 0.26	0.14	− 1.85	0.27	0.15	1.85
Context	0.32	0.16	1.95	− 0.29	0.15	− 1.97*
ot1	0.56	0.08	6.68***	0.45	0.08	5.45***
ot2	0.09	0.08	1.07	0.08	0.08	0.95
Group × Context	− 0.02	0.34	− 0.05	− 0.34	0.28	− 1.20
Group × ot1	0.92	0.17	5.47***	− 0.54	0.17	− 3.21**
Group × ot2	0.68	0.17	4.02***	− 0.47	0.17	− 2.83**
Context × ot1	0.98	0.17	5.84***	− 1.04	0.17	− 6.23***
Context × ot2	− 0.49	0.17	− 2.93**	− 0.35	0.17	− 2.09*
Group × Context × ot1	0.50	0.34	1.48	− 0.16	0.33	− 0.48
Group × Context × ot2	− 0.66	0.34	− 1.96*	2.14	0.33	6.45***

Ot1 and ot2 refer to linear and quadratic models of time, respectively, and *$p<.05$, **$p<.01$, ***$p<.001$

the 1500 ms anticipatory period, and the significant effect of Context showed that fixations on the alternative-world target were more likely following a counterfactual context than a factual context. Importantly, the time-course of fixations on the alternative-world target was modulated by both Group (reflecting an early alternative-world target preference among autistic vs. neurotypical adults) and Context (alternative-world target looks tended to increase over time in a counterfactual context whereas this tendency was reversed in a factual context). The 3-way interaction with Group, Context and quadratic time was also significant. Post-hoc analyses by Group and Context showed that within a counterfactual context, neurotypical adults showed a later shift in looks to the alternative-world target (Est. = 1.03, $SE=0.17$, $z=6.01$, $p<.001$) in contrast to autistic adults who showed an early and steep increase in looks to

Table 4 Statistical results from the permutation t-test analyses in the counterfactual task

	Real-world target				Alternative-world target			
	Cluster no.	Start time	End time	SumT	Cluster no.	Start time	End time	SumT
Factual context								
Autistic								
	1	− 1060	− 1020	4.8	1	− 1500	− 1320	21.3
	2	− 940	− 860	9.2	2	− 1200	− 1140	6.9
	3	− 660	− 480	22.8*	3	− 1020	− 940	10.2
	4	− 400	− 380	2.3	4	− 720	− 620	11.3
	5	− 360	0	55.0**	5	− 480	− 460	2.2
					6	− 420	− 400	2.1
					7	− 100	− 80	2.0
Neurotypical								
	1	− 1500	− 1020	66.6**	1	− 1000	− 980	2.1
	2	− 1000	0	172.0***	2	− 760	− 740	2.2
					3	− 700	− 660	4.4
Counterfactual context								
Autistic								
	1	− 120	− 100	2.2	1	− 1480	0	336.3***
Neurotypical								
	2	− 1320	− 1300	2.0	1	− 1460	− 1440	2.1
					2	− 600	− 540	6.6
					3	− 500	− 440	7.0
					4	− 400	0	64.3**

Anticipatory biases towards the real- or alternative-world target are compared to chance. *$p<.05$, **$p<.01$, ***$p<.001$

the alternative-world target that plateaued just before disambiguation (Est. = − 0.52, $SE=0.16$, $z=-3.28$, $p=.001$). Within a factual context, neurotypical adults showed an initial increase then decrease in looks to the alternative-world target (Est. = − 0.40, $SE=0.17$, $z=-2.28$, $p=.02$), and autistic adults showed a linear decrease in looks to the alternative-world target over time (Est. = − 0.37, $SE=0.16$, $z=-2.27$, $p=.02$).

Permutation tests revealed that within a counterfactual context, neurotypical participants showed a significant bias to fixate the alternative-world target from 400 ms before disambiguation, and autistic participants showed a strong and sustained bias to fixate the alternative-world target throughout the 1500 ms anticipatory period. Neither group showed a significant anticipatory bias to fixate the alternative-world target within a factual context. Therefore, in this type of context, the gaze patterns observed in both groups did not surpass chance level.

Social Mentalising Narratives

Figure 3 plots the proportion of fixations to the open and secret target pictures in each group and context condition for every 20 ms time bin from 1500 ms before disambiguating word onset. Statistical effects for the growth-curve analysis are shown in Table 5 and effects for the permutation analyses are shown in Table 6.

Anticipatory Fixations Towards Open Target

Overall, fixations on the open target object increased over the 1500 ms anticipatory period (significant linear fit of time), with looks to this open target tending to rise more steeply just before disambiguation (significant quadratic fit of time). The rate of increase in looks to the open target was steeper over time within an open than secret context (significant effect of Context and Context × linear time interaction), and among neurotypical than autistic adults (significant Group × linear time interaction). Group appeared in significant 3-way interactions with Context and both linear and quadratic time. Post-hoc analyses by Group and Context showed that within an open context, neurotypical adults showed greater curvature (i.e., significant effects on the quadratic time term)- looks towards the open target were initially stable then increased steeply just before disambiguation (Est. = 0.97, $SE=0.17$, $z=5.56$, $p<.001$) while autistic adults showed a consistent linear increase in looks to the open target (Est. = 1.57, $SE=0.19$, $z=8.33$, $p<.001$). Within a secret context, looks to the open target increased linearly among neurotypical adults (Est. = 1.09, $SE=0.18$, $z=6.00$, $p<.001$), but autistic adults showed a decrease then increase in looks to the open target prior to disambiguation (Est. = 1.32, $SE=0.19$, $z=6.84$, $p<.001$).

Permutation tests revealed that within an open context, neurotypical participants showed a significant bias to fixate the open target from 700 ms before disambiguation

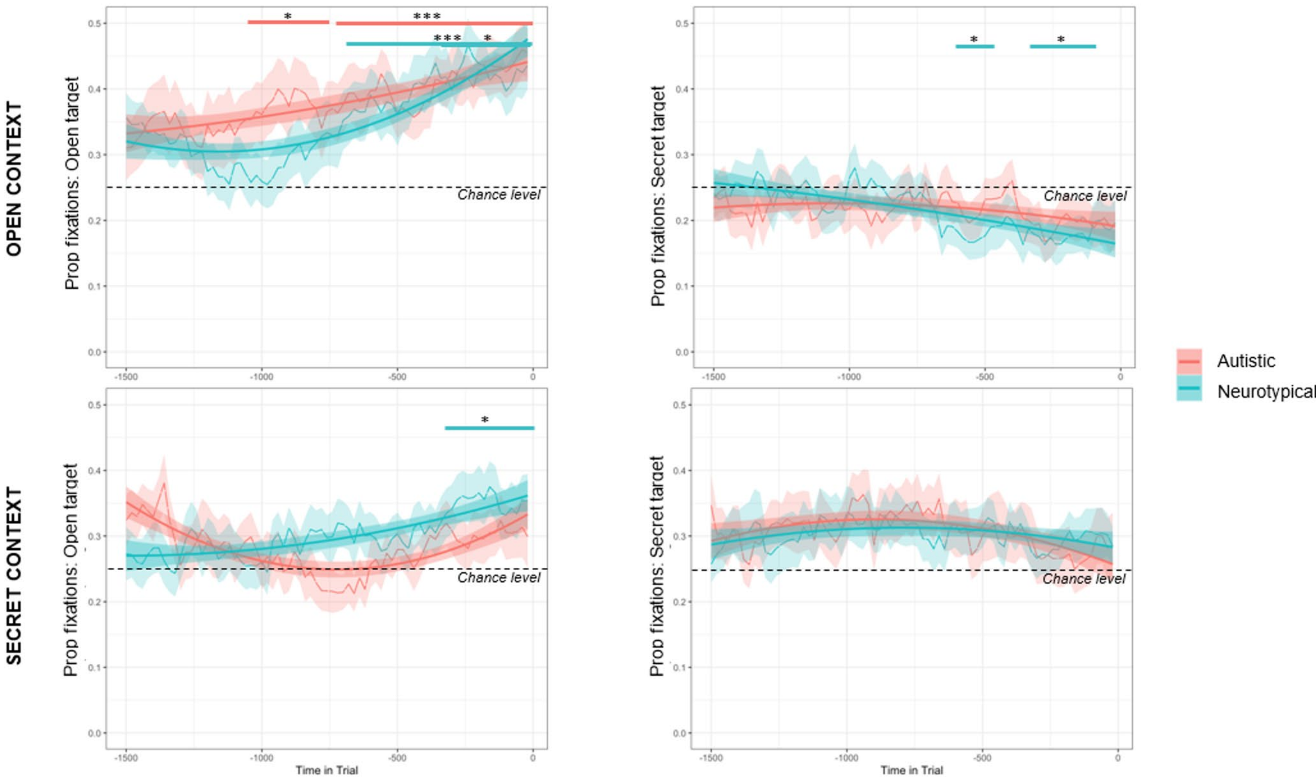

Fig. 3 Timecourse of anticipatory fixations towards the open target (left panel) and secret target (right panel) for each group, in an open context (top panels) and secret context (bottom panels), showing the best fit curves for the data and 95% confidence interval shadow. Horizontal lines at the top of each plot show time clusters where fixations towards that target exceeded chance (*$p<.05$, **$p<.01$, ***$p<.001$)

Table 5 Statistical results from the growth curve analysis examining anticipatory fixations towards the open or secret target objects in the mentalising task

	Open target			Secret target		
	Est.	*SE*	*z* score	Est.	*SE*	*z* score
Group	− 0.01	0.19	− 0.07	0.08	0.20	0.40
Context	0.40	0.18	2.26*	− 0.52	0.18	− 2.93**
ot1	1.07	0.09	11.66***	− 0.61	0.10	− 6.12***
ot2	0.63	0.09	6.87***	− 0.39	0.10	− 3.91***
Group × Context	0.21	0.39	0.55	0.25	0.34	0.75
Group × ot1	− 0.69	0.18	− 3.75***	0.36	0.20	1.83
Group × ot2	0.01	0.18	0.02	− 0.05	0.20	− 0.23
Context × ot1	1.17	0.18	6.37***	− 0.84	0.20	− 4.23***
Context × ot2	− 0.34	0.18	− 1.85	0.24	0.20	1.26
Group × Context × ot1	1.01	0.37	2.77**	1.70	0.40	4.29***
Group × Context × ot2	− 2.05	0.37	− 5.61***	0.16	0.39	− 0.39

Ot1 and ot2 refer to linear and quadratic models of time, respectively, and *$p<.05$, **$p<.01$, ***$p<.001$

onwards, and autistic participants from 1080 ms before disambiguation onwards. Within a secret context, neurotypical participants looked at the—task-irrelevant—open target above chance from 320 ms before disambiguation onwards, but autistic participants never showed a significant anticipatory bias to fixate the open target.

Anticipatory Fixations Towards Secret Target

Fixations on the secret target object decreased over the 1500 ms anticipatory period (significant linear fit of time), with looks to this secret target tending to decline more steeply just before disambiguation (significant quadratic fit of time). Overall, participants were less likely to fixate the secret target within an open vs. secret context, and the rate of decrease in looks to the secret target over time

Table 6 Statistical results from the permutation t-test analyses in the mentalising task

	Open target				Secret target			
	Cluster no.	Start time	End time	SumT	Cluster no.	Start time	End time	SumT
Open context								
Autistic								
	1	− 1400	− 1300	10.9	1	− 560	− 540	− 2.1
	2	− 1080	− 780	40.7*	2	− 280	− 240	− 5.2
	3	− 760	0	144.8***				
Neurotypical								
	1	− 1500	− 1340	21.9	1	− 660	− 480	− 24.1*
	2	− 1300	− 1260	4.3	2	− 360	− 340	− 2.9
	3	− 700	0	131.5***	3	− 320	− 100	− 30.0*
Secret context								
Autistic								
	1	− 1480	− 1340	18.6	1	− 1500	− 1480	2.1
					2	− 1240	− 1220	2.2
					3	− 980	− 920	8.4
					4	− 880	− 860	2.1
					5	− 840	− 820	2.1
					6	− 800	− 640	18.8
Neurotypical								
	1	− 640	− 620	2.0	1	− 1000	− 960	4.1
	2	− 420	− 400	2.1	2	− 920	− 900	2.2
	3	− 320	0	41.6*	3	− 860	− 840	2.3
					4	− 820	− 800	2.0
					5	− 780	− 740	4.2
					6	− 480	− 440	4.8
					7	− 400	− 380	2.4
					8	− 360	− 340	2.4

Anticipatory biases towards the open or secret target are compared to chance, where $^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$

was steeper within an open than secret context (significant effect of Context and Context × linear time interaction). The 3-way interaction between Group, Context and linear time revealed that within an open context, both neurotypical (Est. = − 1.62, $SE=0.20$, $z=-7.75$, $p<.001$) and autistic (Est. = − 0.42, $SE=0.21$, $z=-2.01$, $p=.045$) adults showed linearly decreasing proportions of fixations on the secret target; the rate of decrease was steeper in the neurotypical than autistic group. Within a secret context, neurotypical participants showed stable fixations on the secret target throughout the anticipatory period (Est. = 0.04, $SE=0.18$, $z=0.24$, $p=.81$), and autistic participants showed linearly decreasing fixations on the secret target (Est. = − 0.43, $SE=0.19$, $z=-2.29$, $p=.022$).

Permutation tests showed that within an open context, neurotypical participants were significantly below chance looking at the secret target between 660 and 480 ms then again between 300 and 100 ms before disambiguation, and autistic participants did not differ from chance at any point. Within a secret context, neither neurotypical nor autistic participants looked at the secret target above/below chance. So, never did any of the groups fixate the secret target above chance level, either in the inappropriate open or the appropriate secret context.

Discussion

Anticipation is an essential aspect of narrative cognition (Brooks, 2002; Liveley, 2017). In the current experiment, we investigated the time-course of simple and complex narrative anticipation in autism, a condition for which narrative cognition has generally been found to be atypical (e.g., Happé, 1994; Kaland et al., 2002; Kenan et al., 2019; Murray et al., 2017; White et al., 2009). We tested predictions derived from domain-general (e.g., Van de Cruys et al., 2014; Pellicano & Burr, 2012; van Boxtel & Lu, 2013) vs. social-primacy (see, e.g., Baron-Cohen et al., 1985; Baron-Cohen, 1995) theories of autism by examining anticipation in non-social and social narratives. Domain-general theories lead to the hypothesis that autistic adults would show a delay relative to neurotypical controls in anticipating narratives within both non-social and social contexts. In contrast, social-primacy theories give rise to the hypothesis that this delayed anticipation would be limited to social narrative events and not evident in non-social events.

Within non-social narratives, neurotypical adults showed an earlier, stronger and more consistent increase in looks to the appropriate factual-world target within a factual (simple) context than autistic adults. The bias to fixate the real-world target was significantly different from chance (1) through the entire 1500 ms anticipation period for neurotypical controls, and (2) in the slightly later time windows 660 ms to 480 ms and 360 ms to disambiguation for autistic participants. Furthermore, neither group showed a significant anticipatory bias to fixate the alternative-world target within a factual context. This pattern suggests that in simple, factual narrative contexts both autistic and neurotypical adults used the context to identify an appropriate real-world target picture well before disambiguation, but that this anticipation is comparatively delayed for autistic adults. Within a more complex counterfactual context, the group pattern was reversed, such that neurotypical adults showed a later increase in looks to the alternative-world target than autistic adults. The bias to fixate the alternative-world target was significantly different from chance (1) from 400 ms to disambiguation for neurotypical controls, and (2) through the entire 1500 ms anticipation period for autistic adults. Additionally, neither group demonstrated a significant anticipatory bias to fixate the real-world target within a counterfactual context. This pattern suggests that in more complex counterfactual contexts, both groups successfully adopted the alternative-world version of events and inhibited interference from reality (i.e., preferably fixating the appropriate alternative-world target picture), but that this anticipation emerged earlier for autistic adults.

Compared to non-social narratives, we expected social narratives to put additional demands on listeners' theory of mind. Open contexts required only basic levels of theory of mind (based simply on the character's personal preference), whilst more advanced mentalising was required in secret contexts (based on inhibiting the personal preference to infer their intention to behave in a way that disguises this). Within open contexts, autistic adults showed an earlier and more consistent increase in looks to the open target than neurotypical controls. The bias to fixate the open target was significantly different from chance (1) from 700 ms before disambiguation onwards for neurotypical controls, and (2) from 1080 ms before disambiguation onwards for autistic adults. Looks to the secret target decreased linearly over time in both groups, but this decrease was steeper for neurotypical controls who looked at this secret target below chance (autistic adults never differed from chance in looks to the secret target for open contexts). This pattern suggests that in narratives that require simple theory of mind skills, both groups successfully used the character's personal preference to predict the open target picture. While the anticipation occurs earlier for autistic adults, neurotypical controls showed a stronger open-preference; they not only preferred the open target picture but also averted their gaze from the alternative secret target picture. Within a secret context, participants were more likely to look at the secret target compared to within an open context, but neither group showed a significant preference to fixate the secret target object over chance in this condition prior to disambiguation. In fact, neurotypical controls showed a significant bias towards the open target within secret contexts (autistic adults never differed from chance in looks to the open target for secret contexts). This pattern suggests that when more advanced theory of mind skills are required to understand a complex narrative, neurotypical adults experience persistent interference from their knowledge of reality (i.e., the character's personal preference) and this delays anticipation of the secret interpretation. Autistic adults paused anticipation entirely in these more socially complex contexts, waiting for disambiguating input to clarify the conflict between personal preferences and behavioural intentions. It is possible that this group-level discrepancy in predicting complex social narratives reflects a reduced ability/motivation to attend to others' mental states (see Chita-Tegmark, 2016) and to use this to generate causal explanations for unusual events.

Taken together, these results support the view that more complex levels of information processing incur greater processing costs (across groups, the relevant target object was preferentially fixated from ~1080, ~950, ~890 and 0 ms before disambiguation within a factual, counterfactual, open and secret context, respectively). We will now consider the extent to which they align with predictions derived from domain-general and social-primacy theories of autism. Recall that according to domain-general theories, autistic adults should face greater challenges anticipating the expected target picture in all our experimental conditions because they experience a general meta-learning difficulty (i.e., distinguishing predictions and errors), which means that they are less able to ignore pragmatically irrelevant information (e.g., Van Boxtel & Lu, 2013). Social-primacy theories of autism suggest that such challenges should be restricted to social domains. In our experiment, autistic participants did successfully anticipate reference to the target object before disambiguation in three of the tested conditions, suggesting that they do not experience a global impairment in real-time anticipation, even for complex information. The only condition in which the autistic adults showed clearly lower levels of linguistically appropriate anticipation was the simplest (real-world) non-social narratives, and autistic adults predicted the appropriate target earlier than neurotypicals for the more complex counterfactual and open narratives. Neither group anticipated the secret target in complex social narratives (though they did distinguish predictions within open and secret contexts). Therefore, the body of evidence observed here does not provide unambiguous support for either class of theories.

The finding that autistic adults exhibited undiminished, in fact superior, anticipation of the alternative-world target within counterfactual contexts aligns with existing research showing intact processing of counterfactual utterances in autistic adults. In particular, Ferguson et al. (2019) eye-tracked participants while they read either fictional counterfactual narratives like the ones investigated here or counterfactual alternatives of known fictional worlds. Autistic and neurotypical adults alike detected anomalies at an early stage of processing. Similarly, Black et al. (2018) eye-tracked participants reading either everyday counterfactual narratives or counterfactual versions of historical events and found that autistic adults detected context anomalies even faster than neurotypical controls within everyday counterfactuals, and performance was comparable in both groups for the alternatives to historical events (see also Ferguson et al., 2022). In another eye-tracking experiment by Black et al. (2019), participants read counterfactual narratives in which a character's decision was linked with an outcome that either exceeded (leading to relief) or fell short of (leading to regret) their expectation. Each narrative ended with a comment that was either consistent or inconsistent with the character's inferred emotion. Once again, autistic adults demonstrated preserved processing of counterfactual emotions; they were even more sensitive than neurotypical controls to inconsistencies when the character felt relief. Thus, this line of research suggests that compared to neurotypical controls, autistic adults show equal or even more advanced processing of complex counterfactual statements which depict alternatives to reality.

The current experiment extends this evidence for intact prediction of complex narratives in autism by employing the visual world paradigm, which enabled us to track expectations *before* disambiguating input (eye-tracking reading tasks assess behaviour only from the point of disambiguation), and can reveal the impact of top-down expectations in real-time. The finding that autistic adults showed appropriate anticipation of the target prior to disambiguation in both non-social conditions (in fact, earlier for counterfactual contexts) and for the open context in social narratives, suggests that they do not experience a general lack of predictive processing. Instead, the combination of delayed anticipation of real-world narratives and earlier anticipation of counterfactual-world and open narratives suggests that autistic adults adopt a different processing strategy compared to neurotypical people, incorporating weaker constraints based on reality or more flexible expectations about reality.

A similar pattern of enhanced flexibility has been reported by Barzy et al. (2020) who used a visual world paradigm to examine the time-course with which autistic adults anticipate a speaker's meaning from their voice. Participants listened to utterances in which the speaker's propositions either matched (consistent condition) or did not match (inconsistent condition) their voice (e.g., a child or adult speaker saying they have a glass of wine/milk before bed), and anticipatory fixations were tracked to images depicting these consistent and inconsistent objects. Although all participants showed evidence of mentalising by inferring social context from the speaker's voice to anticipate the consistent object, anticipation was delayed and weaker among autistic compared to neurotypical adults. The authors suggest that this might reflect a more flexible use of social stereotypes to guide expectations in autism. This pattern aligns with performance in the social narrative task reported here, where neurotypical controls anticipated the open target even when it was not warranted—in the secret context condition.

Taken together, the pattern of results for non-social and social narratives suggest a general tendency for autistic adults to be less grounded in knowledge about the real-world, and instead to be more adaptive to imagined alternatives to reality, despite restricted imaginative skills (see Smith et al., 2024). This weaker reality bias is similar to the atypical self-awareness (Lombardo & Baron-Cohen, 2010) and diminished self-other distinction that has been reported in autism (Bird & Viding, 2014; Kennedy & Courchesne, 2008; Lombardo et al., 2010; Henderson et al., 2009; Smith & Ferguson, 2024), which may make their cognitive schemas more malleable (i.e., susceptible to modulation in light of new incoming information) compared to neurotypical people who hold a strong and rigid sense of self (reality). It should be noted, however, that this decoupling of the real world may not generalise to all settings. For instance, Bradford et al. (2018) found that autistic people had difficulties accurately identifying characters' false beliefs. As false-belief tasks require test-takers to mentally represent both one's own reality-based and the character's incorrect belief state (Ward et al., 2013), this suggests that autistic adults experience an increased reality bias and struggle to disengage from reality-based beliefs. Whether autistic adults' preferences to disengage from the real world and to flexibly adapt to an alternative world, as proposed here, are of advantage or disadvantage may depend on situational requirements. The preference might help comprehend stories depicting alienations of reality but may impede understanding realistic stories. Such downstream effects of the narrative anticipation effects should be targeted in future research.

Some limitations with the current experiment should be noted. First, the current pattern of findings might not be representative of the entire autistic spectrum. This is because participants were matched on IQ with neurotypical controls and our experimental stimuli presuppose at least basic language comprehension skills. This means that the current findings may not generalise to non-verbal autistic adults and those with lower levels of intelligence. Relatedly, ten (out of 25) in the autistic group did not meet the ADOS cut-off for a significant level of autistic traits. On a cognitive level, these participants were comparable to neurotypical controls (age [years]: M = 30.32, SD = 10.77 vs. M = 33.00, SD = 10.56; sex [m: f]: 7:3 vs. 18:7; verbal comprehension [WASI]: M = 102.50, SD = 12.92 vs. M = 104.72, SD = 12.86; perceptual reasoning [WASI]: M = 103.00, SD = 20.91 vs. M = 104.38, SD = 8.81; full-scale IQ [WASI]: M = 102.90, SD = 17.53 vs. M = 105.20, SD = 10.48]), but there was a marked difference on the AQ, where the ten autistic adults who scored below ADOS-cutoff scored much higher than controls (M = 31.00, SD = 7.80 vs. M = 19.64, SD = 4.76). Thus, this subgroup of autistic adults self-reported a heightened degree of autistic traits overall; eight of this group scored above the recommended cut-off score of 26 (Ruzich et al., 2015). Current recommendations propose that ADOS should not be used a standalone tool to diagnose autism, and instead results should be considered in conjunction with other assessments and information. The fact that we observed divergent patterns of narrative anticipation even for a group with relatively mild symptoms of autism suggests that the present findings are robust (unfortunately, rerunning analyses without autistic participants with ADOS scores below cut-off would render the results uninformative due to substantial loss of statistical power).

Second, we note that the intact anticipation seen here was supported by the availability of on-screen visual objects, which likely facilitated comprehension and reduced executive load by providing clear alternatives that fit the language input. Real-life narratives rarely provide such salient alternatives to narrow the scope of processing, and indeed the large number of possible alternatives may become overwhelming in these unconstrained settings, particularly among autistic people who experience difficulty inhibiting irrelevant distractors (Adams & Jarrold, 2012).

To conclude, the current experiment found real-time evidence that processing a simple narrative is less cognitively effortful than processing more complex narratives that activate a conflicting alternative version of events. This ease of processing is seen here in earlier and stronger anticipation of forthcoming events in the narrative. At a group level, we found that high-functioning autistic adults were delayed relative to neurotypical controls in anticipating simple non-social narrative events, but were less constrained by reality for complex, fictional narratives, showing earlier anticipation of events when they depict alternatives to reality. Autistic adults also showed intact and early anticipation of simple social narrative events (requiring mentalising abilities) and were less constrained by the real-world than neurotypical controls when social narrative events required more complex theory of mind skills and distancing from reality. We interpret this pattern as reflecting a more global tendency for autistic adults to experience weaker grounding in real-world knowledge and more flexible adaptation to imagined alternatives. The consequences of this style of narrative cognition would provide a worthwhile topic of future research.

Author Contributions LW led on data interpretation and drafting of the manuscript; HJF conceived of the study, designed the study, led on data collection, data analysis and interpretation, and contributed to drafting the manuscript. Both authors gave final approval for publication.

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Declarations

Conflict of interest We have no known conflict of interest to disclose. The authors have no financial or non-financial interests that are directly or indirectly related to the work submitted for publication.

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