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Nostalgia, authenticity and wellbeing in autistic and non-autistic young adults

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Abstract
Research in the general population has shown that nostalgia is associated with greater wellbeing through increased authenticity. It is well documented that autistic versus non-autistic individuals experience reduced wellbeing. This is the first study to explore nostalgia in autistic people and whether nostalgia might support the wellbeing of autistic people in the same way as non-autistic. This study had two aims: (i) to explore the autistic experience of nostalgia (proneness, triggers of nostalgia, related affect) and (ii) to examine the interrelationships at trait level between nostalgia, authenticity and wellbeing in autistic and non-autistic young adults. Participants (n = 230) completed an online questionnaire and reported about their nostalgic experiences, wellbeing, authenticity and autistic traits. Participants also wrote about either a nostalgic oran ordinary memory and rated how happy they felt after reflecting on the memory. With regards to the interrelationships at trait level within the whole cohort, nostalgia was not associated with increased authenticity or wellbeing. In contrast, authenticity was associated with increased wellbeing. However, nostalgia was not associated with greater wellbeing through increased authenticity. Differences in these interrelationships between autistic and non-autistic individuals are also discussed. The autistic experience of nostalgia was similar to the non-autistic, with the exception that autistic participants were less prone to nostalgia. At state level, findings also suggested that reflecting on nostalgic memories may boost positive affect in autistic as well as non-autistic individuals. This study may have implications for boosting wellbeing in autistic people.

Keywords Authenticity · Autism · Autobiographical memory · Nostalgia · Wellbeing · Young adults

Introduction

When people look at a photo of good friends from times gone by or listen to a favourite song from when they were growing up, they often find themselves transported back to memories of earlier times and yearning for something from the past. This yearning evokes a mixed bag of feelings - of happiness for fond memories - but at the same time - a touch of sadness because that desired thing, time or place is now irretrievable. This experience is the distinct emotion of *nostalgia*. This *"sentimental longing for one's past*" (Sedikides et al., 2016) is a complex experience consisting of a mixture of both cognitive and affective processes (Hepper et al., 2012). Nostalgia involves reflection about a memory, contemplating a contrast between the past and the present. It also includes reflecting on some form of loss – an absence of something valuable from the past. The affective component of nostalgia refers to the feelings evoked by the nostalgic memory, involving the simultaneous experience of both positive and negative emotions, although typically more positive than negative (Leunissen, 2022). In this way nostalgia is regarded as an emotion (Hepper et al., 2012; Sedikides & Wildschut, 2023), and moreover, a complex self-relevant emotion (van Tilburg et al., 2018).

Research has identified similar central features of nostalgia (triggers, affect and content) (Hepper et al., 2012). For example, the most frequent triggers of nostalgia are negative feelings or sensory inputs (Wildschut et al., 2006). In terms of affect/emotion, nostalgia often evokes largely positive feelings tinged with a touch of sadness and therefore it is often described as a bittersweet experience (Hepper et

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al., 2012). In terms of content, nostalgic memory narratives (versus ordinary autobiographical memories) are often self-oriented (Wildschut et al., 2006) with more references to self-esteem (Ismail et al., 2021; Routledge et al., 2008) and whereby the self is often with close others (Juhl & Biskas, 2022).

Researchers studying these aspects in the general population have highlighted important interrelationships between three areas: nostalgia, authenticity and wellbeing. With regards to the link between nostalgia and wellbeing, a wealth of research has shown that nostalgia is beneficial for wellbeing. It's worth noting that nostalgia can be studied at state level (by experimentally inducing the emotion) and at trait level or proneness to nostalgia, assessed by a number of standardised scales (Wildschut & Sedikides, 2022). Research both at state and trait levels has shown that nostalgia is beneficial for wellbeing. For example, nostalgia-prone individuals tend to experience increased positive affect (Layous et al., 2021) and increased life satisfaction (Baldwin et al., 2015; Luo et al., 2022). At state level, nostalgia promotes self-esteem (Umar Ismail et al., 2020) and social connectedness (Juhl & Biskas, 2022). However, in terms of the benefits of state nostalgia, the focus of this paper is on *positive affect* – how happy it makes people feel to reflect on a nostalgic experience. In relation to positive affect, researchers conducted an integrative data analysis incorporating 41 experiments manipulating nostalgia (Leunissen et al., 2021). Here, the combined evidence was conclusive - state nostalgia raised positive affect i.e. it makes people feel happy and/or puts them in a good mood.

Preliminary nostalgia interventions also show promise in boosting wellbeing over time, i.e., not just during the nostalgia induction (Layous et al., 2021; Zhou et al., 2021). For example, in a study by Layous et al., participants were asked to recall and reflect on a nostalgic event once a week as part of a six-week nostalgia intervention. Participants in the nostalgia condition (versus control) reported increased positive affect after three weeks but not out to post-intervention. In another study by Zhou et al., nostalgia boosted happiness up to two days after the nostalgia induction. In sum, nostalgia shows promise as a way of boosting mood.

Nostalgia has also been linked with authenticity. Authenticity can be defined as "a sense of alignment with one's true self" (Kelley et al., 2022, p. 1). Wood et al. (2008) described three components of dispositional authenticity: (1) *Self-alienation* - feeling out of touch with the true self); (2) *Authentic Living* - behaving or relating to others in line with one's true self) and (3) *Accepting External Influence* - rejecting social pressure to behave in ways which differ from one's true self. Greater authenticity therefore entails low Self-alienation, high Authentic Living and low Accepting External Influence. With regards to the link between nostalgia and authenticity, being more prone to nostalgia (trait nostalgia) is associated with greater intrinsic self-expression, i.e. knowing and expressing who you really are (Baldwin et al., 2015). In addition, a small body of experimental research has shown that state nostalgia leads to increased authenticity. For example, participants who reflected on a nostalgic (versus ordinary) memory reported increased perceived authenticity of the past self (Baldwin et al., 2015), rated the nostalgic event as more reflective of '*the person you truly are'* (Stephan et al., 2015) and reported increased authenticity (Kelley et al., 2022). Kelley et al. suggest that reflecting on nostalgic memories, which often contain important details about one's identity, helps people to get in touch with who they really are.

With regards to the link between authenticity and wellbeing, studies have shown that dispositional authenticity is associated with a number of aspects of wellbeing such as self-actualization, vitality, satisfaction with life, positive affect, and self-esteem (Kernis & Goldman, 2006; Wood et al., 2008). In contrast to previous correlational studies, in one study researchers manipulated authenticity to show that authenticity (versus inauthenticity and control) boosted wellbeing (Kelley et al., 2022). Lastly, and relevant to the current study, are studies showing that authenticity mediates the link between nostalgia and wellbeing (Kelley et al., 2022; Naidu et al., 2024), meaning that nostalgia's positive effects on wellbeing are caused at least in part by increasing authenticity. Kelley et al. asked participants to complete trait versions of nostalgia, authenticity and wellbeing scales and showed that people who were more prone to nostalgia were more likely to experience greater wellbeing via authenticity. Naidu et al. explored the interrelationships between these variables at state level and showed that people who reflected on a nostalgic (versus an ordinary) memory also reported increased wellbeing via authenticity.

The current study focuses on nostalgia, authenticity and wellbeing in autistic adults - a neurodivergent group who experience social, communicative, cognitive, sensory (Pearson & Rose, 2021) and emotional processing differences (Livingston et al., 2022) compared to the non-autistic population. At the time of writing, there is no reliable biological marker of autism. Cases of autism are thought to be the result of a combination of both genetic and environmental factors (Ecker et al., 2015). However, studies have noted differences in specific brain regions, in particular the frontotemporal and frontoparietal regions, amygdala-hippocampal complex and cerebellum (Ecker et al., 2015). Researchers have attempted to link these differences in specific brain regions to the behavioural features of autism. As such, autism is currently diagnosed based on behavioural aspects. For a diagnosis of autism, individuals must evidence 'impairments' in two areas: 1) social communication/

interaction and 2) restricted, repetitive behaviours and interests (RRBIs). The first diagnostic criteria include an atypical social approach or reduced sharing of emotions. The second criteria involve insistence on sameness or routines, or hyper- or hypo reactivity to sensory input (American Psychiatric Association, 2013).

Although many autistic adults have a diagnosis of autism, many others go undiagnosed (Ashwood et al., 2016; Geurts & Jansen, 2012). Reasons for underdiagnosis are many, but include: overstretched assessment services (Ashwood et al., 2016) and underdiagnosis / misdiagnosis in females as they often don't fit the autistic stereotype (Zener, 2019). Due to these difficulties surrounding diagnosis, many people self-identify or self-diagnose as autistic (Lewis, 2017). Therefore, the focus of the current study is concerned with the experiences of both autistic diagnosed and autistic self-identified individuals, in the period of *emerging adulthood* (young adults 18–25). This period is a time of identity exploration in non-autistic (Arnett, 2000) but also in autistic individuals (Cribb et al., 2019) and may involve life transitions, a factor which evokes frequent nostalgic reminiscence in this age group (Hepper et al., 2021; Wang et al., 2023).

An abundance of evidence shows that autistic (diagnosed) compared to non-autistic people experience considerably higher rates of mental health difficulties (Lever & Geurts, 2016). With the exception of one study pointing to reduced quality of life in autistic individuals (Van Heijst & Geurts, 2015), less attention has been paid to researching wellbeing per se in autistic people – how happy they are, their satisfaction with life and the extent to which they flourish. Studies have tended to focus on mental health or on specific domains such as employment or friendships in autistic people. Similarly, evidence points to reduced wellbeing (Lewis, 2016a, b), but less is known about the wellbeing of individuals who self-identify as autistic. Studies often assess the wellbeing of autistic people with a diagnosis but less often the wellbeing of those who self-identify as autistic and rarely compare the wellbeing of both autistic groups. Thus this study aims to explore the wellbeing of both autistic people with a diagnosis as well as those who self-identify as autistic, compared to non-autistic people.

Although nostalgia has been shown to be beneficial for wellbeing for people in the general population, some researchers have suggested that nostalgia does not provide wholesale positive effects for all groups of people. For example, in one study, individuals who had a tendency towards habitual worry subsequently felt more anxiety and depression when they dwelled on happy nostalgic memories, as the pleasant episode in the past contrasted with their actual anxious state (Verplanken, 2012). Other scholars propose that the positive effects of nostalgia are limited to circumstances in which individuals have maintained identity continuity between the past and the present, i.e. it is only when individuals feel a connection to a fondly remembered past that nostalgia will be beneficial (Iyer & Jetten, 2011). In addition, apart from some work in dementia (Ismail et al., 2018, 2021), very little research has explored how so called 'atypical populations' experience nostalgia. In sum, it's important to explore whether nostalgia is beneficial for different groups of the population. Therefore, the thrust of this study is to explore within one group of people – autistic people - to see how they experience nostalgia. More specifically, the overarching aim of the current study was to explore if nostalgia (both at state and trait level) might be beneficial for wellbeing for autistic in the same way as non-autistic people. This study was pre-registered on the Open Science Framework and can be found here:https://osf.io/tsbmk..

This is the first study to explore how autistic people experience the emotion of nostalgia, which in turn may impact how autistic people can benefit from the emotion. There may be reason to suspect some differences between how autistic and non-autistic people experience the central features of nostalgia. Atypical sensory function (South & Rodgers, 2017) may result in differences in typical triggers of nostalgic memories. As emotion processing differences/difficulties are common in autistic people (Livingston et al., 2022), autistic people may also experience affect/emotion evoked by nostalgia differently to non-autistic people. For example, in relation to emotion recognition, although the picture is mixed (Bird & Cook, 2013), eye tracking and electroencephalography studies have reported atypical processing of facially expressed emotion in autistic people (Black et al., 2017). fMRI studies have shown reduced activation in both subcortical (e.g. amygdala) and neocortical regions when observing emotional facial expressions in autistic compared to non-autistic people (Sato et al., 2020).

Empathy is another salient area of research, typically divided into two components: affective/emotional and cognitive empathy (Shalev et al., 2022). Affective empathy refers to the idea that when we perceive another person's state, it leads us to experience that same state ourselves. Cognitive empathy refers to the ability to represent another person's state, i.e. understanding and knowing what other people are feeling. Cognitive empathy is similar to a long standing theory - Theory of Mind (ToM) (Baron-Cohen et al., 1985). ToM or 'mentalising' refers to one's ability to recognise, represent and interpret the mental states (beliefs, desires, intentions, thoughts and emotions) of oneself and others. With regards to any differences in affective/cognitive empathy between autistic and non-autistic individuals, research has shown very mixed results. A recent meta-analysis of 35 studies indicated that autistic versus non-autistic individuals tend to experience much lower cognitive and somewhat lower affective empathy (Fatima & Babu, 2023), in complete contrast to the fact that some autistic

individuals report overwhelming empathy (Gillespie-Lynch et al., 2017). Lastly, and relevant to this research is that autistic people may also have more difficulty in identifying, interpreting and describing their *own* emotions - also known as alexithymia (Huggins et al., 2020). Alexithymia is significantly higher in autistic compared to non-autistic people (Kinnaird et al., 2019) although it is not necessarily an inherent feature of the autistic experience (Huggins et al., 2021). In sum, it is unknown how autistic people experience nostalgia, but differences may be expected compared to the non-autistic experience.

Authenticity and its relationship with wellbeing is another salient topic for autistic individuals (Rivera et al., 2019). To the best of our knowledge, this is the first quantitative study to explore authenticity in autistic people. However, findings from a related body of largely qualitative research – *autistic masking* - suggest that authenticity may be lower in autistic people. Autistic people are often presented with a message in society that their way of being in the world is abnormal (Pearson & Rose, 2021). Therefore, many autistic people use a number of specific behavioural and cognitive strategies known as *masking* (also referred to as *camouflaging*), such as the concealment of their autistic traits, to cope within or to fit into the predominately non-autistic social world (Cook et al., 2021). Non-autistic individuals also engage in masking behaviours (often referred to as "impression management"). However, whereas non-autistic individuals shift between different versions of the self for shorter periods, autistic individuals might mask for longer periods of time even to the point whereby the "true self" is rarely revealed (Sedgewick et al., 2022). Evidence shows that masking limits authenticity and is associated with reduced wellbeing (Cook et al., 2021).

Given the potential differences described above, the first aim of the current study was to explore the autistic experience of nostalgia in terms of proneness to nostalgia, the triggers of nostalgic memories and state nostalgia's related affect compared to the non-autistic experience[1]. As this was the first study to consider the topic of nostalgia in autistic individuals, this first aim was exploratory, and no specific hypotheses were made.

The second overarching aim was to explore the interrelationships between (trait) nostalgia, (dispositional) authenticity and wellbeing both within the whole cohort and in the separate groups. Sitting under this overarching aim were two sub-aims[2]: to assess and compare the (1) wellbeing and (2) authenticity of autistic (both diagnosed and self-identified) and non-autistic individuals. In relation to aim two, three hypotheses[3] were made. H1) It was predicted that wellbeing (on all measures used) and H2) authenticity would be significantly lower in the autistic groups compared to the non-autistic H3) Authenticity would mediate the association between nostalgia and wellbeing within the whole cohort (this was also explored within individual participant groups, but no specific hypotheses made).

Materials and methods

Consultation

We recruited five autistic young adults (18–25, from the UK) through one of the first author's personal contacts on social media to provide feedback on the suitability of study materials and procedures for use with autistic individuals (and all individuals) before recruitment began. Consultation individuals were remunerated in line with National Institute for Health and Care Research (NIHR) guidelines.

Sample size

We carried out a power analysis using G*Power 3.1 (Faul et al., 2009) to estimate the sample size required to test for differences between groups, including for a 2×2 between subjects design – group/condition. The estimated sample size, assuming a medium effect size at 80% power was 158.

We used the MedPower app to estimate the sample size required to observe an indirect effect of nostalgia on wellbeing via authenticity. We specified associations found in a similar mediation analysis by Kelley et al. (2022), i.e., nostalgia – authenticity (the a path) 0.19, authenticity – wellbeing (the b path) 0.45 and nostalgia – wellbeing (the c' path) 0.14. Using these parameters, the estimated sample size to detect an indirect effect at 80% power was 214.

[1] In our pre-registration document on the Open Science Framework, we also planned to explore the content of nostalgic memory narratives as part of this first aim. Unfortunately, we did not have enough memory narrative texts (group/condition) of sufficient word count to conduct our planned analysis. Therefore, we removed the 'content of nostalgic memories' from this first aim and do not report about this here.

[2] This differs slightly from the pre-registration of our study. We added in these 2 sub-aims following peer review feedback so that the aims were more strongly aligned with the hypotheses.

[3] We tweaked the original wording of H1 and H2 from our pre-registration document and collapsed them into one new hypothesis (H3). This was due to feedback about our methods/analyses as part of the peer review process for publication. In addition, our original plan included H5 (to explore the associations between frequency of masking, authenticity, and wellbeing). We did collect data on this but, on reflection, decided that our one single item to measure frequency of masking was insufficient. Therefore, this paper does not report associations between frequency of masking, authenticity, and wellbeing.

Table 1 Participant characteristics by group

		non-autistic ($n=112$) M (SD)	autistic diagnosed ($n=52$) M (SD)	autistic self-identified ($n=66$) M (SD)	*P*	ε^2
age		22.72 (1.89)	22.57 (2.55)	22.60 (1.91)	$p=.778$	*0.00*
gender	man	36 (32%)	16 (31%)	37 (56%)	-	
	woman	74 (66%)	24 (46%)	21 (32%)	-	
	non-binary/third gender	0 (0%)	10 (19%)	5 (8%)	-	
	other[a]	2 (2%)	2 (4%)	3 (4%)	-	
autistic traits[b] (RAADS-14)		16.56 (9.21)	31.54 (6.67)	26.59 (6.97)	$p<.001$***	0.40

[a]other – includes 1 person who did not report gender and 1 person who preferred not to say (both non-autistic) and 5 people who preferred to self-describe

[b]We carried out a One-Way Kruskal-Wallis ANOVA (group) to test for differences. Note: alpha values - *$p < .05$ ** $p < .01$ *** $p < .001$

Pairwise comparisons showed - autistic diagnosed > non-autistic, autistic self-identified > non-autistic, autistic diagnosed > autistic self-identified – all comparisons were highly significant ($p < .001$)

Participants

301 people completed an online survey. 71 were excluded[4], leaving a final sample of 230 participants. We recruited 112 non-autistic participants, 52 participants with a diagnosis of autism and 66 who reported no autism diagnosis but who identified as autistic. Although the two autistic groups were treated as distinct groups (in the analysis that follows), for the purpose of this study both were considered autistic as opposed to non-autistic.

Autistic participants were recruited through groups for autistic people on social media, the researchers' academic and professional contacts, Oxford Brookes University's Research Activity Group and Autistica (UK Autism research and campaigning charity). Non-autistic and autistic self-identified participants were recruited online through social media. Participants were also recruited using the platform Survey Circle https://www.surveycircle.com/.

All participants needed to be able to write at least 4 sentences without help about a past event in English. Those who had ever had traumatic brain injury or those who currently or in the past had been dependent on alcohol or other substances were not able to take part. Members of other neurodivergent groups were free to take part. Most participants were from the United Kingdom or the United States, with the remainder from several other countries around the world. Participants were a mixture of students and individuals in employment. Approximately half of the autistic participants reported psychiatric/psychological diagnoses[5] such as depression or anxiety, compared to approximately one quarter of the non-autistic participants. Participant characteristics - age, gender, and a mean score for a measure of autistic traits (RAADS-14) are presented for each group in Table 1.

Measures

The survey began by asking participants to select from one of three options: (i) I have a diagnosis of autism (ii) I don't have a diagnosis of autism, but I do identify as autistic or (iii) I don't have a diagnosis of autism and I don't identify as autistic.

Participant response to this first item was the basis for group allocation: autistic diagnosed, autistic self-identified or non-autistic. All participants then completed all of the following five blocks in a random order: Wellbeing, Authenticity, Nostalgia, Event Reflection Task (ERT) and Autistic Traits. All participants completed the demographics section at the end.

Wellbeing block

Measures of both subjective and psychological wellbeing were used. Subjective wellbeing was measured with the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999) (cohort $\alpha=0.82$) and the Satisfaction with Life Scale (Diener et al., 1985) (cohort $\alpha=0.88$). Psychological wellbeing was measured using the Flourishing Scale (Diener et al., 2010) (cohort $\alpha=0.94$).

[4] 71 were excluded due to: not being in the correct age bracket ($n=3$), no variance in Raads score (one item reverse scored) ($n=8$), <75% response rate to items on any given scale ($n=8$), replication/duplication of response (including keywords/memory narrative) ($n=10$), no memory narrative ($n=17$), nonsensical memory narrative ($n=23$), memory narrative not in English ($n=2$).

[5] Of the whole cohort ($n=230$), 90 participants reported having at least one psychiatric/psychological diagnosis. Of those 90, this included 24 (21.42%) in the non-autistic group, 32 (61.53%) in the autistic diagnosed group and 34 (51.51%) in the autistic self-identified group. Of those people ($n=66$) who included details of these diagnoses, some reiterated that they had a diagnosis of autism, some other neurodevelopmental disorders (e.g. dyslexia), mental health conditions (e.g. depression or anxiety) and some other psychological conditions. Due to the difficulty in teasing apart these diagnoses, we decided not to include psychological diagnoses in the analyses.

Authenticity block

The Authenticity Scale - a person-centred/humanistic conceptualisation of dispositional authenticity was used to assess authenticity (Wood et al., 2008) (cohort α = 0.83). It has 3 sub-scales: (1) Self-alienation (2) Authentic living (3) Accepting External Influence.

Nostalgia block

The nostalgia block was made up of two sections: Triggers of nostalgia and Nostalgia Proneness.

Triggers of nostalgia

We created two novel items based on previous research findings (Wildschut et al., 2006) to assess the extent to which certain typical triggers evoked nostalgia; the first assessed nine direct/external triggers (e.g. music, smells, food etc.) (cohort α = 0.86) - *What things tend to make you think of nostalgic memories?* and the second assessed six psychological states (e.g., sadness, happiness, loneliness) (cohort α = 0.69) - *What kind of feelings tend to trigger nostalgic memories for you?* For both items, participants rated each option from 1 (not at all) to 7 (very much). The importance of both direct and psychological state triggers were combined into an overall score – The Importance of Overall Triggers (cohort α = 0.71).

Nostalgia proneness

Two measures were used to assess proneness to nostalgia (trait nostalgia). First, the Nostalgia Inventory (Batcho, 1995) (cohort α = 0.89), which asks participants to rate the extent to which they miss 20 aspects of their life (such as family, places and the way society was) from when they were younger. Second, the Southampton Nostalgia Scale (SNS) (Sedikides et al., 2015) (cohort α = 0.91), which asks participants about how much they value nostalgia and how frequently they experience it.

Event reflection task block

In this block all participants completed the following three sections and all in this order: Event Reflection Task (Sedikides et al., 2015), Event Reflection Task Affect Measure and Nostalgia Manipulation Check.

Event reflection task

All participants were randomly assigned to one of two conditions – nostalgic memory *or* ordinary memory. For this task, half of the autistic (both diagnosed and self-identified) and half of the non-autistic participants were prompted to describe a nostalgic memory (by typing into a textbox) and the other half were prompted to describe an ordinary memory.

Event reflection task affect measure

After recalling a memory, all participants responded to two items: "*Thinking about this event makes me feel happy"* and "*Does thinking about your experience make you feel happy*?". Participants rated both items on a 7-point scale: the first item from 1 (strongly disagree) to 7 (strongly agree) and the second from 1 (not happy at all) to 7 (very happy). We combined the two responses into a mean affect score (cohort α = 0.90).

Nostalgia manipulation check

Participants in both the nostalgic and the ordinary memory conditions completed one item: "Thinking about this memory makes me feel nostalgic" rating from 1 (strongly disagree) to 7 (strongly agree).

Autistic traits block

All participants completed the Ritvo Autism and Asperger Diagnostic Scale 14 – Screen (RAADS-14 Screen) (Eriksson et al., 2013) (cohort α = 0.88), a 14 item self-report measure of autistic traits. For each item, participants chose one of the following options (a four-point Likert scale ranging from 0 to 3): 3 - *This is true and describes me now and when I was young*; 2 - *This was true or describes me only now*; 1 - *This was true only when I was young (16 years of younger);* 0 - *This was never true and never described me*. Higher scores indicate higher autistic traits.

Demographics block

Participants responded to demographic items about their gender, age, country of residence, occupation and whether they had any other psychiatric or psychological diagnoses.

Completion of the online questionnaire took approximately 20 min. This study was approved by Oxford Brookes University's Research Ethics Committee. A copy of the questionnaire on the Open Science Framework can also be found through this link:https://osf.io/tsbmk.

Statistical analysis procedure

For all data collected with an ordinal scale non-parametric tests were used. To consider group differences, one-way

Kruskal-Wallis tests were utilised and where appropriate pairwise comparisons with Dwass-Steel-Critchlow-Fligner (DSCF) correction were used. Where only two groups were compared, a Mann-Witney U test was used instead. However, in the absence of a non-parametric equivalent test, a 2-way ANOVA was used to test for differences in Event Reflection Task Affect scores between group and condition. Due to the high (inter)correlations between the two nostalgia scales (SNS and NI) (rho 0.54, $p < .001$) and between the three wellbeing scales (SHS, SWL and Flourishing) (rho 0.70 −0.75, $p < .001$) and to reduce the number of variables for analysis in aim 2, we standardised the nostalgia and wellbeing scale scores (converted them to z-scores) and combined the z-scores to create a Nostalgia Combined Score (NCS) (cohort $\alpha = 0.74$) and a Wellbeing Index (cohort $\alpha = 0.70$). To determine simple relationships, we conducted Spearman's correlations within the whole cohort with Bonferroni correction applied to the p value to account for the elevated chance of a type I error. We carried out a common method bias test, incorporating all the nostalgia, authenticity and wellbeing items into a principal components analysis. As the total variance was less than 50% (20.79%), this suggested that common method bias was not prevalent in this study. For both the mediation and moderated mediation analyses, we calculated standard errors and 95% confidence intervals for the indirect effect using the bootstrap approach based on 1000 bootstrap samples and report standardised effect sizes. For all inferential statistics an alpha level of 0.05 was used to determine significance unless otherwise stated.

Results

Aim 1

The first aim was to explore the autistic experience of nostalgia in terms of proneness to nostalgia, triggers of nostalgia and state nostalgia's related affect.

Proneness to nostalgia, triggers of nostalgia and Event Reflection Task (ERT) affect measure

Mean scores are presented in Table 2 for nostalgia proneness (trait nostalgia) measured on both the Southampton Nostalgia Scale (SNS) and the Nostalgia Inventory (NI), for the Importance of Direct Triggers, the Importance of Psychological State Triggers and Importance of Overall Triggers and also for the Event Reflection (Task ERT) Affect Measure for each participant group: non-autistic, autistic diagnosed and autistic self-identified.

In terms of proneness to nostalgia (trait nostalgia), there was no significant difference between groups on the SNS. However, there was a significant difference between groups in NI scores, although the effect size was small (see Table 2). DSCF pairwise comparisons showed that the autistic diagnosed group scored significantly lower in NI than the non-autistic group ($p = .017$). There were no significant differences in NI scores between the non-autistic and autistic self-identified group ($p = .402$), nor between the two autistic groups ($p = .298$). In terms of the Importance of the Triggers of nostalgia, results showed no significant difference between groups in any of these three categories (see Table 2).

In the Event Reflection Task (ERT) affect measure, there was a significant effect of group but not of condition, nor in the interaction between group and condition (see Table 2). Post-hoc tests analysing the effect of group showed that the autistic self-identified group scored significantly lower in affect overall (regardless of condition) compared to

Table 2 Mean Nostalgia Scale, Importance of triggers scores by group and event Reflection Task affect scores by group*condition

Scale	non-autistic M (SD)	autistic diagnosed M (SD)	autistic self-identified M (SD)	p	ε^2
Nostalgia					
Southampton Nostalgia Scale	4.55 (1.19)	4.32 (1.33)	4.61 (1.30)	$p = .417$	0.01
Nostalgia Inventory	4.43 (0.98)	3.87 (1.17)	4.21 (0.93)	$p = .020$*	0.03
Importance of Triggers					
Importance of Direct Triggers	4.79 (1.15)	4.49 (1.34)	4.53 (1.00)	$p = .200$	0.01
Importance of Psychological Triggers	4.21 (1.09)	4.27 (1.14)	4.28 (1.13)	$p = .876$	0.00
Importance of Overall Triggers	4.56 (0.97)	4.40 (1.15)	4.43 (0.97)	$p = .663$	0.00
Event Reflection Task (ERT) Mean Affect Scores					
Nostalgic memory	5.36 (1.48)	4.97 (1.90)	4.86 (1.25)	group $p = .022$*	0.03
Ordinary memory	4.95 (1.61)	5.16 (2.05)	4.03 (1.88)	condition $p = .140$	0.01
				group*condition $p = .279$	0.01

alpha values - * $p < .05$ ** $p < .01$ *** $p < .001$

the non-autistic group ($p = .019$). There was no significant difference in affect overall (regardless of condition) between the non-autistic and autistic diagnosed participants ($p = .950$), nor between the two autistic groups ($p = .126$).

Event Reflection Task – nostalgia manipulation check

The nostalgia manipulation was effective for the non-autistic and the autistic self-identified groups. Non-autistic participants in the nostalgia condition (M = 5.82, SD = 1.35) reported feeling significantly more nostalgic than their counterparts in the ordinary memory condition (M = 4.86, SD = 1.75), (U = 1052.00, $p = .002$, rrb = 0.33). The same was true of the autistic self-identified group whereby participants in the nostalgia condition (M = 5.71, SD = 1.38) reported feeling significantly more nostalgic than those in the ordinary memory condition (M = 4.00, SD = 2.12), (U = 280.00, $p < .001$, rrb = 0.47). However, the difference between the autistic diagnosed participants in the nostalgia condition (M = 5.64, SD = 1.67) and their counterparts in the ordinary memory condition (M = 4.63, SD = 2.22) did not reach statistical significance ($p = .093$).

Aim 2

The second overarching aim was to explore the interrelationships (using a measurement of mediation design) between (trait) nostalgia, (dispositional) authenticity and wellbeing both within the whole cohort and in the separate groups. Sitting under this overarching aim were two sub-aims: to assess and compare the (1) wellbeing and (2) authenticity of autistic (both diagnosed and self-identified) and non-autistic individuals.

Mean scores are presented for the three individual wellbeing scales (SHS, SWL, Flourishing), authenticity subscales (Self-alienation, Authentic Living and Accepting External Influence), authenticity overall (authenticity subscales combined), as well as a Wellbeing Index (SHS, SWL and Flourishing combined) for all groups (see Table 3). There were significant differences between autistic and non-autistic groups (but not between the two autistic groups) in all of the above variables, with the exception of the one authenticity subscale – Accepting External Influence.

Correlations were conducted at trait level between nostalgia (Nostalgia Combined Score), authenticity (overall score) and wellbeing (Wellbeing Index) within the whole

Table 3 Mean scores (SD) in authenticity Subscales and Authenticity overall, Wellbeing scales and Wellbeing Index for each group

Scale	non-autistic M (SD)	autistic diagnosed M (SD)	autistic self-identified M (SD)	*p*	ε^2
Authenticity Subscales					
Self-alienation	18.45 (5.34)	16.08 (6.96)	15.20 (6.05)	$p = .002$**	0.05
Authentic Living	20.99 (3.87)	20.42 (4.65)	18.61 (5.18)	$p = .016$*	0.04
Accepting External Influence	16.21 (5.07)	15.69 (6.42)	16.14 (5.35)	$p = .563$	0.01
Authenticity overall	55.65 (10.71)	52.19 (13.95)	49.94 (10.02)	$p = .007$**	0.04
Wellbeing Scales					
Subjective Happiness	4.18 (1.37)	3.69 (1.36)	3.59 (1.15)	$p = .001$***	0.06
Satisfaction with Life	21.39 (6.83)	17.44 (7.26)	17.44 (6.23)	$p < .001$***	0.08
Flourishing	38.50 (9.56)	33.52 (12.19)	29.53 (9.73)	$p < .001$***	0.13
Wellbeing Index[a]	0.29 (0.97)	-0.27(1.03)	-0.14 (0.87)	$p < .001$***	0.07

[a] As these scores were standardised, Wellbeing Index mean scores are presented as z-scores

alpha values - *$p < .05$ **$p < .01$ ***$p < .001$

Pairwise comparisons with significant group differences:

Self-alienation – autistic diagnosed = non-autistic ($p = .056$), autistic self-identified < non-autistic ($p = .003$), autistic self-identified = autistic diagnosed ($p = .842$)

Authentic Living - autistic diagnosed = non-autistic ($p = .877$), autistic self-identified < non-autistic ($p = .012$), autistic self-identified = autistic diagnosed ($p = .147$)

Authenticity overall - autistic diagnosed = non-autistic ($p = .197$), autistic self-identified < non-autistic ($p = .005$), autistic self-identified = autistic diagnosed ($p = .878$)

Subjective Happiness Scale - autistic diagnosed < non-autistic ($p = .035$), autistic self-identified < non-autistic ($p = .002$), autistic self-identified = autistic diagnosed ($p = .967$)

Satisfaction with Life - autistic diagnosed < non-autistic ($p = .004$), autistic self-identified < non-autistic ($p < .001$), autistic self-identified = autistic diagnosed ($p = 1.00$)

Flourishing - autistic diagnosed = non-autistic ($p = .071$), autistic self-identified < non-autistic ($p < .001$), autistic self-identified = autistic diagnosed ($p = .111$)

Wellbeing Index - autistic diagnosed < non-autistic ($p = .004$), autistic self-identified < non-autistic ($p = .005$), autistic self-identified = autistic diagnosed ($p = .807$)

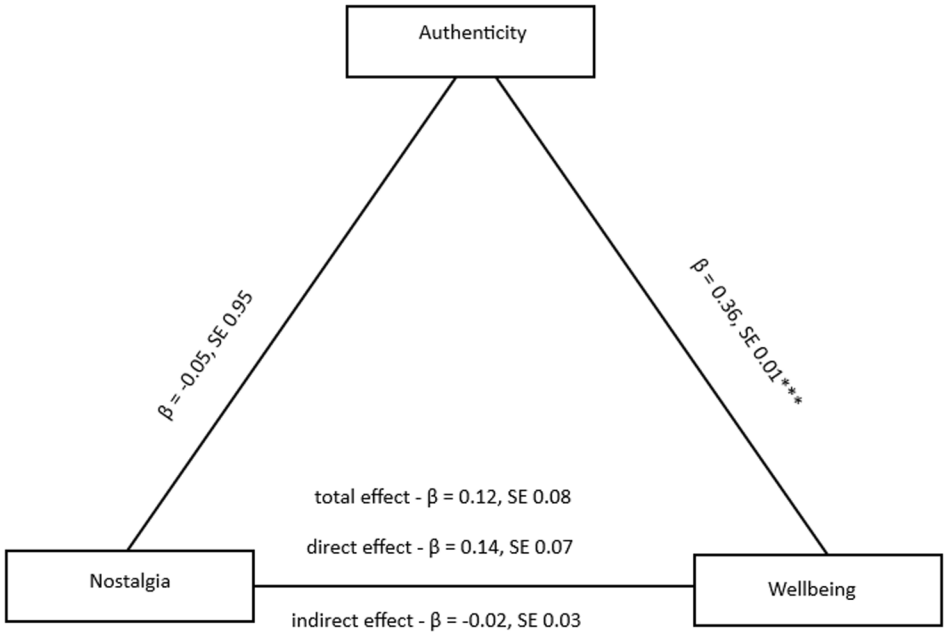

Fig. 1 The association of trait nostalgia with wellbeing via authenticity within the whole cohort. Note: alpha values - *$p <$ .05 **$p < .01$ ***$p < .001$

Table 4 Moderated mediation analyses

Path	non-autistic	autistic diagnosed	autistic self-identified
Association between Nostalgia and Authenticity (path a)	β = -0.01, SE 1.31, t = -0.06, p = .954, CI [-2.69, 2.45]	β = 0.11, SE 2.57, t = 0.56 p = .575, CI [-3.84, 6.24]	**β = -0.32, SE 1.61, t = -2.62 p = .009**, CI [-7.28, -1.14]**
Association between Authenticity and Wellbeing (path b)	**β = 0.40, SE 0.01, t = 4.40 p< .001***, CI [0.02, 0.05]**	β = 0.25, SE 0.01, t = 1.86 p = .062, CI [0.01, 0.03]	β = 0.15, SE 0.01, t = 1.06 p = .288, CI [0.00, 0.02]
Association between Nostalgia and Wellbeing (path c – total effect)	β = 0.13, SE 0.11, t = 1.27 p = .204, CI [-0.07, 0.35]	β = 0.18, SE 0.16, t = 1.13 p = .258, CI [-0.13, 0.49]	β = -0.06, SE 0.12, t = -0.52 p = .601, CI [-0.29, 0.17]
Association between Nostalgia and Wellbeing (path c' – direct effect)	β = 0.13, SE 0.11, t = 1.29 p = .196, CI [-0.07, 0.35]	β = 0.15, SE 0.17, t = 0.88 p = .377, CI [-0.17, 0.50]	β = -0.01, SE 0.12, t = -0.11 p = .915, CI [-0.24, 0.21]
Association between Nostalgia and Wellbeing via Authenticity (indirect effect)	β = -0.00, SE 0.04, t = -0.06 p = .954, CI [-0.08, 0.08]	β = 0.03, SE 0.07, t = 0.41 p = .679, CI [-0.11, 0.15]	β = -0.05, SE 0.05, t = -0.91 p = .364, CI [-0.16, 0.05]

alpha values - * $p < .05$ ** $p < .01$ *** $p < .001$ (significant associations are shown in bold)

cohort. Authenticity was significantly associated with increased wellbeing within the whole cohort (rho 0.34, $p < .001$). Associations between nostalgia and authenticity (rho − 0.00, $p = .952$) and nostalgia and wellbeing (rho 0.10, $p = .132$) were not significant.

We conducted a mediation analysis using the jAMM GLM Mediation Model module in jamovi to test our hypothesis that authenticity mediates nostalgia's effect on wellbeing within the whole cohort (see Fig. 1). First, the total effect of nostalgia on increased wellbeing (the c path – without the involvement of authenticity as the mediator) was not significant. The direct effect of nostalgia on increased wellbeing (the c' path, in the presence of authenticity as the mediator) was also not significant. Nostalgia was negatively (but not significantly) associated with authenticity (the a path). Authenticity was positively (significantly) associated with wellbeing (the b path). The indirect effect of nostalgia on wellbeing through authenticity (ab) was *not* significant i.e., authenticity did *not* mediate the path between nostalgia and wellbeing.

Finally, we carried out moderated mediation analyses, testing whether Group impacted on any of the paths in the mediational model above (see moderated mediation analyses in Table 4). The relationship between nostalgia and authenticity (the a path) was not significant in the non-autistic group, nor in the autistic diagnosed group. However, nostalgia was significantly negatively associated with authenticity in the autistic self-identified group. The relationship between authenticity and wellbeing (the b path) only remained significant in the non-autistic group. The relationship between nostalgia and wellbeing (both the c path, total effect and the c' path, direct effect) remained non-significant in all three groups. The indirect effect of nostalgia on wellbeing via authenticity also remained non-significant in all three groups.

Discussion

This was the first study to address the topic of nostalgia, authenticity and wellbeing in autistic individuals. The first aim was to explore the autistic experience of nostalgia in terms of proneness to nostalgia, triggers of nostalgia and state nostalgia's related affect compared to the non-autistic experience. In sum, there were differences in proneness to nostalgia between groups – the autistic diagnosed participants missed typical aspects from their past much less compared to the non-autistic group. However, the autistic experience of nostalgia in terms of triggers and affect did not differ from the non-autistic experience.

With regards to the triggers of nostalgia, there were no differences between autistic and non-autistic groups in the extent to which direct or psychological state triggers evoked nostalgia, although the design of the current study only allowed for analysis in these two main categories. With regards to proneness to nostalgia, SNS scores did not differ significantly between autistic and non-autistic groups, suggesting that both autistic and non-autistic participants valued and experienced nostalgia to a similar extent. In contrast, autistic diagnosed participants were significantly less prone to nostalgia measured on the NI. This may suggest that autistic people are less nostalgic about the specific aspects assessed on the NI (e.g., friends, school, holidays) and this measure fails to capture other aspects that they miss from when they were younger, however, we do not yet know what those things might be. An alternative explanation could be that autistic individuals do not *miss* these aspects (e.g., friends, school, holidays) from the past as much because they may not always entail positive memories for autistic people due to adverse childhood experiences (Bottema-Beutel et al., 2020; Kerns et al., 2017). Although, to be clear, we used the original version of the NI which asks participants about the extent to which they *miss* aspects from their life when they were younger. As Kelley et al. (2022) point out, *missing* is only a small part of the of the construct of nostalgia (Hepper et al., 2012) and our results may have been different, had we simply asked about the extent to which participants were nostalgic about the aspects on the NI.

In relation to state nostalgia and affect, reflecting on a nostalgic (versus an ordinary) memory did not make participants feel happier, a pattern that was consistent across all three participant groups. This finding is in contrast to other studies with participants from the general population (Leunissen et al., 2021; Zhou et al., 2021). The finding that reflecting on a nostalgic memory did not make participants happier is a curious one since participants in the nostalgia condition (in the non-autistic and autistic self-identified groups but not the autistic diagnosed group) reported feeling more nostalgic compared to those in the control condition. Of course, nostalgic feelings are typically bittersweet, a mixture of happiness and sadness and therefore it's possible that participants felt mixed feelings but this study only assessed positive affect.

However, on a positive note, reflecting on nostalgic memories (state nostalgia) made both autistic and non-autistic participants equally happy. As there were no differences in nostalgia induced affect between autistic and non-autistic groups in the current study, one might also expect state nostalgia to support autistic people (in terms of boosting positive affect) in the same way as research has shown for non-autistic people. This finding, although small, may have implications in terms of providing a starting point from which to explore the potential use of nostalgic recollection as part of Positive Psychology Interventions (PPIs) or interventions to support the wellbeing of autistic people. Although engaging in nostalgia produces momentary increases in positive emotion, the Broaden-and-Build Theory of positive emotions proposes that short term increases in positive emotion open the mind to new possibilities, and help to build enduring personal resources over time (Fredrickson, 2013). Therefore, through boosting positive affect, nostalgia may be able to help autistic people counter life's difficulties and adversities. Although of course, much more research is necessary to assess this.

The second aim was to explore the interrelationships between (trait) nostalgia, (dispositional) authenticity and wellbeing in all groups. Sitting under this second aim were two sub-aims: to assess and compare wellbeing and authenticity in autistic and non-autistic groups. As predicted, wellbeing (overall) was significantly lower in both autistic groups compared to the non-autistic group. Both autistic groups reported feeling less satisfied with life and less happy compared to the non-autistic group. In addition, the autistic self-identified group reported reduced flourishing compared to the non-autistic group too. The finding that the autistic diagnosed group experienced lower wellbeing compared to the non-autistic group was expected as the higher prevalence of co-occurring depression and anxiety is well documented. However, as less is known about the wellbeing experiences of people who self-identify as autistic, the finding that they too experience significantly lower wellbeing highlights that they are also a vulnerable group.

As predicted, dispositional authenticity was lower in the autistic groups (particularly in the autistic self-identified group) compared to the non-autistic group. To the best of the authors' knowledge, this is the first (quantitative) study to report this finding. According to Wood et al.'s (2008) conceptualisation, a key feature of authenticity is being in touch with one's emotions. As alexithymia often co-occurs with autism, these difficulties might explain lower authenticity in autistic versus non-autistic participants to some degree

(although the current study did not assess alexithymia). In addition, the period of emerging adulthood is made more challenging for autistic young adults due to a lack of acceptance from others (non-autistic people) in society (Lee et al., 2022). This lack of societal acceptance may be confusing for autistic young adults, particularly at this critical time of their lives, and may contribute to a lack of self-acceptance. Self-acceptance is a key component of Kernis and Goldman's (2006) conceptualisation of authenticity. A lack of self-acceptance may, in part, contribute to autistic people feeling more out of touch with and/or behaving in line with the true self. An interesting finding here is that the autistic self-identified (as opposed to the autistic diagnosed) participants scored significantly lower in authenticity overall compared to the non-autistic group. This may suggest that a diagnosis of autism can help autistic people to develop self-understanding (Lewis, 2016b). Lack of self-understanding may also hinder autistic self-identified individuals from behaving in more authentic ways i.e., behaving in line with the true self (Wood et al., 2008).

Surprisingly, being more prone to nostalgia was not associated with higher authenticity within the whole cohort. Even more surprisingly, self-identified autistic participants who were more prone to nostalgia were more likely to report *lower* authenticity. The negative association in this group may be due to the link between nostalgia proneness and rumination (Sedikides & Wildschut, 2019); a form of repetitive thinking (Verplanken, 2012). Perhaps, instead of helping autistic self-identified adults to understand themselves more, being more prone to nostalgia leads to increased repetitive thinking, which is common in autistic individuals (Cooper et al., 2022; Williams et al., 2021). However, this study did not control for levels of rumination/repetitive thinking.

Higher dispositional authenticity was associated with higher wellbeing within the whole cohort and in the non-autistic group. This finding is in line with previous research (Kernis & Goldman, 2006; Wood et al., 2008) and highlights the importance of the aforementioned 'sense of alignment with one's true self' (Kelley et al., 2022, p. 1) for wellbeing. Although trending in the expected direction for the autistic diagnosed group, there was no association between authenticity and wellbeing in the autistic groups. The latter was a surprising finding and reasons for this are unknown.

Trait nostalgia was not associated with higher wellbeing within the whole cohort, nor within individual groups. This finding differs from some other studies e.g., (Baldwin et al., 2015; Luo et al., 2022). However, not all studies have found a positive association between trait nostalgia and wellbeing. For example, nostalgia-prone individuals (as assessed by the Personal Inventory of Nostalgic Experiences), reported lower levels in some areas of wellbeing (Newman et al., 2020). Additional research is needed to unpick these findings and also consider whether additional factors may have precluded finding a positive association between trait nostalgia and wellbeing. For example, a variable we did not measure is neuroticism (a trait with tendencies towards experiencing negative feelings). Neuroticism is associated with autistic traits (Austin, 2005), nostalgia (Barrett et al., 2010) and wellbeing (Kotov et al., 2010).

Against our predictions, authenticity did not mediate the link between nostalgia and wellbeing (neither within the whole cohort nor in individual groups). This result contrasts with that of Kelley et al. (2022) and Naidu et al. (2024). This may be due to the use of different measurement tools of authenticity. The current study used the whole of the Authenticity Scale but Kelley et al. and Naidu et al. only used one subscale of the Authenticity Scale (Authentic Living) along with the Southampton Authenticity Scale (Kelley et al., 2022). Alternatively, of course, this contrasting finding could be due to the differing nature of participants.

The current study has limitations. Firstly, as this study was conducted online, it was not possible to verify autism diagnoses. It is possible that not all people included in the autistic diagnosed or self-identified groups were autistic. It is equally possible that some of the people who self-reported as non-autistic were actually autistic. However, the fact that both autistic groups scored significantly higher in autistic traits (as shown by RAADS-14 scores) compared to the non-autistic group mitigates this limitation. Secondly, autistic individuals represent a very heterogenous group (Nordahl et al., 2022). The vast majority of individuals who participated in this study were likely managing independently (active online, studying, working etc.) and so findings of the current study cannot be applied to the broad spectrum of autistic experiences.

In relation to the nostalgia manipulation (Event Reflection Task), we only assessed state nostalgia's related affect with a brief measurement, in terms of how happy people felt when reflecting on a nostalgic/ordinary memory. As nostalgia typically evokes bittersweet feelings, future studies exploring how autistic people experience nostalgia should focus on assessing feelings of state nostalgia using broader affect measures. The nostalgia manipulation (ERT) was less successful with the autistic diagnosed group compared to the non-autistic and autistic self-identified groups, i.e. autistic diagnosed participants in the nostalgia condition did not report feeling more nostalgic compared to their counterparts in the ordinary memory condition. One potential explanation is higher (unassessed) alexithymia in this group, meaning that participants may have had difficulty in identifying their nostalgic feelings, as this emotion evokes complex, mixed feelings. Alternatively, the autistic diagnosed participants in the ordinary memory condition may have felt primed to provide a nostalgic as opposed to an ordinary memory (and so rated their ordinary memory as more nostalgic). In

addition, despite having prompts, some participants provided feedback that they were unsure what an "ordinary memory" was. Another potential confound is depression. Although we asked if our participants had any psychological diagnoses, we did not assess depression per se. Many participants (especially in the autistic groups) reported a variety of diagnoses, including depression. Depressed people tend to recall autobiographical memories in a more negative light (Grace et al., 2016).

In sum, autistic (diagnosed) participants were less prone to nostalgia in the sense that they missed typical aspects from their past much less compared to the non-autistic group. However, the autistic experience of nostalgia in terms of triggers and state nostalgia's related affect did not differ from the non-autistic experience. In terms of the interrelationships at trait level between the key variables, nostalgia was not associated with increased authenticity or wellbeing. In contrast, authenticity was associated with increased wellbeing both within the whole cohort and in the non-autistic group. Lastly, nostalgia did not promote wellbeing through increased authenticity.

Findings highlight the reduced wellbeing of autistic individuals, be they diagnosed or self-identified and also reduced authenticity in autistic individuals, particularly in the self-identified group. Findings also suggest that reflecting on nostalgic memories may boost positive affect in autistic as well as non-autistic individuals. Future research could explore if reflecting on nostalgic memories might be a promising approach to boosting wellbeing in autistic people. Research could explore, for example, whether *state* nostalgia makes autistic individuals feel happier or leads to enhanced social connectedness or authenticity. Importantly, findings from this study provide a starting point from which to explore the potential use of nostalgic recollection as part of PPIs or interventions to support the wellbeing of autistic people.

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Data, materials and/or Code availability The data for this study and an accompanying codebook are available on the Open Science Framework through this link:https://osf.io/d47ft/.

Declarations

Ethics approval This study was performed in line with the principles of the Declaration of Helsinki. This study was approved by Oxford Brookes University's Research Ethics Committee on 28/02/22, no 221571.

Consent to participate Informed consent was obtained from all participants included in the study.

Competing interests The authors have no relevant financial or non-financial interests to disclose.

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