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RESEARCH ARTICLE

Measuring and validating autistic burnout

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Abstract

Researchers have begun to explore the characteristics and risk factors for autistic burnout, but assessment tools are lacking. Our study comprehensively examined and compared the psychometric properties of the unpublished 27-item AASPIRE Autistic Burnout Measure (ABM), and personal and work scales of the Copenhagen Burnout Inventory (CBI) to evaluate their efficacy as screening measures for autistic burnout, with a group of 238 autistic adults. Exploratory factor analyses (EFA) revealed a 4-factor structure for the ABM and a 2-factor structure for the CBI personal scale (CBI-P). Factorial validity and dimensionality were examined with four exploratory models which indicated a unidimensional structure for the ABM with an overarching 'Autistic Burnout' construct, and multidimensional CBI-P structure comprising two subscales and overarching 'Personal Burnout' construct. Other reliability and validity indicators included Spearman correlations, analysis of variance, receiver operating characteristics, sensitivity, specificity, and intra-class correlations (ICC). The ABM and CBI-P were strongly correlated with depression, anxiety, stress, and fatigue. Unexpectedly, correlations between the burnout measures and camouflaging, and wellbeing measures were moderate. Potential overlap between burnout and depression and fatigue was examined through EFA, which supported convergent validity of the ABM and depression measure, while correlations and ICC analyses revealed mixed results. We concluded that the ABM and the CBI-P *Emotional Exhaustion* subscale were valid preliminary screening tools for autistic burnout. Testing with larger and more diverse autistic samples is required to further examine the psychometric properties of the ABM, and to understand the relationships between autistic burnout and depression, and masking.

Lay Summary

Early research shows that autistic burnout could be very harmful and can have negative consequences for the mental health and wellbeing of autistic people. Outside the autistic community, most people do not know about autistic burnout, so we need to find ways for healthcare providers and researchers to identify and measure the condition. This study tested two burnout questionnaires, the new AASPIRE Autistic Burnout Measure (ABM) and the Copenhagen Burnout Inventory (CBI) to compare how well they were able to detect and measure autistic burnout among a group of 238 autistic adults. We also examined whether the ABM was measuring a unique condition called 'Autistic Burnout' or if the symptoms were better described by measures of depression and fatigue. Our research found that both the ABM and '*Emotional Exhaustion*' subscale of the CBI-P accurately

detected self-reported autistic burnout among the study participants, but more testing is needed with more diverse groups of autistic people, and those with higher support needs. We also need to explore the relationship between autistic burnout and depression further.

KEYWORDS
autism, autistic burnout, autistic burnout measure, Copenhagen Burnout Inventory, factor analysis, validation

INTRODUCTION

'Autistic burnout' was discussed informally by autistic people long before the first research was published by Raymaker et al. (2020). A subsequent study which collected social media data posted between 2005 and 2019 found 'autistic burnout' mentioned as early as 2008 (Mantzalas et al., 2021). Despite this, research is in its infancy, with studies indicating that autistic burnout is characterized by debilitating mental, physical, and emotional exhaustion (Arnold et al., 2023b; Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020), which occurs because autistic people experience more difficulties in everyday life than non-autistic people (Gillott & Standen, 2007; Moseley et al., 2021). For example, social communication between autistic and non-autistic people can contribute to frustration, and loss of agency, resulting in unmet needs and a lack of accommodations (Donaldson et al., 2022; Sarrett, 2018). This disparity, known as the 'double empathy problem' (Milton, 2012) and, more recently, 'perspective disconnect' (Arnold et al., 2023b), refers to mismatched understandings among autistic and non-autistic people about each other's points of view that leads to miscommunications and a seeming lack of empathy and compassion from both parties. These conflicting perspectives can affect social connection, making it difficult for autistic people to form friendships which, in turn, can contribute to diminished social support and increased loneliness (Ee et al., 2019; Mazurek, 2014; Moseley et al., 2021).

Other factors that can contribute to autistic burnout include overwhelming sensory stimuli (e.g., bright lights, crowds, or noise) that can interfere with engagement in education (Jones et al., 2020; Sarrett, 2018) and employment (Hayward et al., 2019), travel (Dempsey et al., 2021), access to public spaces (MacLennan et al., 2022) and vital physical and mental healthcare (Malik-Soni et al., 2022). Unexpected changes to routines, stressful life events or transitions, and a lack of control over one's environment can tax autistic people's coping abilities contributing to poor mental health (Muniandy et al., 2022). It has been shown that autistic people experience higher levels of perceived stress than non-autistic people, which can negatively impact their quality of life and independence (McQuaid et al., 2022). Furthermore, co-occurring conditions such as alexithymia and poor interoception, which are disproportionately high among autistic people, can interfere with emotional regulation and detecting bodily signs of stress (Hassen et al., 2022; Kinnaird et al., 2019; Shah et al., 2016). Combinations of these factors may also contribute to an individual's risk for autistic burnout.

In society, autistic people represent a minority group (Botha & Frost, 2020) who face stigma, discrimination, and negative stereotypes. These factors can contribute to autistic people's perceived stress (McQuaid et al., 2022) and lead to the use of 'masking' or 'camouflaging' behaviors (Han et al., 2021; Pearson & Rose, 2021). A recent systematic review found that psychosocial factors such as autism stigma and a need for social belongingness underlie the use of camouflaging strategies (Zhuang et al., 2023). Masking can be described as the use of conscious and unconscious strategies to suppress one's autistic traits or use of performative behaviors to pass as non-autistic such as pre-preparing scripts for social interactions, restraining self-stimulatory behaviors, and maintaining eye contact (Cook et al., 2021; Pearson & Rose, 2021). While conceptual differences between masking and camouflaging have been identified (Radulski, 2022), we use the broad term 'masking' here as it reflects the language used by autistic people in the autistic burnout literature (Arnold et al., 2023b; Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020). Autistic people mask to avoid ostracism and bullying and gain access to opportunities and inclusion they might otherwise be denied (Bernadin et al., 2021; Pearson & Rose, 2021). However, the continuous and vigilant monitoring of the self and others during masking is effortful and exhausting (Cook et al., 2021; Miller et al., 2021). Cross-sectional studies have associated masking with many adverse outcomes, including late, missed and misdiagnosis of autism, mental health difficulties, including suicidal ideation and behavior, unidentified support needs, and identity confusion (Cook et al., 2021; Miller et al., 2021), although the causal directions of these relationships have yet to be conclusively demonstrated.

Preliminary studies suggest that masking and other stressors can lead to autistic burnout (Arnold et al., 2023b; Higgins et al., 2021;Mantzalas et al., 2021; Raymaker et al., 2020). The consequences of autistic burnout can include the inability to function, brain fog and dissociation, reduced executive functioning and emotion regulation, the loss of previously mastered skills

(e.g., driving, cooking), an inability to speak or communicate, increased sensory intolerance, and social and interpersonal withdrawal (Higgins et al., 2021; Mantzalas et al., 2021; Mantzalas et al., 2022; Raymaker et al., 2020). Periods of autistic burnout can last months or years and impact the mental health and wellbeing of autistic people who are already at greater risk for negative life experiences and poor mental health (see also Griffiths et al., 2019; Lai et al., 2019). Prolonged or repeated episodes of burnout may contribute to unemployment and reduced educational achievement, which can affect the long-term independence and quality of life of autistic people (Mantzalas et al., 2021; Raymaker et al., 2020). Despite early research (Arnold et al., 2023b; Higgins et al., 2021; Mantzalas et al., 2021; Mantzalas et al., 2022;Phung et al., 2021; Raymaker et al., 2020) and many informal testimonies, awareness about autistic burnout is lacking, especially outside the autistic community. From an early age, autistic people report that their burnout symptoms are dismissed, misunderstood, misdiagnosed, and incorrectly treated (Phung et al., 2021; Raymaker et al., 2020) such that autistic people have identified autistic burnout as a research priority (Raymaker et al., 2020).

Burnout research has primarily focused on non-autistic individuals in people-centred professions such as social work, teaching, or medicine, and over 90% of studies have used the Maslach Burnout Inventory (MBI; Schaufeli et al., 2009). The MBI measures three facets of burnout: emotional exhaustion, depersonalisation (cynicism), and reduced personal accomplishment (Maslach & Jackson, 1981; Schaufeli et al., 2009). Conjecture exists whether the MBI fully represents the burnout experience because 'emotional exhaustion' is the only facet that remains stable across studies. In contrast, depersonalisation is the least stable and is possibly multidimensional (Schaufeli et al., 1998). The methodological underpinnings of the MBI have been criticized because it was developed inductively rather than on theoretical or clinical foundations and (initially) assumed that burnout only happened to workers in people-facing jobs (Bianchi et al., 2015). Other researchers have also questioned the cultural validity of some items (Kristensen et al., 2005). Therefore, while the MBI is undoubtedly the dominant burnout questionnaire, critics posit that "burnout is what the MBI measures and the MBI measures what burnout is" (p.193, Kristensen et al., 2005). Collectively, these issues raise some legitimate concerns about the validity of the MBI, particularly as a measure of non-organizational burnout. This has led to the development of alternative measures to assess other forms of burnout, such as parental burnout (Roskam et al., 2018) and athlete burnout (Raedeke & Smith, 2001).

A validated measure that captures non-organizational and job-related burnout is the Copenhagen Burnout Inventory (CBI; Kristensen et al., 2005); it uses three scales to assess 'generic' personal burnout, work-related burnout, and client-related burnout. A recent study adapted the CBI to investigate whether personal and academic burnout predicted 'dropping out' among autistic and non-autistic university students during the Covid-19 pandemic (Cage & McManemy, 2022). The study was the first to use the CBI with an autistic population and the findings showed that, while the autistic students reported higher personal and academic burnout rates than the non-autistic students, burnout predicted dropping out only among the non-autistic students. The results lend support to a unique form of 'autistic burnout'.

Despite the prolific amount of burnout research spanning 50 years, burnout syndrome is not included in the current Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013), although it is mentioned in the latest International Classification of Diseases (ICD-11; World Health Organization, 2022) it is accompanied by strict parameters. The lack of formal recognition in the DSM may be partly due to the ongoing debate about whether burnout and depression are distinct constructs. Factors such as similar etiology and core symptom overlap, including anhedonia, fatigue, and withdrawal, contribute to this uncertainty (Bianchi et al., 2014; Bianchi et al., 2015; Tavella & Parker, 2020). A meta-analysis examining 14 samples from occupational burnout studies in various countries concluded that burnout is not a separate condition but instead belongs on the spectrum of depressive symptoms because its core facet (exhaustion) correlated more highly with depression than with other burnout facets (Bianchi et al., 2021; Bianchi & Sowden, 2022). However, the MBI was used to measure burnout in all the included studies, which, due to the methodological concerns described previously, may weaken the validity of these findings.

Occupational burnout research has shown that burnout can be a precursor to depression, with increased risk if burnout is severe (Ahola et al., 2005). Though a bi-directional relationship has been suggested, "the path from burnout to depression appears to be stronger than the path from depression to burnout" (p.109, Ahola & Hakanen, 2007). Autistic adults have differentiated between depression and autistic burnout in all qualitative studies so far, indicating that the two can co-occur and that autistic burnout can contribute to and exacerbate depression (Arnold et al., 2023b;Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020). Furthermore, qualitative research suggests that when autistic burnout and depression occur concurrently, the consequences can be particularly devastating and may include suicidal ideation (Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020). It is thus important to investigate whether a reciprocal relationship similar to that reported by Ahola and Hakanen (2007) exists between autistic burnout and depression.

Clarifying the distinction between autistic burnout and depression is vital otherwise misdiagnosis and

ineffective treatments could occur. Medication to treat suspected depression may have adverse side effects, and some therapies may be inappropriate for individuals experiencing acute autistic burnout whose cognitive resources are depleted. In a recent study by Arnold et al. (2023b), one participant shared, "I was misdiagnosed with bipolar…also burnout is still blamed on depression, but I know the difference" (p.9). Failure to show symptom improvement may lead to a further misdiagnosis of 'treatment-resistant depression' (Souery et al., 2006). Early research suggests that appropriate recovery strategies for autistic burnout include complete rest, reduced cognitive demands, social withdrawal, empowerment and control, improved self-awareness, and energy management (Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020), although empirical data to support these are lacking.

The Academic Autism Spectrum Partnership in Research and Education (AASPIRE) began the task of measuring autistic burnout by developing the AASPIRE Autistic Burnout Measure (ABM) using a community-based participatory research approach in consultation with autistic people. The ABM assesses facets of autistic burnout identified in the literature including decreased cognitive abilities, decreased emotional regulation, increased sensitivity, decreased everyday abilities, increased avoidance or withdrawal, and increased exhaustion. The AASPIRE team validated the ABM with a sample of 80 autistic adults, although the results remain unpublished (D. Raymaker, personal communication, February 5, 2021). Arnold et al. (2023a) were the first to report and compare some psychometric properties of the ABM with their new measure, the Autistic Burnout Severity Items (ABSI), using a sample of autistic adults with experience of autistic burnout ($N = 141$). Their findings showed a strong correlation between depression measured by the Patient Health Questionnaire-9 (PHQ-9) and the ABM ($r = 0.67$); and a moderate correlation between the PHQ-9 and the ABSI ($r = 0.48$), highlighting the need to better understand similarities and differences among autistic burnout and depression. Of note, masking was not a significant predictor of autistic burnout as measured by the ABM, despite consistent reports that it is a strong risk factor (Higgins et al., 2021; Mantzalas et al., 2021; Mantzalas et al., 2022; Raymaker et al., 2020). The ABM also showed poor specificity with an AUC of 0.661 for differentiating between participants who reported they had ($n = 103$) and had not ($n = 33$) experienced autistic burnout during the previous 3 months (Arnold et al., 2023).

Despite the early indications that autistic burnout may be common among autistic people, prevalence rates have not been reported. Validated psychometric measures can assist researchers in gauging the prevalence of autistic burnout and examine its relationship with depression and other variables (e.g., alexithymia, autistic traits). Validated measures can also assist researchers and clinicians in screening for autistic burnout and monitoring its impact over time. Thus, the current study tests the validity and factor structure of both the ABM and CBI (personal and work scales) with autistic adults. The study aims were to:

1. Comprehensively examine the psychometric properties of the ABM and CBI (personal and work scales) with an autistic sample.
2. Evaluate and compare the efficacy of the ABM and CBI as screening tools for autistic burnout.
3. Examine the relationship between measures of burnout and validated measures of mental strain (depression, anxiety, and stress), fatigue, and wellbeing (satisfaction with life, social integration, and social contribution).

METHOD

Participants

Of the initial 451 survey responses, 213 were excluded for not completing the participant consent form, being 'non-responders' on all survey questionnaires, not answering the attention check items, or were suspected duplicates that contained identical answers for the demographic and open-ended questions. The survey was lengthy and was estimated to take approximately 45 min to complete fully. Examination of the time and date stamps identified some surveys that were completed quickly; therefore, studies completed in 10 min or less were also excluded. The study participants were 238 autistic adults (71% female) aged between 18 and 75 years ($M = 37.89$, $SD = 11.38$). More than half of the participants were engaged in a form of employment (55%) and had earned a Bachelor's degree or higher (64%). Most participants (69%) reported having experienced autistic burnout at least once, and nearly half had experienced autistic burnout four or more times (46%). Most participants indicated they had one or more co-occurring physical and/or mental health conditions (76%). The socio-demographic characteristics of participants are presented in Table 1.

Procedure

The study was approved by the Human Research Ethics Committee at La Trobe University (reference HEC21009), and recruitment was conducted via social media. This study is part of a PhD research project that proposes and tests a conceptual model of risk and protective factors for autistic burnout (Mantzalas et al., 2021). The project was reviewed and endorsed by an Advisory Group of four autistic adults (3 female:1 male) with a late autism diagnosis and lived experience of autistic burnout. The online survey was hosted by REDCap (Version 12.5.5) hosted at La Trobe University. To minimize self-

TABLE 1 Socio-demographic information for study participants.

	N	%
Age group		
18–23	29	12.2
24–40	109	45.8
41–58	90	37.8
59+	10	4.2
Gender		
Male	41	17.2
Female	170	71.4
Non-binary	23	9.7
Prefer to self-describe	4	1.7
Country of residence ($n = 159$)		
Australia	86	36.1
United Kingdom	28	11.8
United States of America	24	10.1
New Zealand	11	4.6
Other	10	4.2
Education		
Year 10 or below	10	4.2
Year 11	7	2.9
Vocational/Trade	5	2.1
Year 12	21	8.8
Diploma/Advanced diploma	41	17.2
Bachelor degree (incl Honors)	89	37.4
Master's degree	44	18.5
Doctoral degree	21	8.8
Employment		
Full-time	68	28.6
Part-time	25	10.5
Casual	15	6.3
Unemployed	40	16.8
Self-employed	23	9.7
Student	27	11.3
Carer	19	8.0
Home duties	21	8.8
Age at autism diagnosis/self-identification as autistic		
≤6	7	2.9
7–16	13	5.5
17–25	37	15.5
26–35	62	26.1
36–45	63	26.5
46–55	38	16.0
56+	7	2.9
Have you experienced autistic burnout?		
Yes	165	69.3
No	3	1.3
Not sure	70	29.4

(Continues)

TABLE 1 (Continued)

	N	%
How many times have you experienced autistic burnout? ($n = 165$)		
Once	15	6.3
Twice	22	9.2
Three times	18	7.5
Four or more times	110	46.2
Are you currently experiencing autistic burnout? ($n = 163$)		
Yes	76	31.9
No	59	24.8
Not sure	28	11.8
Do you have a co-occurring condition?		
Yes	181	76.1
No	46	19.3
Prefer not to say	11	4.6
Ten most common co-occurring conditions ($n = 158$)[a]		
Anxiety	109	69.1
Depression	77	48.7
Attention deficit hyperactivity disorder	54	34.2
Post-traumatic stress disorder	34	21.5
Fibromyalgia	18	11.4
Ehlers-Danlos syndrome	18	11.4
Obsessive-compulsive disorder	14	8.9
Thyroid-related	10	6.3
Borderline personality disorder	10	6.3
Asthma	10	6.3
Other[b]	100	63.3

[a]Participants could report more than one co-occurring condition.
[b]Other conditions included postural orthostatic tachycardia syndrome (POTS), chronic pain, arthritis, chronic fatigue syndrome (CFS), irritable bowel syndrome (IBS), migraine, sleep difficulties (e.g., sleep apnoea, insomnia), and learning disorders (e.g., dyslexia, dyscalculia).

selection bias, the study was advertised as an investigation of factors that may affect the mental health and well-being of autistic adults, but a brief description of autistic burnout based on preliminary definitions (Higgins et al., 2021; Raymaker et al., 2020) was provided: "Autistic burnout describes long-term exhaustion, increased sensory sensitivities and loss of skills that builds up over time". Eligible participants were 18 years of age or over, had English language competency, and had a formal Autism diagnosis or self-identified as autistic. Proof of a DSM-based diagnosis of Autism Spectrum Disorder (APA, 2013) was not requested. The 28-item Autism Spectrum Quotient (AQ-Short; Hoekstra et al., 2011) was used as a screening tool, with all participants' scores exceeding the suggested AQ-Short cut-off of >65, indicating elevated autistic traits. Upon completing the survey, participants could opt into a prize draw to win one of five gift vouchers valued at $50 AUD or $35 USD.

Measures

Demographics

Participants completed various socio-demographic questions about their age and gender, level of education achieved, employment status, country of residence, diagnostic status, and age at diagnosis or self-identification. Participants were asked whether, and how many times, they had experienced autistic burnout, and if they were currently experiencing autistic burnout. Participants were asked if they had any co-occurring acute or chronic physical and mental health conditions, and if so, to list which type(s). The participants were not asked to specify whether their co-occurring conditions were formally diagnosed but some individuals voluntarily included this information in the written responses.

Autistic burnout

The 27-item AASPIRE Autistic Burnout Measure (ABM) is a new measure of autistic burnout that asks participants to rate a range of symptoms experienced over the past three months compared to what they consider typical for them using a 5-point Likert scale from 0 (strongly disagree) to 4 (strongly agree). The ABM assesses various facets of autistic burnout: decreased cognitive abilities (e.g., "I've had a harder time solving challenging problems than I usually do"); decreased emotional regulation (e.g., "I've been feeling more irritable than I usually do"); increased sensitivity (e.g., "I've had more, or more severe, meltdowns than I usually do"); decreased abilities (e.g., "I've had a harder time managing work or school than I usually do"); increased avoidance/withdrawal (e.g., I've been avoiding activities that require effort, even if I like them, more often than I usually do); and increased exhaustion (e.g., "I've felt more physically exhausted than I usually do"). Participants can provide reasons for their responses at the end of the questionnaire. A total score between 0 and 108 is calculated by summing all items, with higher scores indicating a greater risk of experiencing autistic burnout. The ABM was used with permission from the lead author (D. Raymaker, personal communication, February 5, 2021). McDonald's omega coefficient (ω) for the ABM in the current study was 0.95.

Burnout

The Copenhagen Burnout Inventory (CBI; Kristensen et al., 2005) measures burnout across three domains: personal burnout (6 items, e.g., "How often do you feel worn out?"), work-related burnout (7 items, e.g., "Is your work emotionally exhausting?"), and client-related burnout (6 items, e.g., "Do you find it hard to work with clients?"). Only the personal and work-related subscales were used in this study, and participants were advised that 'work' could refer to paid or unpaid employment, study, or caring responsibilities. All items use a 5-point Likert scale from 1 (Always) to 5 (Never/almost never) for the personal subscale and from 1 (To a very high degree) to 5 (To a very low degree) for the work-related subscale. Scores are converted as follows: Always/To a very high degree = 100; Often/To a high degree = 75; Sometimes/Somewhat = 50; Seldom/To a low degree = 25; and Never/almost never /To a very low degree = 0. The total for each subscale is calculated as the average of the items answered, where higher scores indicate higher levels of personal or work-related burnout. The CBI personal (CBI-P) and work (CBI-W) subscales have previously been used with an autistic sample (Cronbach's 0.86 and 0.89, respectively; Cage & McManemy, 2022). In the current study, ω for the CBI-P was 0.80 and 0.87 for the CBI-W 0.87.

Depression

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) is a 9-item measure of self-reported depressive symptoms during the previous two weeks (e.g., "Feeling down, depressed, or hopeless") and has been validated for use with autistic adults (Arnold et al., 2020). The nine items are scored on a 4-point Likert scale from 0 (not at all) to 3 (nearly every day) and summed to achieve a total score between 0 and 27, where scores between 0 and 4 indicate minimal depression; between 5 and 9 mild depression; between 10 and 14 moderate depression; between 15 and 19 moderately severe depression, and between 20 and 27 indicate severe depression. The ω for the PHQ-9 in the current study was 0.89.

Anxiety

The General Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006) is a 7-item measure of self-reported anxiety symptoms during the previous two weeks (e.g., "Feeling afraid as if something awful might happen"). All items are scored on a 4-point Likert scale from 0 (not at all) to 3 (nearly every day). The 7-item responses are summed to achieve a total anxiety severity score between 0 and 21, where scores between 0 and 4 indicate minimal severity; between 5 and 9 mild; between 10 and 14 moderate; and between 15 and 21 severe. The GAD-7 has previously been used with autistic adults ($\alpha = 0.88$; Griffiths et al., 2019). The ω for the GAD-7 in the present study was 0.90.

Stress

The Depression Anxiety Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995) is an abbreviated version of the DASS-42 that measures self-reported distress associated with depression, anxiety, and stress symptoms over the previous week. The DASS-21 has been validated for use with autistic adults ($\alpha = 0.88$; Park et al., 2020). Each of the three subscales contains seven items, but only the Stress subscale was used in this study. Subscale items are added together and multiplied by two to achieve a total score where values between 0 and 14 indicate normal levels of stress; between 15 and 18 mild stress; between 19 and 25 moderate stress; between 26 and 33 severe stress; and scores >34 indicate extremely severe levels of stress. The ω for the stress subscale was 0.88 in the current study.

Camouflaging/masking

The Camouflaging Autism Traits Questionnaire (CAT-Q; Hull et al., 2018), is a 25-item self-report questionnaire that measures social camouflaging behaviors used by autistic and non-autistic people. The CAT-Q assesses three

factors of camouflaging behavior: Compensation (9 items; "When I am interacting with someone, I deliberately copy their body language or facial expressions"); Masking (8 items; "I monitor my body language or facial expressions so that I appear relaxed"); and Assimilation (8 items; "In social situations, I feel like I'm 'performing' rather than being myself"). All items are rated on a Likert scale where 1 = Strongly disagree, 2 = Disagree, 3 = Somewhat disagree, 4 = Neither agree nor disagree, 5 = Somewhat agree, 6 = Agree, and 7 = Strongly agree. Five items are reverse scored. The total scores for the Masking and Assimilation factors can range between 8 and 56, and between 9 and 63 for the Compensation factor, where higher scores indicate greater use of camouflaging strategies. High internal consistency has previously been demonstrated both for the total scale (Cronbach's alpha 0.94) and individual factors, with Cronbach's alphas of 0.91 for Compensation, 0.85 for Masking, and 0.92 for Assimilation (Hull et al., 2018). The ω for the CAT-Q (total) was 0.91 in the current study.

Fatigue

The Flinders Fatigue Scale (FFS; Gradisar et al., 2007) is a 7-item scale that measures characteristics of daytime fatigue experienced over the previous two weeks (e.g., frequency, severity, consequences). Six items use a Likert scale ranging from 0 (not at all) to 4 (extremely), and one item measures the time-of-day respondents experienced fatigue (e.g., early morning, midday, late afternoon). Items are summed to achieve a total score ranging from 0 to 31, where scores between 13 and 15 indicate borderline fatigue; 16–20 moderate fatigue; and scores ≥21 indicate high levels of fatigue (Cameron et al., 2017). The FFS has been previously used with autistic adults ($\alpha = 0.84$; Baker & Richdale, 2015). The ω for the FFS was 0.86 in this study.

Life satisfaction

The Satisfaction with Life Scale (SWLS; Diener et al., 1985) is a 5-item measure of overall life satisfaction. Items are rated on a Likert scale from 1 (Strongly disagree) to 7 (Strongly agree). Responses are summed to achieve a total score between 5 and 35, where higher scores indicate greater satisfaction with life. The SWLS has been used previously with autistic adults ($\alpha = 0.89$; Casagrande et al., 2020). The ω for the SWLS in this study was 0.89.

Wellbeing

The Social Well-Being Scale (Keyes, 1998) measures individuals' assessment of their circumstances and functioning in society across five domains: social integration (SI); social acceptance; social contribution (SC); social actualization; and social coherence. Each subscale uses a 7-point Likert scale from 1 (Strongly disagree) to 7 (Strongly agree). Only the SI and SC subscales were used in this study. The SI subscale consists of 7 items (e.g., "You feel like you're an important part of your community"), where items 1 and 6 are reverse scored. The SC subscale consists of 6 items (e.g., You think you have something valuable to give to the world") where items 3, 4, and 6 are reverse scored. Subscale scores are calculated by adding the individual item scores and dividing them by the number of items in the subscale. In the current study, ω for the SI and SC subscales was 0.91 and 0.80, respectively.

Statistical analyses

Most data analyses were conducted with Statistical Package for the Social Sciences (SPSS, Version 28). Semi-exploratory factor models were constructed using AMOS (Version 29) and reliability values calculated using the R psych::omega package (Version 2023.06.1). After cleaning the data, 202 missing values were detected (0.33% of the total dataset and a maximum of 1.12% per individual questionnaire). Given the proportion of missing data was less than 5% and the values were missing at random, the Expectation Maximization method was used to substitute missing data points in SPSS (Tabachnick & Fidell, 2013). Descriptive statistics for all questionnaires are provided in Table 2. Skewness and kurtosis values fell within the acceptable range of +3 and −3 (Tabachnick & Fidell, 2013).

Analyses were conducted in two parts: part one addressed the first and second aims of this study (evaluating the psychometric properties of the burnout measures, and their efficacy as screening tools for autistic burnout), and part two addressed the third aim (examining the relationship between autistic burnout and other variables).

Correlations were used to explore relationships among variables, and assess convergent, divergent, and discriminant validity of the burnout measures. Correlations ≥0.30 were evaluated. Spearman correlations (r_s) were interpreted because all measures used Likert scales. Group differences according to self-reported autistic burnout status (Yes; No; Unsure) were examined using Welch's F statistic as the group sizes were unequal, with effect sizes represented by Omega squared (ω^2) where 0.01, 0.06, and 0.14 represented small, medium, and large effect sizes, respectively (Kirk, 1996). Games-Howell post-hoc analyses were used where appropriate, where Cohen's d values of 0.20, 0.50, and 0.80 represented small, medium and large effect sizes, respectively (Kirk, 1996).

Exploratory factor analysis (EFA) used principal components (PC) factoring with orthogonal (Varimax)

TABLE 2 Descriptive statistics for study variables.

Measure (construct)	*M*	*SD*	Min	Max	Skewness	Kurtosis
ABM (autistic burnout)	75.87	20.138	9	108	−0.692	0.322
CBI-P (personal burnout)	70.95	15.992	25	100	−0.363	−0.114
CBI-W (work burnout)	62.13	22.015	0	100	−0.340	−0.545
CAT-Q (camouflaging)	129.76	21.520	51	172	−0.879	1.260
PHQ-9 (depression)	14.42	6.966	0	27	0.062	−1.001
GAD-7 (anxiety)	11.58	5.929	0	21	−0.043	−1.127
DASS-S (stress)	23.53	10.68	0	42	−0.149	−0.748
FFS (fatigue)	18.42	6.388	0	31	−0.330	−0.328
SWLS (life satisfaction)	17.37	7.542	5	34	−0.029	−1.005
SI (social integration)	3.31	1.433	1	7	0.237	−0.790
SC (social contribution)	4.62	1.232	1	7	−0.359	−0.117

Note: $N = 238$.
Abbreviations: ABM, AASPIRE Autistic Burnout Measure; CAT-Q, Camouflaging Autistic Traits Questionnaire; CBI-P, Copenhagen Burnout Inventory—Personal subscale; CBI-W, Copenhagen Burnout Inventory—Work subscale; DASS-S, Depression Anxiety Stress Scale-21 (stress subscale); FFS, Flinders Fatigue Scale; GAD-7, Generalized Anxiety Disorder scale-7; PHQ-9, Patient Health Questionnaire-9; SC, Social Contribution subscale; SI, Social Integration subscale; SWLS, Satisfaction With Life Scale.

rotation. Factor retention was informed by parallel analysis using 1000 random correlation matrices and comparing mean eigenvalues (Vivek et al., 2017), and Velicer's minimum average partial (MAP) tests (O'Connor, 2000). Retention decisions were additionally informed by the percentage of variance explained, communalities values, and whether the factor(s) made theoretical sense. Retained items had a minimum loading of 0.30. To examine divergent validity, EFA (PC; Promax rotation) was also conducted using the ABM, CBI-P, CBI-W, PHQ-9, and FFS items. Corrected item-total correlations were used to assess factor reliability, where minimum correlations of 0.30 were acceptable and higher values indicated greater factor reliability (Zijlmans et al., 2018).

Semi-exploratory models were used to examine the factorial validity of the ABM and CBI-P (the CBI-W was excluded after initial analyses). The models included factors identified from EFA, but the questionnaire items were unconstrained and free to load or cross-load onto any factor(s). Four exploratory models were fitted for each burnout measure: (1) a single general factor model; (2) a correlated factors model; (3) a single hierarchical model; and (4) a single bifactor model. Model fit was evaluated using chi-square (χ^2), the root mean square error of approximation (RMSEA) ≥0.06 = good fit; ≥0.08 = fair fit; comparative fit index (CFI) >0.95 = good fit; Tucker Lewis index (TLI) >0.90 = fair fit; and standardized root mean residual (SRMR) ≥0.06 = good fit; ≥0.08 = fair fit (Reise et al., 2013). To identify the most parsimonious model, Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC) and Consistent Akaike Information Criterion (CAIC) values were also compared, where the smallest value represents the best fitting model (Tabachnick & Fidell, 2013). We attempted to fit exploratory models with all items from the burnout, depression, anxiety, stress, and fatigue measures, however there were too many parameters to produce identified models.

Dimensionality and reliability of the ABM and CBI-P were examined to determine the amount of item variance that could be attributed to an overarching 'general' factor, and to 'specific' factors (Reise, 2012; Rodriguez et al., 2016a). As the factor structure of the ABM has not been reported, and one other study has used the CBI with an autistic population (Cage & McManemy, 2022), reliability estimates were calculated with the R psych::omega package which is appropriate for exploratory factor models (Flora, 2020). This method produces omega hierarchical (ω_h) values based on a higher-order exploratory factor structure where "every item has a non-zero factor loading on each lower-order factor" (Flora, 2020, Data S1, p. 7). As the higher-order factor indirectly affects scale items through the lower-order factors, exploratory ω_h is conceptually similar to omega-higher order (ω_{ho}) in a CFA model (Flora, 2020). Omega hierarchical (ω_h) and the omega general, group, and total values were interpreted to obtain the reliability estimates for the latent total and subscale scores. In general, higher ω_h scores (>0.80) suggest scale unidimensionality and low subscale reliability values indicate that most variance is attributable to the general factor (Rodriguez et al., 2016b). The Schmid-Leiman factor transformation was applied to further examine the relationships between the higher and lower-order factors and scale items (Wolff & Preising, 2005).

Interrater reliability of the burnout measures was assessed with intraclass correlations (ICC) analyses using the maximum likelihood estimation method. The design was a two-way, consistency, single rating, random effects

model (ten Hove et al., 2022). Reliability values below 0.5 were considered poor; between 0.51 and 0.75 moderate; between 0.76 and 0.9 good; and above 0.9, excellent (Koo & Li, 2016).

Receiver operator characteristic (ROC) analyses assessed the effectiveness of the ABM, CBI-P and CBI-W as screening tools for autistic burnout by comparing how well they were able to detect autistic burnout among participants who indicated they were ($n = 76$) or were not currently experiencing autistic burnout. For this analysis, the 'No' and 'Unsure' groups were merged into a single category 'No/Unsure' ($n = 87$). Area under the curve (AUC) was computed, which represents the chance that a randomly selected individual who *is* experiencing autistic burnout will score higher on a burnout measure than a randomly selected individual who is *not* experiencing autistic burnout. Higher values represent greater discriminant validity. Youden's index determined optimal cut-off scores for each measure, and crosstabulations were used to calculate sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios, prevalence and overall test accuracy. Given the high co-occurrence of depression, anxiety, and stress in the sample, and debate regarding a burnout-depression overlap, ROC analyses and crosstabulations were also conducted with the PHQ-9, GAD-7, DASS-S and FFS to examine their effectiveness for detecting autistic burnout in the current sample.

The magnitude of the correlations between the ABM and CBI-P with depression, anxiety, stress, and fatigue were examined to evaluate divergent validity between the burnout measures and PHQ-9, DASS-S, GAD-7, and FFS. We used syntax based on Meng et al., (1992; IBM SPSS Support) and values were entered in the following order: r23; r12; r13 *n*. Convergent and divergent validity were calculated using r12–r13.

RESULTS

Descriptive statistics

The descriptives for the study questionnaires are shown in Table 2. On average, participants exceeded the clinical cut-offs for anxiety (GAD-7), moderate depression (PHQ-9), moderate stress, and moderate to high levels of fatigue (FFS) and were slightly dissatisfied with life. The majority of participants who self-reported they were currently experiencing autistic burnout ($n = 76$) scored at or above the cut-off score for depression on the PHQ-9 (88.16%), compared to 50.85% in the 'No' group ($n = 59$), and 78.57% of participants in the 'Unsure' group ($n = 28$). In response to the question, "Thoughts that you would be better off dead or of hurting yourself in some way", 63.16% of participants in the 'Yes' group indicated they had experienced such thoughts some of the day, most of the day or almost every day over the previous two weeks, compared to 22% of those in the 'No' group and 35.71% in the 'Unsure' group.

Evaluating the psychometric properties of the ABM and CBI

Construct validity

The ABM, CBI-P and CBI-W scores for participants who self-reported that they were ('Yes'; $n = 76$), were not ('No'; $n = 59$) or were unsure ('Unsure'; $n = 28$), if they were currently experiencing autistic burnout differed significantly. Post-hoc analyses showed statistically significant differences in the mean ABM scores of participants in the 'Yes' and 'No' groups; 'Yes' and 'Unsure' groups; and 'No' and 'Unsure' groups. In comparison, the only statistically significant mean differences found for the CBI-P and CBI-W were between the 'Yes' and 'No' groups. The means and standard deviations for each burnout status group, Welch's F results and omega squared (ω^2) effect sizes are shown in Table 3. Results of post-hoc analyses are shown in Table 4.

Factor structure

Identifying the factor structure of the 27-item AASPIRE autistic burnout measure

Both the KMO (0.926) and Bartlett's test of sphericity (χ^2 (351) = 4792.65, $p < 0.001$) endorsed the appropriateness of factor analysis for the ABM. Measures of sampling adequacy (MSA) and communalities values indicated all 27 items could be retained for EFA. Initial inspection of the eigenvalues indicated a 4-factor solution, whereas parallel analysis suggested a 3-factor solution (Table S1). As the mean value of the fourth component was only slightly lower than its corresponding simulated value ($M = 1.407$ compared to $M = 1.497$), and the percentage of variance explained increased from 59.89% to 65.10% upon inclusion of the fourth factor, four factors were ultimately retained. The 4-factor solution also made theoretical sense and was endorsed by Velicer's MAP test, and the Kaiser-Guttman rule of retaining eigenvalues >1.

The first factor, '*Cognitive and Functioning Difficulty*' comprised nine items (items 1, 2, 3, 4, 5, 14, 19, 20, 21). The second factor, '*Emotional and Sensory Dysregulation*', consisted of eight items (items 6, 7, 8, 9, 10, 11, 12, 13). The third factor, '*Avoidance and Exhaustion*' comprised six items (items 22, 23, 24, 25, 26, 27), and the fourth factor, '*Social and Communication Difficulty*' consisted of four items (items 15, 16, 17, 18). Table 5 shows the factor loadings, ω coefficients, and percentage of variance explained for the four ABM factors.

Most corrected inter-item correlations fell within acceptable ranges of 0.30–0.70 (Ferketich, 1991). Some item redundancy was suggested by very strong

TABLE 3 Means, standard deviations, Welch's F statistics and effect sizes for the AASPIRE autistic burnout measure (ABM), Copenhagen Burnout Inventory—Personal and Work Scales by self-reported autistic burnout status.

	Means and standard deviations					Welch's *F* statistic ($N = 163$)[a]			
					95% CI				
Measure	**Status**	***n***	***M***	***SD***	**[Lower, Upper]**	***df***	***F***	***p***	**ω^2**
ABM	Yes	76	88.84	15.22	[85.36, 92.32]	(2, 73.11)	29.53	<0.001	0.276
	No	59	65.08	19.82	[59.92, 70.25]				
	Unsure	28	77.44	15.74	[71.34, 83.55]				
CBI-P	Yes	76	78.67	12.78	[75.75, 81.59]	(2, 72.22)	14.71	<0.001	0.151
	No	59	65.13	15.75	[61.02, 69.23]				
	Unsure	28	71.52	13.71	[66.21, 76.84]				
CBI-W	Yes	76	70.01	22.11	[64.96, 75.06]	(2, 79.73)	7.91	<0.001	0.081
	No	59	55.75	19.29	[50.72, 60.78]				
	Unsure	28	62.88	17.21	[56.21, 69.55]				

Abbreviations: ABM, AASPIRE Autistic Burnout Measure; CBI-P, Copenhagen Burnout Inventory—Personal scale; CBI-W, Copenhagen Burnout Inventory—Work scale.
[a]$n = 75$ non-responders.

correlations between item 17 ("I've had a harder time communicating my point to others") and item 18 ("I've had a harder time finding the right words to communicate what I mean than I usually do"; 0.807), and between item 22 ("I've been avoiding social situations, even if I like them, more often than I usually do") and item 23 ("I've wanted to isolate myself from others more often than I usually do"; 0.784). There were weak correlations between item 6 ("I've had a harder time controlling my impulses than I usually do") and item 11 ("I've had more, or more severe, meltdowns than I usually do") with all the avoidance-related items from the *Avoidance and Exhaustion* factor (items 22, 23, 24 and 25). However, all ABM items were ultimately retained as reliability would not have improved upon their deletion, and the corrected item-total correlations between all items and their respective factors were strong (>0.60; see Table S2). Inter-factor correlations between the four ABM factors were good (>0.50) as shown in Table S3.

Identifying the factor structure of the personal and work scales of the Copenhagen Burnout Inventory

Both KMO (0.857) and Bartlett's test of sphericity ($\chi^2(78) = 1408.69$, $p < 0.001$) confirmed that factor analysis was appropriate for the two CBI scales. Communalities values indicated that all 6 CBI-P items and 7 CBI-W items could be retained for EFA. Inspection of the eigenvalues suggested a 3-factor solution which was endorsed by parallel analysis, and which explained 64.57% of the variance. Items 1–6 of the CBI-W grouped onto the first factor, '*Work-Related Exhaustion*', and the CBI-P items loaded equally onto two factors: factor two, '*Emotional Exhaustion*' (items 3, 5, 4), and factor three, '*Physical Exhaustion*' (items 1, 2, 6). Item 7 of the CBI-W ("Do you have enough energy for family and friends during leisure time?") loaded onto *Emotional Exhaustion*, but the item was discarded as excluding it improved factor reliability from $\omega = 0.775$ to $\omega = 0.795$.

The CBI-W and CBI-P are standalone scales that can be administered and scored separately (Kristensen et al., 2005). In our initial factor analysis comprising both CBI scales, the retained CBI-W items loaded onto the *Work-Related Exhaustion* factor which accounted for 41.06% of the total variance. To examine whether this underestimated the structure of the CBI-P, EFA was repeated using only the 6 CBI-P items. Parallel analysis and Velicer's MAP test suggested a single-factor solution (Table S1), however, two factors were ultimately retained (*Emotional Exhaustion* and *Physical Exhaustion*) as the variance explained increased from 52.45% to 69.60% with the 2-factor solution. Table 6a shows the factor loadings, ω coefficients and percentage of variance explained for the 3-factor CBI solution, and Table 6b presents the values for the 2-factor CBI-P solution. The reliability coefficients for the 3-factor and 2-factor solutions were slightly lower than for the ABM total and factors, however this is common for very short scales (Tavakol & Dennick, 2011).

The corrected item-total correlations for each CBI-P factor were good (>0.60 for *Emotional Exhaustion* and >0.50 for *Physical Exhaustion*). Inter-item correlations were within the acceptable range of 0.30–0.70 (Ferketich, 1991), and factor reliability would not have improved if any items were deleted (see Table S4). The inter-factor correlation between the two CBI-P factors was good (0.528; Table S5).

Inter-rater reliability

Interpretation of the single measures ICC values and their 95% CI (Koo & Li, 2016) are shown in Table 7

TABLE 4 Games-Howell multiple comparison post-hoc tests for the AASPIRE Autistic Burnout Measure, Copenhagen Burnout Inventory-Personal scale and Copenhagen Burnout Inventory-Work scale by self-reported autistic burnout status.

	ABM				CBI-P				CBI-W			
				95% CI				95% CI				95% CI
Group comparison	*MD*	*SE*	*p*	[Lower, Upper]	*MD*	*SE*	*p*	[Lower, Upper]	*MD*	*SE*	*p*	[Lower, Upper]
Yes-No	23.76*	3.12	<0.001	[16.35, 31.16]	13.55*	2.52	<0.001	[7.56, 19.54]	14.26*	3.57	<0.001	[5.80, 22.72]
Yes-Unsure	11.40*	3.45	0.005	[3.05, 19.75]	7.15	2.98	0.053	[−0.06, 14.36]	7.13	4.12	0.203	[−2.78, 17.03]
No-Unsure	−12.36*	3.94	0.007	[−0.19.75, −3.05]	−6.40	3.30	0.138	[−14.34, 1.54]	−7.13	4.11	0.201	[−17.01, 2.75]

Note: ABM, AASPIRE Autistic Burnout Measure; CBI-P, Copenhagen Burnout Inventory—Personal subscale; CBI-W, Copenhagen Burnout Inventory—Work subscale.
*Mean difference significant at $\alpha = 0.05$.

and indicated moderate inter-rater reliability between the ABM and CBI-P total scale (0.517) and CBI-P-E (0.545). Inter-rater reliability between the ABM and CBI-W and CBI-P-P subscale was poor (0.100 and 0.373, respectively). Overall, the results indicated that the CBI-P-P subscale and CBI-W were not reliable measures of autistic burnout, but that the ABM and CBI-P (total score) and CBI-P-E subscale were moderately reliable measures of autistic burnout.

Discriminant validity

A comparison of the AUC curves (Figure 1) showed the CBI-W and CBI-P—Physical Exhaustion subscale (CBI-P-P) performed more poorly than the other measures, so they were excluded from ROC analyses. The ROC analyses for the ABM, CBI-P total score, and the *Emotional Exhaustion* subscale (CBI-P-E) are compared in Table 8. For comparison, the CBI-P total scale was also included as the scale was designed to be measured using a total score (Kristensen et al., 2005). The results showed that the ABM and CBI-P-E outperformed the total CBI-P scale for detecting self-reported autistic burnout among the participants. The sensitivity values showed the ABM correctly identified 66.7% of participants who self-reported they were currently experiencing autistic burnout ($n = 76$) compared to 66.3% by the CBI-P-E. Specificity was good for both measures, with 78.1% (ABM) and 78.9% (CBI-P-E) of participants who self-reported they were not or were unsure if they were currently experiencing autistic burnout ($n = 87$) scoring below the cut-off scores. The ABM correctly predicted that 78.9% of participants who scored above the cut-off score on the ABM were currently experiencing autistic burnout, compared to 80.2% by the CBI-P-E. The ABM correctly predicted that 65.5% of the participants who scored below the cut-off score were not experiencing autistic burnout, compared to 64.4% by the CBI-P-E. Overall, the ABM and CBI-P-E were equally accurate (71.8%) at identifying participants based on their self-reported autistic burnout status in the current study.

Factorial validity

Four exploratory models were generated using AMOS to assess the factorial structure and validity of the ABM and CBI-P identified through EFA (See Figure S1 for a general overview of each model). To improve model fit, modification indices from the 'Covariances' and 'Regression Weights' tables were examined, and expected parameter change values were sorted from largest to smallest. Changes that were logical and methodologically appropriate were systematically applied, one at a time (Byrne, 2009). Model fit statistics (χ^2, SRMR, RMSEA, CFI and TLI) were examined and recorded after each alteration to evaluate the

TABLE 5 Factor loadings, percentage of variance explained and McDonald's omega coefficients for the 27-item AASPIRE Autistic Burnout Measure.

	Factor			
	1	2	3	4
	Cognitive & functioning	**Emotional & sensory**	**Avoidance & exhaustion**	**Social & communication**
% Variance explained	46.71	7.57	5.61	5.21
McDonald's omega coefficient	0.921	0.885	0.878	0.856
Factor 1—Cognitive and functioning difficulty				
1 I've had more trouble thinking clearly than I usually do	**0.775**	0.242	0.255	0.195
2 I've had a harder time making decisions for myself than I usually do	**0.712**	0.233	0.180	0.197
3 I've had a harder time solving challenging problems than I usually do	**0.752**	0.245	0.101	0.295
4 I've had a harder time holding information in my mind for short periods of time than I usually do (short-term or working memory)	**0.769**	0.193	0.135	0.158
5 I've had a harder time recalling things I know than I usually do (long-term memory)	**0.710**	0.275	0.125	0.120
14 I've had a harder time deciding what is and is not important to pay attention to than I usually do	**0.454**	0.324	0.298	0.347
19 I've had a harder time doing basic day-to-day activities than I usually do (e.g., eating, cleaning, shopping, showering)	**0.580**	0.263	0.427	0.136
20 I've had a harder time managing work or school than I usually do	**0.488**	0.259	0.414	0.353
21 I've had a harder time managing the steps I need to take to complete tasks than I usually do	**0.580**	0.275	0.424	0.294
Factor 2—Emotional and sensory dysregulation				
6 I've had a harder time controlling my impulses than I usually do	0.197	**0.634**	−0.078	0.273
7 I've been more moody than I usually am	0.164	**0.828**	0.135	0.151
8 I've been feeling more irritable than I usually do	0.204	**0.822**	0.166	0.169
9 I've had a harder time tolerating sensory input than I usually do (e.g., bright lights, loud sounds, or intense smells)	0.383	**0.584**	0.381	0.072
10 I've had a harder time preventing sensory overstimulation than I usually do	0.329	**0.580**	0.359	0.117
11 I've had more, or more severe, meltdowns than I usually do	0.210	**0.647**	0.033	0.184
12 I've had more, or more severe, shutdowns than I usually do	0.269	**0.576**	0.232	0.288
13 I've had a harder time ignoring unimportant sensory input than I usually do (e.g., distracting sounds, sights, smells, or tactile sensations)	0.426	**0.471**	0.377	0.030
Factor 3—Avoidance and exhaustion				
22 I've been avoiding social situations, even if I like them, more often than I usually do	0.147	0.090	**0.795**	0.164
23 I've wanted to isolate myself from others more often than I usually do	0.119	0.157	**0.793**	0.301

(Continues)

TABLE 5 (Continued)

	Factor			
	1	2	3	4
	Cognitive & functioning	**Emotional & sensory**	**Avoidance & exhaustion**	**Social & communication**
24 I've been avoiding stimulating environments, even if I like them, more often than I usually do	0.103	0.024	**0.779**	0.304
25 I've been avoiding activities that require effort, even if I like them, more often than I usually do	0.328	0.089	**0.703**	0.150
26 I've felt more mentally exhausted than I usually do	0.473	0.434	**0.528**	0.006
27 I've felt more physically exhausted than I usually do	0.305	0.403	**0.583**	−0.017
Factor 4—Social and communication difficulty				
15 I've had a harder time getting along with people I know well than I usually do	0.129	0.263	0.185	**0.749**
16 I've had a harder time getting along with people at work, school, or in other community settings, than I usually do	0.173	0.209	0.263	**0.759**
17 I've had a harder time communicating my point to others	0.422	0.224	0.206	**0.695**
18 I've had a harder time finding the right words to communicate what I mean than I usually do	0.466	0.172	0.256	**0.607**

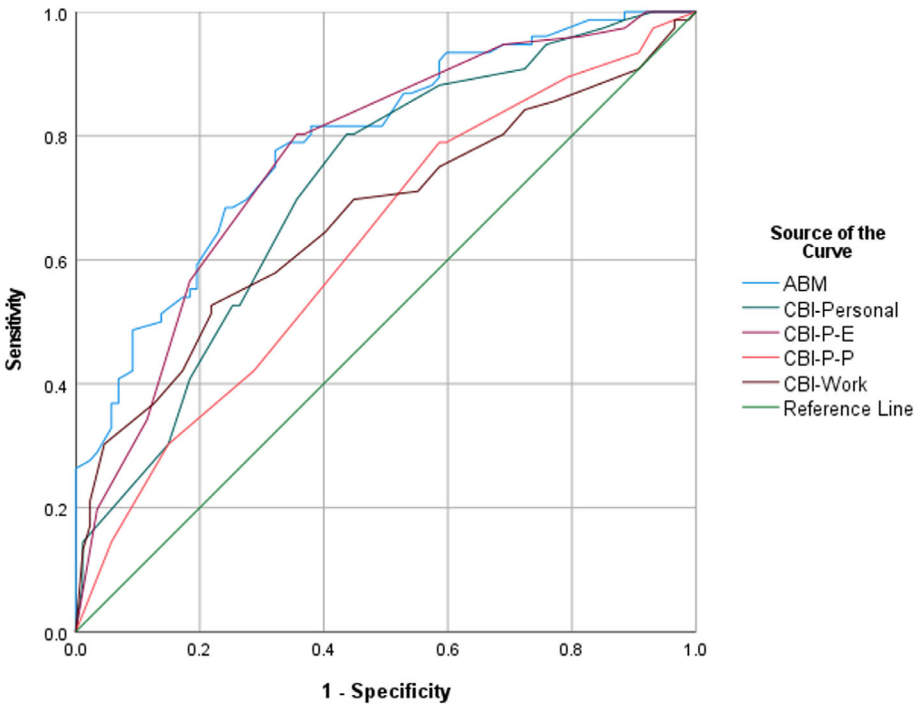

FIGURE 1 Comparison of area under the curve results for the AASPIRE Autistic Burnout Measure, Copenhagen Burnout Inventory-Personal total and subscales and Copenhagen Burnout Inventory-Work scale.

impact of the change on overall model fit. Only changes that improved model fit were retained. After completing the first round of suggested modifications, model estimates were recalculated, and new modification indices were examined and applied where appropriate. This process was repeated until no further changes were possible. The modifications that were made to each exploratory model are shown in Figures S2a–d (ABM) and S3a–d (CBI-P). After applying the suggested modifications to the ABM and CBI-P, inspection of the χ^2, SRMR, RMSEA, CFI and

TABLE 6 Factor loadings of the Copenhagen Burnout Inventory. (a) Personal and Work scales. (b) Personal scale.

(a)

	Factor		
	1	2	3
	Work	Physical	Emotional
% Variance explained	41.06	17.60	8.86
McDonald's omega	0.885	0.746	0.795
Factor 1—Work-related exhaustion			
1w Is your work emotionally exhausting?	**0.710**	−0.031	0.192
2w Do you feel burnt out because of your work?	**0.841**	−0.047	0.155
3w Does your work frustrate you?	**0.771**	−0.019	0.088
4w Do you feel work out at the end of the working day?	**0.798**	0.258	0.085
5w Are you exhausted in the morning at the thought of another day at work?	**0.786**	0.264	0.134
6w Do you feel that every working hour is tiring for you?	**0.768**	0.313	0.088
Factor 2—Physical exhaustion			
1p How often do you feel tired?	0.124	**0.670**	0.335
2p How often are you physically exhausted?	0.086	**0.841**	0.139
6p How often do you feel weak and susceptible to illness?	0.096	**0.767**	0.180
Factor 3—Emotional exhaustion			
3p How often are you emotionally exhausted?	0.107	0.122	**0.861**
4p How often do you think "I can't take it anymore"?	0.204	0.220	**0.767**
5p How often do you feel worn out?	0.180	0.371	**0.744**

(b)

	Factor	
	1	2
	Emotional	Physical
% Variance explained	52.45	17.15
McDonald's omega	0.795	0.746
Factor 1—Emotional exhaustion		
3p How often are you emotionally exhausted?	**0.865**	0.108
4p How often do you think "I can't take it anymore"?	**0.798**	0.216
5p How often do you feel worn out?	**0.768**	0.367
Factor 2—Physical Exhaustion		
1p How often do you feel tired?	0.381	**0.638**
2p How often are you physically exhausted?	0.143	**0.867**
6p How often do you feel weak and susceptible to illness?	0.174	**0.809**

Note: (w) denotes items from the Copenhagen Burnout Inventory-Work scale and (p) denotes items from the Copenhagen Burnout Inventory-Personal scale.

TLI values indicated that all four exploratory models were a good fit to the data, with minimal differences among their fit indices. To identify the most parsimonious models, we then compared the AIC, BIC and CAIC values (Table 9). For the ABM and CBI-P, the lowest BIC and CAIC indices belonged to the single hierarchical factor (or 'higher-order') models, thus representing the best fit for the data.

Scale dimensionality

ABM

The higher-order model measured an overarching 'Autistic Burnout' construct which influenced four lower-order factors: '*Cognitive and Functioning Difficulty*', '*Emotional and Sensory Dysregulation*', '*Avoidance and*

TABLE 7 Intraclass correlation coefficients for the AASPIRE Autistic Burnout Measure, Copenhagen Burnout Inventory-Personal (total and subscales) and Copenhagen Burnout Inventory-Work scale.

Measures	ICC	95% CI [Lower, Upper]	Sig.	Cronbach's α
ABM—CBI-P	0.518	[0.418, 0.605]	0.001	0.682
ABM—CBI-W	0.338	[0.127, 0.502]	<0.001	0.581
ABM—CBI-P-E	0.054	[−0.038, 0.196]	<0.001	0.516
ABM—CBI-P-P	0.038	[−0.034, 0.140]	<0.001	0.393

Abbreviations: ABM, AASPIRE Autistic Burnout Measure; CBI-P, Copenhagen Burnout Inventory-Personal total scale; CBI-P-E, Copenhagen Burnout Inventory—'Emotional Exhaustion' subscale; CBI-P–P, Copenhagen Burnout Inventory—'Physical Exhaustion' subscale; CBI-W, Copenhagen Burnout Inventory-Work scale.

TABLE 8 Results of ROC, sensitivity and specificity analyses comparing the efficacy of the AASPIRE Autistic Burnout Measure, Copenhagen Burnout Inventory-Personal scale and Emotional Exhaustion subscale for detecting self-reported autistic burnout status.

Statistic	ABM	CBI-P-E	CBI-P total
Youden J	0.454	0.446	0.366
Cut-off score	≥ 79	≥ 71	≥ 68
AUC [95% CI]	0.789 [0.721, 0.858]	0.767 [0.694, 0.840]	0.716 [0.638, 0.794]
True +	60	61	61
False +	16	15	15
True −	57	56	48
False −	30	31	39
Prevalence	55.2%	56.4%	61.3%
Sensitivity [95% CI]	**66.7%** [55.9, 76.3]	**66.3%** [55.7, 75.8]	61% [50.7, 70.6]
Specificity [95% CI]	**78.1%** [66.9, 86.9]	**78.9%** [67.6, 87.7]	76.2% [63.8, 86.0]
PPV [95% CI]	78.9% [70.4, 85.6]	**80.2%** [71.7, 86.7]	80.3% [71.8, 86.6]
NPV [95% CI]	**65.5%** [58.1, 72.3]	64.4% [57.0, 71.2]	55.2% [48.2, 62.0]
+LR [95% CI]	3.05 [1.93, 4.80]	3.14 [1.96, 5.03]	2.56 [1.60, 4.09]
−LR [95% CI]	0.426 [0.31, 0.59]	0.430 [0.31, 0.58]	0.512 [0.39, 0.68]
Overall test accuracy	**71.8%** [64.2, 78.5]	**71.8%** [64.2, 78.5]	66.9% [59.1, 74.0]

Note: 'Yes' $n = 76$; 'No/Unsure' $n = 87$; Missing: $n = 75$.
Abbreviations: ABM, Autistic Burnout Measure; CBI-P, Copenhagen Burnout Inventory—Personal subscale; CBI-P-E, Copenhagen Burnout Inventory—Emotional Exhaustion subscale; AUC, area under the curve; CI, confidence interval; PPV, positive predictive value; NPV, negative predictive value; +LR, positive likelihood ratio; −LR, negative likelihood ratio.

Exhaustion' and '*Social and Communication Difficulty*'. The omega hierarchical (ω_h) value for the higher-order factor was 0.77, which indicated that 77% of the variance in the total ABM score was reliably measured by the 'Autistic Burnout' construct. The explained common variance (ECV) was 0.61 which indicated that 61% of the common variance could be attributed to the general factor, 'Autistic Burnout' and 39% was spread across the four lower-order factors. The omega (general) values for each lower-order factor were: *Cognitive and Functioning Difficulty* = 0.72, *Emotional and Sensory Dysregulation* = 0.56, *Avoidance and Exhaustion* = 0.48, and *Social and Communication Difficulty* = 0.48 (Table 10). The results suggested that the ABM was primarily unidimensional and supported the use of a total score to estimate scale reliability.

To better understand the relationships between the higher and lower-order factors and scale items, we compared the factor loadings from the original 4-factor EFA with the Schmid-Leiman (S-L) transformed factor loadings. >0.20 (Table S6). S-L loadings >0.20 were retained and were generally lower than the initial factor loadings as they represent part correlations (Wolff & Preising, 2005). The S-L loadings for the majority (20 of 27) ABM items was higher on the general factor than the loading on their individual factors, and items 18, 19, 20, 21, and 26 had low cross-loadings onto other factors. The results suggested the items could form an abbreviated scale to measure a general 'Autistic Burnout' construct (Wolff & Preising, 2005). In contrast, items 7 and 8 were better measures of the *Emotional Dysregulation* factor than the general 'Autistic Burnout' factor, items 22, 23 and 24 were better measures of the *Avoidance* factor than of the general factor, and items 15 and 16 were better measures of the *Social Difficulty* factor than of the general factor. The results supported the earlier finding

TABLE 9 Comparison of model fit indices to identify parsimonious exploratory factor models for the AASPIRE Autistic Burnout Measure and Copenhagen Burnout Inventory-Personal scale.

	χ^2	*p*	*df*	RMSEA [90% CI]	SRMR	CFI	TLI	AIC	BIC	CAIC
ABM										
Model 1 Single general factor	330.74	0.001	254	0.036 [0.024, 0.046]	0.0395	0.983	0.977	578.74	1009.31	1133.31
Model 2 Four correlated factors	283.44	0.084	252	0.023 [0.000, 0.036]	0.0327	0.993	0.991	535.44	972.95	1098.95
Model 3 Single hierarchical factor	278.74	0.128	253	0.021 [0.000, 0.034]	0.0324	0.994	0.992	528.74	962.77	1087.77
Model 4 Single bifactor	253.21	0.185	234	0.019 [0.000, 0.033]	0.0298	0.996	0.994	541.21	1041.22	1185.22
CBI-P										
Model 1 Single general factor	0.252	0.969	3	0.000 [0.000, 0.000]	0.0037	1.00	1.029	36.25	98.75	116.75
Model 2 Two correlated factors[a]	10.30	0.113	6	0.055 [0.000, 0.110]	0.0274	0.991	0.977	40.30	92.38	107.38
Model 3 Single hierarchical factor	9.301	0.232	7	0.037 [0.000, 0.093]	0.0266	0.995	0.990	37.30	85.92	99.91
Model 4 Single bifactor[a]	12.56	0.084	7	0.058 [0.000, 0.109]	0.0411	0.988	0.975	40.56	114.92	135.92

Note: Model fit achieved after systematically applying modifications.
Abbreviations: ABM, AASPIRE Autistic Burnout Measure; AIC, Akaike's information criterion; BIC, Bayesian information criterion; CAIC, consistent Akaike's information criterion; CBI-P, Copenhagen Burnout Inventory—Personal scale; CFI, comparative fit index; RMSEA, root mean square error of approximation; SRMR, squared root mean residual; TLI, Tucker Lewis Index.
[a]Model fit without modifications.

that a single general factor, unidimensional model best represented the structure of the ABM.

CBI-P

For the CBI-P, the overarching construct was 'Personal Burnout' which influenced two lower-order factors named '*Emotional Exhaustion*' and '*Physical Exhaustion*'. The omega hierarchical (ω_h) value for 'Personal Burnout' was 0.57, indicating that 57% of the variance in the CBI-P total score was reliably measured by the overarching construct. The ECV was 0.54 (54%) which indicated that just over half of the common reliable variance could be attributed to the general factor, 'Personal Burnout' and the remaining 46% was spread across the two lower-order factors. The omega (general) values for the specific factors were: *Emotional Exhaustion* = 0.42 and *Physical Exhaustion* = 0.45 (Table 10). The results suggested a multidimensional structure for the CBI-P and some support for calculating subscale scores to assess reliability.

We compared the EFA loadings and Schmid-Leiman transformed factor loadings the 2-factor CBI-P (Table S7a). The S-L loadings for all items except item 2 ("How often are you physically exhausted?") and item 3 ("How often are you emotionally exhausted?") were higher on the general factor than their individual factors, which suggested that items 1, 4, 5, and 6 represented an overarching 'Personal Burnout' construct. However, as R recommends a minimum of three factors to produce an identified model, these results should be interpreted with caution. To overcome this limitation, the analysis was repeated without specifying the number of lower-order factors to be extracted and the results are presented in Table S7b. A 3-factor solution was proposed, although only item 1 ("How often do you feel tired?") loaded onto the third factor named '*Energy*' and its individual factor loading was lower than its loading on the general factor (0.48 compared to 0.71). Items 2, 5, and 6 also had a higher loading on the general 'Personal Burnout' factor than their individual factors. Only the S-L loadings for item 3 ("How often are you emotionally exhausted?") and item 4 ("How often do you think 'I can't take it anymore'?") were higher on their specific factor. The ω_h value increased to 0.64 (from 0.57) under this model indicating that 64% of the variance in the total CBI-P score was reliably measured by the overarching 'Personal Burnout' construct. The ECV was 0.5 (55%) which indicated that half of the common reliable variance was attributed to the general factor, 'Personal Burnout' and the remaining 45% was spread across the three lower-order factors. For the lower-order factors, the omega (general) values were: *Emotional Exhaustion* = 0.40, *Physical Exhaustion* = 0.42, and *Energy* = 0.50 (Table 10). The explained common variance of the general factor remained almost identical (0.55 compared to 0.54 under the first model). The results provided some preliminary support for a single hierarchical factor structure and multidimensionality of the CBI-P.

Evaluating the relationships between the ABM and CBI with other variables

Discriminant validity

Spearman correlations were used to examine item-level discriminant validity between items from the ABM, CBI-P subscales and CBI-W and their total scores, as

TABLE 10 Omega values and explained common variance for the general factor and specific factors of the AASPIRE Autistic Burnout Measure and Copenhagen Burnout Inventory—Personal scale.

	ω_h	ECV	GF	F1	F2	F3	F4
ABM	0.77	0.61					
Omega total			0.97	0.90	0.87	0.88	0.83
Omega general			0.77	0.72	0.56	0.48	0.48
Omega group			0.10	0.18	0.32	0.40	0.35
CBI-P (2 factors)	0.57	0.54					
Omega total			0.86	0.81	0.75		
Omega general			0.57	0.42	0.45		
Omega group			0.23	0.39	0.30		
CBI-P (3 factors)	0.64	0.55					
Omega total			0.88	0.81	0.72	0.73	
Omega general			0.64	0.40	0.42	0.50	
Omega group			0.20	0.41	0.31	0.23	

Note: For the ABM, F1 = '*Cognitive and Functioning Difficulty*', F2 = '*Emotional and Sensory Dysregulation*', F3 = '*Avoidance and Exhaustion*' and F4 = '*Social and Communication Difficulty*'. For the CBI-P (2 factors), F1 = '*Emotional Exhaustion*' and F2 = '*Physical Exhaustion*'. For the CBI-P (3 factors), F1 = '*Emotional Exhaustion*', F2 = '*Physical Exhaustion*', and F3 = '*Energy*'.
Abbreviations: ω_h, omega hierarchical; ABM, AASPIRE Autistic Burnout Measure; ECV, explained common variance; GF, general factor; CBI-P, Copenhagen Burnout Inventory—Personal scale.

well as the total score of the PHQ-9 (Table S8). Discriminant validity was supported as all items on each of the burnout measure correlated more strongly with the total score of their respective questionnaire than with the total score of the PHQ-9.

ROC analyses examined scale-level discriminant validity and compared how accurately the PHQ-9, GAD-7, DASS-S, and FFS detected self-reported autistic burnout in the current sample. Comparison of the AUC curves (Figure 2) showed the AUC for the PHQ-9 was slightly higher than for the other measures. The DASS-S reported the highest sensitivity (63.74%) and the GAD-7 reported highest specificity (76%). Overall test accuracy was highest for the DASS-S (68.71%), but all measures performed similarly (Table 11). None of the mental strain and fatigue measures were more accurate than the ABM and CBI-P-E at detecting self-reported autistic burnout among the participants (Table 7).

Convergent and divergent validity

Elevated rates of depression, anxiety, stress, and fatigue, and lower life satisfaction were reported by study participants (Table 2). Table 12 shows the Spearman correlations and 95% CI between the ABM and CBI-P (totals and factors) with measures of depression, anxiety, stress, fatigue, and camouflaging, and measures of wellbeing (satisfaction with life, social integration and social contribution). The ABM and CBI-P (totals and factors) showed strong, significant positive correlations with measures of mental strain (depression, anxiety, and stress). Fatigue was moderately correlated with the ABM (total and factors), but there were strong, positive correlations between fatigue and the CBI-P total and subscales (r_s between 0.61 and 0.72). There were strong correlations between the ABM and CBI-P and the ABM and CBI-P-E ($r_s = 0.48$ and $r_s = 0.49$ respectively), suggesting convergent validity, while the correlation between the ABM and the CBI-P-P was moderate ($r_s = 0.34$). Although masking has been consistently identified as a prominent risk factor for autistic burnout (Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020), the correlations between the CAT-Q and the ABM and CBI-P were moderate ($r_s = 0.36$ and $r_s = 0.30$, respectively), and at the factor level, most correlations were weak. While most correlations were statistically significant, the correlations between the CAT-Q and mental strain, fatigue and wellbeing variables were weak and did not reach the $r_s = 0.30$ threshold. The correlation between the CAT-Q and social contribution was negligible. Please note: Results using CBI-P (total and subscales) have been provided for completeness, but results using the CBI-P total score should be interpreted with caution due to unresolved questions about scale dimensionality.

The magnitude of the positive correlations between the burnout measures and depression, anxiety, stress, and fatigue were assessed further using Fisher's r to z transformations (Table S9). Correlation comparisons among the ABM, CBI-P (total and subscales) and PHQ-9 were all statistically significant ($p = 0.01$, $p = 0.02$, and $p \leq 0.001$, respectively). The results indicated convergent validity between the ABM and PHQ-9 and suggested the autistic burnout and depression scales were measuring a similar construct in this sample. Convergent validity was also suggested between the autistic burnout measure and measures of anxiety and stress. The results showed statistically significant correlations

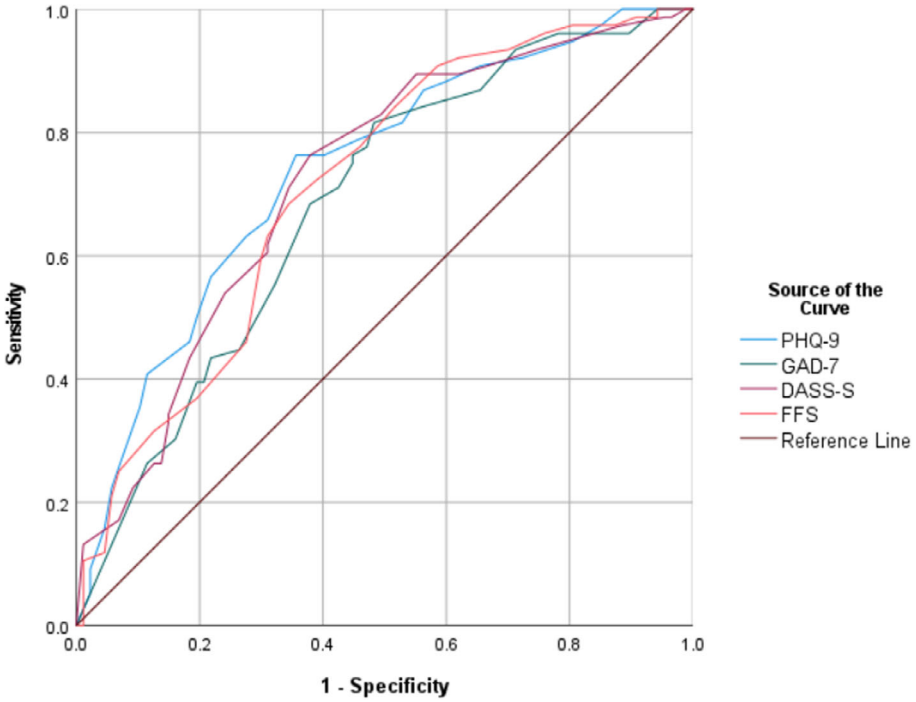

FIGURE 2 Comparison of area under the curve results for measures of depression, anxiety, stress and fatigue.

between the ABM with the GAD-7 ($p = 0.01$, compared with the ABM—CBI-P-P) and between the ABM and DASS-S ($p = 0.04$, compared with the ABM—CBI-P). In contrast, the correlation comparisons among the ABM, CBI-P-E and FFS indicated divergent validity between the ABM and FFS ($p = 0.05$), which suggested that the ABM and FFS were measuring different constructs in this sample.

Incremental validity

After controlling for depression, anxiety, stress, and fatigue, the weak to moderate relationships between the ABM and CBI-P (total and subscales) and the wellbeing measures (life satisfaction, social integration and social contribution) were weak to negligible, and none remained statistically significant. The ABM, CBI-P (total and subscales) did not demonstrate incremental validity above the PHQ-9, GAD-7, DASS-S, and FFS for evaluating wellbeing in the current sample. The comparisons between the zero-order and partial correlations are provided in Table S10.

Inter-rater reliability among the ABM and PHQ-9

Inter-rater reliability between the ABM and PHQ-9 was poor (single measures ICC = 0.371, [0.256, 0.476] 95% CI), indicating that the two questionnaires measured different constructs and were not interchangeable as reliable measures of autistic burnout in the current sample.

Convergent and divergent validity among the ABM, CBI-P, PHQ-9 and FFS

Fatigue is listed as a symptom in both proposed definitions of autistic burnout (Higgins et al., 2021; Raymaker et al., 2020), and there is ongoing debate about overlap between the burnout and depression constructs. As we found moderate (r_s >0.40) to strong (r_s >0.50) correlations between the ABM and CBI-P and depression and fatigue, EFA was conducted to further examine convergent and divergent validity. (For consistency, the CBI-W was included in this analysis as it was used in the EFA to identify the ABM and CBI). The KMO (0.924) and Bartlett's test of sphericity (χ^2 (1378) = 9225.60, $p < 0.001$) confirmed factor analysis was suitable. EFA included all items from the ABM, CBI-P, CBI-W, PHQ-9, and FFS, except two items which had low communalities values: "Do you have enough energy for family and friends during leisure time?" (CBI-W) and "How much was your fatigue caused by poor sleep?" (FFS; 0.272 and 0.103, respectively). Initial inspection of the eigenvalues in SPSS showed nine factors with eigenvalues >1. Parallel analysis suggested a 6-factor solution (Table S1), whereas Velicer's MAP test recommended retaining 10 factors. EFA was repeated, restricting the number of extracted factors to seven as this made theoretical sense and accounted for 62.97% of the variance. The factors were (1) *Exhaustion and Fatigue*; (2) *Cognitive and Functioning Impact*; (3) *Depressive Symptoms*; (4) *Emotional and Sensory Dysregulation*; (5) *Avoidance and Withdrawal*; (6) *Work Exhaustion*; and (7) *Social and Communication Impact*. Factor items, loadings, ω coefficient, and percentage of variance explained for each factor are presented in

TABLE 11 Results of ROC analyses comparing the efficacy of the Patient Health Questionnaire-9, Generalized Anxiety Disorder scale-7, Depression Anxiety Stress Scale (stress subscale), and the Flinders Fatigue Scale for detecting self-reported autistic burnout status.

	Measure			
	PHQ-9	GAD-7	DASS-S	FFS
Statistic	Value [95% CI]	Value [95% CI]	Value [95% CI]	Value [95% CI]
Youden's J	0.41	0.33	0.38	0.34
Cut-off score	≥14	≥8	≥23	≥19
AUC	**0.737**	0.685	0.721	0.712
	[0.663, 0.803]	[0.604, 0.766]	[0.643, 0.799]	[0.636, 0.780]
True +	58	64	58	52
False +	18	12	18	24
True −	52	49	54	57
False −	35	38	33	30
Prevalence	57.1%	69.3%	55.8%	50.3%
Sensitivity	62.4%	56.6%	**63.74%**	63.4%
	[51.7, 72.2]	[46.9, 65.9]	[53.0, 73.6]	[52.0, 73.8]
Specificity	74.3%	**76.0%**	75.0%	70.4%
	[62.4, 84.0]	[61.8, 86.9]	[63.4, 84.5]	[59.2, 80.0]
PPV	76.3%	84.2%	76.3%	68.4%
	[67.8,83.2]	[76.0,89.9]	[65.1, 85.3]	[59.9,75.9]
NPV	59.7%	43.7%	62.1%	65.5%
	[52.5,66.6]	[37.4,50.2]	[51.1, 72.3]	[58.0,72.3]
+LR	2.43	2.36	2.55	2.14
	[1.58, 3.72]	[1.4,3.97]	[1.66,3.92]	[1.47,3.11]
−LR	0.51	0.57	0.48	0.52
	[0.38,0.68]	[0.44,0.74]	[0.36, 0.65]	[0.38,0.72]
Overall test Accuracy	67.5%	62.6%	**68.71%**	66.9%
	[59.7,74.6]	[54.7,70.0]	[61.0, 75.7]	[59.1,74.0]

Note: Yes: $n = 76$; No/Unsure: $n = 87$; Missing: $n = 75$.
Abbreviations: AUC, area under the curve; CI, confidence interval; DASS-S, Depression Anxiety Stress Scale-21—stress subscale; GAD-7, Generalized Anxiety Disorder scale; FFS, Flinders Fatigue Scale; NPV, negative predictive value; +LR, positive likelihood ratio; −LR, negative likelihood ratio; PHQ-9, Patient Health Questionaire-9; PPV, positive predictive value.

Table 13. Inter-factor correlations are provided in Table S11 and item-factor correlations in Table S12.

The results supported convergent validity of the CBI-P and FFS as all questions loaded onto the *Exhaustion and Fatigue* factor, except the CBI-P item "How often do you think 'I can't take it anymore'?", which loaded onto the *Depressive Symptoms* factor. Divergent validity was indicated for the ABM (and CBI-P) with depression as all PHQ-9 items loaded onto the *Depressive Symptoms* factor, whereas the ABM items loaded onto three factors that described the symptoms of autistic burnout: *Emotional and Sensory Dysregulation*, *Avoidance and Withdrawal*, and *Social and Communication Impact*. Consistent with the findings of the EFA to identify the ABM and CBI, all the CBI-W items clustered together on a *Work Exhaustion* factor.

DISCUSSION

The small body of current research suggests that autistic burnout can affect autistic people across the lifespan (Higgins et al., 2021; Mantzalas et al., 2021; Phung et al., 2021; Raymaker et al., 2020). While early findings and first-person reports indicate that autistic burnout is a common experience among autistic people, its prevalence remains unknown. Extrapolating from autism prevalence worldwide (Lord et al., 2022), a modest estimate of 1% autistic burnout prevalence suggests over a million individuals could be affected. Indeed, 69% of participants in our sample self-reported at least one prior experience of autistic burnout, and 46% indicated they had experienced autistic burnout *four or more* times. Of those currently in autistic burnout ($n = 76$), 63% also reported recent

TABLE 12 Spearman correlations (top half) and 95% CI's (bottom half) among measures of burnout, mental strain and wellbeing.

	ABM	CBI-P	CATQ	PHQ-9	DASS-S	FFS	GAD-7	SWLS	SI	SC	ABM-F1	ABM-F2	ABM-F3	ABM-F4	CBI-F1	CBI-F2
ABM	-	**0.48**	**0.36****	**0.59****	**0.58****	**0.41****	**0.50****	−0.27**	−0.29**	−0.21**	**0.92****	**0.82****	**0.74****	**0.79****	**0.49****	**0.34****
CBI-P	[0.37, 0.57]	-	**0.30**	**0.68**	**0.57**	**0.72**	**0.52**	**−0.39**	**−0.31**	**−0.33**	**0.45**	**0.38**	**0.44**	**0.36**	**0.86**	**0.87**
CATQ	[0.24, 0.47]	[0.18, 0.42]	-	0.24**	0.26**	0.29**	0.27**	−0.15*	−0.15*	−0.05	**0.32****	0.29**	**0.33****	0.29**	0.25**	0.28**
PHQ-9	[0.49, 0.67]	[0.60, 0.75]	[0.12, 0.36]	-	**0.66****	**0.65****	**0.70****	**−0.49****	**−0.39****	**−0.43****	**0.54****	**0.51****	**0.44****	**0.43****	**0.70****	**0.50****
DASS-S	[0.48, 0.66]	[0.47, 0.65]	[0.13, 0.38]	[0.58, 0.73]	-	**0.55****	**0.77****	**−0.32****	−0.24**	−0.23**	**0.48****	**0.60****	**0.35****	**0.47****	**0.56****	**0.44****
FFS	[0.29, 0.51]	[0.65, 0.78]	[0.17, 0.41]	[0.55, 0.71]	[0.45, 0.63]	-	**0.51****	**−0.38****	−0.25**	−0.26**	**0.39****	**0.35****	**0.32****	**0.30****	**0.63****	**0.61****
GAD-7	[0.40, 0.59]	[0.42, 0.61]	[0.14, 0.39]	[0.63, 0.76]	[0.71, 0.82]	[0.41, 0.60]	-	**−0.35****	−0.26**	−0.26**	**0.40****	**0.51****	**0.34****	**0.41****	**0.54****	**0.39****
SWLS	[−0.39, −0.15]	[−0.50, −0.27]	[−0.27, −0.02]	[−0.58, −0.38]	[−0.44, −0.20]	[−0.49, −0.26]	[−0.46, −0.23]	-	**0.52****	**0.55****	−0.25**	−0.19**	−0.22**	−0.22**	**−0.42****	−0.27**
SI	[−0.40, −0.16]	[−0.43, −0.19]	[−0.27, −0.02]	[−0.50, −0.27]	[−0.36, −0.12]	[−0.36, −0.12]	[−0.38, −0.13]	[0.42, 0.61]	-	**0.58****	−0.27**	−0.15*	−0.29**	−0.26**	**−0.36****	−0.21**
SC	[−0.33, −0.08]	[−0.44, −0.21]	[−0.18, 0.09]	[−0.53, −0.32]	[−0.35, −0.10]	[−0.38, −0.13]	[−0.38, −0.14]	[0.45, 0.63]	[0.48, 0.66]	-	−0.18**	−0.13*	−0.17*	−0.22**	**−0.38****	−0.22**
ABM-F1	[0.89, 0.94]	[0.34, 0.55]	[0.19, 0.43]	[0.44, 0.62]	[0.37, 0.57]	[0.27, 0.50]	[0.29, 0.51]	[−0.36, −0.12]	[−0.38, −0.14]	[−0.31, −0.05]	-	**0.67****	**0.59****	**0.67****	**0.46****	**0.33****
ABM-F2	[0.77, 0.86]	[0.26, 0.49]	[0.16, 0.40]	[0.40, 0.60]	[0.51, 0.68]	[0.23, 0.45]	[0.41, 0.60]	[−0.31, −0.06]	[−0.27, −0.02]	[−0.26, 0.00]	[0.59, 0.73]	-	**0.44****	**0.56****	**0.41****	0.25**
AMB-F3	[0.67, 0.79]	[0.33, 0.54]	[0.21, 0.44]	[0.33, 0.54]	[0.23, 0.46]	[0.20, 0.43]	[0.22, 0.45]	[−0.34, −0.09]	[−0.41, −0.17]	[−0.29, −0.04]	[0.50, 0.67]	[0.33, 0.54]	-	**0.56****	**0.37****	0.24**
ABM-F4	[0.74, 0.84]	[0.24, 0.47]	[0.17, 0.41]	[0.31, 0.53]	[0.36, 0.57]	[0.17, 0.41]	[0.30, 0.52]	[−0.34, −0.09]	[−0.37, −0.13]	[−0.34, −0.09]	[0.59, 0.74]	[0.46, 0.64]	[0.46, 0.64]	-	**0.38****	0.25**
CBI-F1	[0.39, 0.59]	[0.83, 0.89]	[0.12, 0.37]	[0.63, 0.76]	[0.47, 0.65]	[0.54, 0.70]	[0.44, 0.63]	[−0.52, −0.31]	[−0.47, −0.24]	[−0.49, −0.26]	[0.35, 0.55]	[0.30, 0.52]	[0.25, 0.48]	[0.27, 0.49]	-	**0.53****
CBI-F2	[0.22, 0.45]	[0.84, 0.90]	[0.16, 0.40]	[0.40, 0.60]	[0.33, 0.54]	[0.52, 0.69]	[0.28, 0.50]	[−0.39, −0.15]	[−0.33, −0.08]	[−0.34, −0.09]	[0.21, 0.44]	[0.12, 0.37]	[0.11, 0.36]	[0.12, 0.37]	[0.43, 0.62]	-

Abbreviations: ABM, AASPIRE Autistic Burnout Measure; ABM-F1, ABM factor 1: 'cognitive difficulties'; ABM-F2, ABM factor 2: 'emotional and sensory dysregulation'; ABM-F3, ABM factor 3: 'avoidance and exhaustion'; ABM-F4, ABM factor 4: 'social and communication difficulties'; CATQ, Camouflaging Autistic Traits Questionnaire; CBI-F1, CBI-P factor 1: 'emotional exhaustion'; CBI-F2, CBI-P factor 2: 'physical exhaustion'; CBI-P, Copenhagen Burnout Inventory—Personal scale; DASS-S, Depression Anxiety Stress Scale-21 (stress subscale); GAD-7, General Anxiety Disorder scale-7; PHQ-9, Patient Health Questionnaire-9; SC, Social Contribution; SI, Social Integration; SWLS, Satisfaction With Life scale.

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

TABLE 13 Results of factor analysis for measures of burnout, depression, and fatigue showing factor loadings, percentage of variance explained and Mcdonald's omega coefficients.

	Factors						
	1	2	3	4	5	6	7
	Exhaustion & Fatigue	Cognitive & Functioning	Depressive symptoms	Emotional & Sensory	Avoid & Withdrawal	Work exhaustion	Social & Comm'n
% of Variance explained	34.39	7.93	4.64	3.39	2.96	2.33	2.10
McDonald's omega	0.794	0.924	0.560*	0.876	0.878	0.885	0.856
Factor 1—Exhaustion & Fatigue							
How often do you feel tired?[a]	**0.685**						
How often are you physically exhausted?[a]	**0.696**						
How often are you emotionally exhausted?[a]	**0.348**						
How often do you feel worn out?[a]	**0.561**						
How often do you feel weak and susceptible to illness?[a]	**0.718**						
Feeling tired or having little energy[d]	**0.672**						
Was fatigue a problem for you?[b]	**0.891**						
Did fatigue cause problems with your everyday functioning? (e.g., work, social, family)[b]	**0.871**						
Did fatigue cause you distress?[b]	**0.679**						
How often did you suffer from fatigue?[b]	**0.908**						
How severe was the fatigue you experienced?[b]	**0.700**						
Factor 2—Cognitive & functioning impact							
I've had more trouble thinking clearly than I usually do[c]		**0.949**					
I've had a harder time making decisions for myself than I usually do[c]		**0.738**					
I've had a harder time solving challenging problems than I usually do[c]		**0.868**					
I've had a harder time holding information in my mind for short periods of time than I usually do (short-term or working memory)[c]		**0.942**					
I've had a harder time recalling things I know than I usually do (long-term memory)[c]		**0.833**					
I've had a harder time doing basic day-to-day activities than I usually do (e.g., eating, cleaning, shopping, showering)[c]		**0.563**					
I've had a harder time managing work or school than I usually do[c]		**0.407**					
I've had a harder time ignoring unimportant sensory input than I usually do (e.g., distracting sounds, sights, smells, or tactile sensations)[c]		**0.390**		0.324			

TABLE 13 (Continued)

	Factors						
	1	2	3	4	5	6	7
	Exhaustion & Fatigue	Cognitive & Functioning	Depressive symptoms	Emotional & Sensory	Avoid & Withdrawal	Work exhaustion	Social & Comm'n
I've had a harder time deciding what is and is not important to pay attention to than I usually do[c]		**0.386**					
I've had a harder time managing the steps I need to take to complete tasks than I usually do[c]		**0.547**					
Factor 3—Depressive symptoms							
How often do you think "I can't take it anymore"?[d]			**0.417**				
Little interest or pleasure in doing things[d]			**0.559**				
Feeling down, depressed, or hopeless[d]			**0.783**				
Trouble falling or staying asleep, or sleeping too much[d]			**0.475**				
Poor appetite or overeating[d]			**0.390**				
Feeling bad about yourself, or that you are a failure or have let yourself or your family[d]			**0.799**				
Trouble concentrating on things, such as reading the newspaper or watching television[d]			**0.431**				
Moving or speaking so slowly that other people could have noticed? Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual[d]			**0.390**				
Thoughts that you would be better off dead or of hurting yourself in some way[d]			**0.795**				
Factor 4—Emotional & sensory dysregulation							
I've had a harder time controlling my impulses than I usually do[c]				**0.571**			
I've been more moody than I usually am[c]				**0.960**			
I've been feeling more irritable than I usually do[c]				**0.990**			
I've had a harder time tolerating sensory input than I usually do (e.g., bright lights, loud sounds, or intense smells)[c]				**0.495**			
I've had a harder time preventing sensory overstimulation than I usually do[c]				**0.528**			
I've had more, or more severe, meltdowns than I usually do[c]				**0.514**			

(Continues)

TABLE 13 (Continued)

	Factors						
	1	2	3	4	5	6	7
	Exhaustion & Fatigue	Cognitive & Functioning	Depressive symptoms	Emotional & Sensory	Avoid & Withdrawal	Work exhaustion	Social & Comm'n
I've had more, or more severe, shutdowns than I usually do[c]				**0.406**			
Factor 5—Avoidance & withdrawal							
I've been avoiding social situations, even if I like them, more often than I usually do[c]					**0.865**		
I've wanted to isolate myself from others more often than I usually do[c]					**0.875**		
I've been avoiding stimulating environments, even if I like them, more often than I usually do[c]					**0.923**		
I've been avoiding activities that require effort, even if I like them, more often than I usually do[c]					**0.689**		
I've felt more mentally exhausted than I usually do[c]		0.333			**0.350**		
I've felt more physically exhausted than I usually do[c]	0.337				**0.431**		
Factor 6—Work exhaustion							
Is your work emotionally exhausting?[e]						**0.651**	
Do you feel burnt out because of your work?[e]						**0.820**	
Does your work frustrate you?[e]						**0.737**	
Do you feel worn out at the end of the working day?[e]						**0.806**	
Are you exhausted in the morning at the thought of another day at work?[e]						**0.716**	
Do you feel that every working hour is tiring for you?[e]						**0.699**	
Factor 7—Social & communication Impact							
I've had a harder time getting along with people I know well than I usually do[c]							**0.632**
I've had a harder time getting along with people at work, school, or in other community settings, than I usually do[c]							**0.698**
I've had a harder time communicating my point to others[c]							**0.663**
I've had a harder time finding the right words to communicate what I mean than I usually do[c]		0.363					**0.546**

*McDonald's omega for factor 3 increased to 0.886 after excluding item 'How often do you think "I can't take it anymore"?'.
[a]Copenhagen Burnout Inventory-Personal scale item.
[b]Patient Health Questionnaire-9 item.
[c]Flinders Fatigue Scale item.
[d]AASPIRE Autistic Burnout Measure item.
[e]Copenhagen Burnout Inventory-Work scale item.

thoughts of suicidal ideation or self-harm. Similarly, in Arnold et al.'s (2023a) study, 73% of the participants had experienced autistic burnout within the past three months and 44% endorsed thoughts of suicidality or self-harm. These concerning figures imply that autistic burnout is grossly under-recognized, highlighting the urgent need for awareness and prevention. Thus, developing valid measures of autistic burnout is essential for determining accurate prevalence rates and to inform effective diagnosis, monitoring and appropriate support for autistic people.

The first aim of our study was to comprehensively examine the psychometric properties of the ABM and another well-validated measure of burnout, the CBI (personal and work scales) within a large autistic sample. Preliminary information about the validity of the ABM compared to a new autistic burnout measure, the ABSI, was recently reported (Arnold et al., 2023a) and our findings extend these initial results. Construct validity for the ABM was demonstrated through its ability to detect statistically significant differences among three autistic burnout status groups ('Yes'; 'No'; 'Unsure'). Conversely, the CBI-P and CBI-W only detected statistically significant differences between the 'Yes' and 'No' burnout groups.

Exploratory factor analysis that examined the dimensions of the ABM, CBI-P, and CBI-W revealed a 4-factor structure for the ABM: *Cognitive and Functioning Difficulty*, *Emotional and Sensory Dysregulation*, *Avoidance and Exhaustion*, and *Social and Communication Difficulty*, which explained 65.10% of the variance. A 3-factor structure was found for the CBI (personal and work scales): *Work-Related Exhaustion*, *Emotional Exhaustion*, and *Physical Exhaustion*, which explained 64.57% of the variance and showed that the six retained items from the CBI-W loaded onto the work-related factor. A separate factor analysis for only the CBI-P items identified a 2-factor structure that explained 69.60% of the variance. Overall, the ABM and CBI-P factors reflected symptoms and consequences of autistic burnout reported in the literature including reduced cognitive and self-care abilities, increased sensory sensitivities, social and interpersonal withdrawal, and difficulties producing and processing speech (Arnold et al., 2023b;Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020). The factor structures of the ABM and CBI-P also aligned with evidence that burnout is not always related to one's job and can result from any stressful aspect of one's life (Kristensen et al., 2005; Pines et al., 1981).

All the experimental models we used to test factorial validity of the ABM and CBI-P represented a good fit for the data. After comparing the four models, the 'single hierarchical factor' model was shown to be the most parsimonious for both burnout measures, indicating that a higher-order factor ('Autistic Burnout' for the ABM, and 'Personal Burnout' for the CBI-P) was indirectly influencing the scale items through the lower-order factors (Flora, 2020). The ABM was primarily a unidimensional scale as 77% of the variance in the total score was reliably measured by its overarching 'Autistic Burnout' construct, which supported the use of a total score to assess internal consistency reliability. In contrast, 57% of the variance in the total CBI-P score was attributed to the higher-order 'Personal Burnout' construct which suggested some scale multidimensionality; however, further testing with autistic samples is required.

The second study aim of evaluating the effectiveness of the ABM and CBI as screening measures for autistic burnout found moderate inter-rater reliability among the ABM and CBI-P total scale. The results indicated that the two measures were moderately reliable measures of autistic burnout in the current study. The individual subscales of the CBI-P (*Emotional Exhaustion* and *Physical Exhaustion*) and the CBI-W were not reliable measures of autistic burnout in the current sample. ROC analyses showed that discriminant validity was highest for the ABM and CBI-P-E and lowest for the CBI-W and CBI-P-P. As autistic adults consistently highlight stronger risk factors than work for autistic burnout (e.g., masking, stressful life events; Arnold et al., 2023b; Higgins et al., 2021; Mantzalas et al., 2022; Raymaker et al., 2020), the CBI-W was excluded from further analysis.

Both the ABM and CBI-P-E showed good specificity in the current study (AUC = 0.789 and 0.767, respectively, $N = 238$) compared to findings by Arnold et al. (2023a) who reported weak specificity as a limitation of the ABM (AUC = 0.661; $n = 136$). However, as sensitivity and specificity are inversely related, sensitivity may have been stronger than specificity in their study, although this is only conjecture. Results from cross-tabulations endorsed the validity of each measure via good positive and negative predictive values, satisfactory detection of autistic burnout prevalence in the sample, and good sensitivity and specificity. Overall, the performance of the ABM and CBI-P-E as preliminary screening tools for autistic burnout was almost identical.

The third aim of the current study was to examine the relationships between the ABM and CBI-P with validated measures of camouflaging, mental strain (depression; anxiety; stress), fatigue, and wellbeing (life satisfaction; social integration; social contribution): variables that have been previously identified as potential risk and protective factors for autistic burnout (Mantzalas et al., 2021). Although masking has been uniformly cited as a prime risk factor for autistic burnout in the qualitative literature (Arnold et al., 2023b; Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020), our results showed only moderate correlations between masking (measured by the CAT-Q) and the ABM ($r_s = 0.36$) and CBI-P ($r_s = 0.30$). Our findings are similar to those of Arnold et al. (2023a) who reported a moderate correlation between the ABSI and the CAT-Q ($r = -0.34$) but are not consistent with their findings of a negligible

correlation between the ABM and the CAT-Q ($r = -0.07$). Overall, the findings suggest that masking is not strongly associated with autistic burnout, and Arnold et al. (2023a) hypothesized that masking might be "a precursor rather than a feature of autistic burnout" (p.11). Still, another possibility could be related to the CAT-Q as a measure of camouflaging. In a systematic review, Cook et al. (2021) concluded that the CAT-Q is a reliable measure of *conscious* camouflaging strategies but may not adequately capture *unconscious* masking behaviors, especially among late-diagnosed adults who tend to use more masking strategies. In our study, almost half the participants were diagnosed or began to self-identify as autistic at age 35 years or older, and the mean age at autism diagnosis was slightly older (36.9 years) in Arnold et al.'s (2023a) study. It is possible that the late-diagnosed adults in our and Arnold et al.'s (2023a) studies had developed unconscious masking behaviors that contributed to their autistic burnout but were not captured by the CAT-Q.

It is well established that autistic people experience higher rates of depression and anxiety than the general population (Lai et al., 2019), are exposed to more stressors than non-autistic people (Moseley et al., 2021), and report higher levels of self-perceived stress (Hirvikoski & Blomqvist, 2014). Autistic people also experience high levels of fatigue, often from childhood (Baker et al., 2013; Keville et al., 2021; Phung et al., 2021) through to adulthood (Baker & Richdale, 2015; Richdale, et al., 2023; Williams & Gotham, 2021). In qualitative studies, autistic adults have identified chronic life stress as a prominent risk factor for autistic burnout and indicated that mental health difficulties and fatigue are exacerbated during burnout (Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020). Conversely, greater life satisfaction (the self-evaluation of one's life; Pavot & Diener, 2008), social integration (one's connection to society and community) and social contribution (one's self-perceived social value; Keyes, 1998) are known to contribute to better wellbeing among autistic people (Casagrande et al., 2020; Mournet et al., 2023). Indeed, support from the autistic community and positive interactions with autistic peers have been identified as protective factors for autistic burnout (Mantzalas et al., 2021; Raymaker et al., 2020).

There were mostly strong correlations between the ABM and CBI-P (total and subscales) with measures of mental strain and fatigue. Correlations between the ABM and CBI-P (total and subscales) with anxiety and stress were almost identical, but the association between the CBI-P (total) and CBI-P-E with depression ($r_s = 0.68$ and 0.70, respectively) was stronger than the correlation between depression and the ABM ($r_s = 0.59$). The correlations between fatigue and the CBI-P total ($r_s = 0.72$) and its subscales ($r_s = 0.63$ with the CBI-P-E and $r_s = 0.61$ with the CBI-P-P) were also stronger than the correlation between fatigue and the ABM ($r_s = 0.41$). This could be because the CBI-P is primarily a measure of general exhaustion, whereas the ABM measures exhaustion plus other facets of autistic burnout (e.g., cognitive and sensory difficulties). Arnold et al. (2023a) also found strong correlations between the ABM and depression. These findings suggest a 'concept creep' that has been reported in other burnout studies and has been used to support claims that burnout and depression are not distinct constructs (Bianchi et al., 2014; Bianchi et al., 2015; Tavella & Parker, 2020). However, non-autistic adults describe depression and burnout as different: "I'm not sad as such, I just feel… as though my cup is empty" (p.3) and "(burnout) doesn't feel as suffocating as depression, it just is a state of pure exhaustion" (p.4) (Tavella & Parker, 2020). Similarly, autistic adults differentiate between these two conditions and the impact on their lives (seeHiggins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020). For example, while dysthymia and loss of interest in enjoyable activities are hallmark features of depression (APA, 2013), autistic people indicate they can still engage in their special interests during episodes of autistic burnout (Mantzalas et al., 2021).

Our examination of the potential overlap between autistic burnout and depression revealed mixed results. The ABM and CBI-P-E ranked first overall as the most accurate measure of self-reported autistic burnout in this sample; however, differences between the AUC, sensitivity, specificity and predictive values for the ABM and PHQ-9 were generally modest. Of note, the PHQ-9 outperformed the CBI-P (total score) on most criteria and was better at detecting and correctly classifying autistic burnout than the CBI-P (total) in the current sample. Also, the correlations between the ABM and CBI-P total ($r_s = 0.48$) and CBI-P-E ($r_s = 0.49$) were weaker than the correlation between the ABM and PHQ-9 ($r_s = 0.59$), the CBI-P and PHQ-9 ($r_s = 0.68$), and CBI-P-E and PHQ-9 ($r_s = 0.70$) which suggested some overlap between burnout and depression. Convergent validity was further supported after comparing the magnitude of the correlations between the ABM and CBI-P (total and subscales) and the PHQ-9.

Poor inter-rater reliability between the ABM and PHQ-9 further supported divergent validity and indicated the two are not interchangeable measures of autistic burnout. Notably, EFA showed that ABM and PHQ-9 items clustered onto different factors, with no cross-loadings. The depression items almost all grouped together, while the ABM items all grouped separately into commonly reported symptoms of autistic burnout (cognitive and functioning impact, emotional and sensory dysregulation, avoidance and withdrawal, and social and communication impact). However, EFA may have missed nuances among the two measures. Recently, De Beer et al. (2024) used bifactor exploratory structural equation modeling (ESEM) to investigate the burnout-depression overlap among four non-autistic patient samples in four countries. The authors reported

an overarching 'Psychological Distress' factor common to both syndromes, and distinct factors specific to each (e.g., exhaustion, and cognitive and emotional impairment for burnout, and suicidal ideation for depression). The findings supported the contention that burnout and depression are distinct constructs, united by a 'Psychological Distress' feature (De Beer et al., 2024) and could partly explain the inconsistent findings in the current study.

All associations between the four ABM factors and depression, stress, and anxiety were moderate to strong, and correlations with fatigue were moderate reflecting findings from previous studies of burnout and fatigue in autistic children and adults, where overwhelming exhaustion and the inability to function were reported (Higgins et al., 2021; Keville et al., 2021; Mantzalas et al., 2021; Phung et al., 2021; Raymaker et al., 2020). Reduced functioning and fatigue are core characteristics of depression and consistent with fear, avoidance and stress associated with anxiety disorders, particularly, social and generalized anxiety and with posttraumatic stress disorder (PTSD; APA, 2013); conditions that occur more frequently in autistic people (Lai et al., 2019; Rumball et al., 2021).

Autistic people of all ages are also likely to experience sensory hyper-sensitivity, a core characteristic of autism, which can lead to increased anxiety and stress resulting in intolerance to change or environmental stimuli (e.g., sounds, lights, textures), and sensory avoidance (Black et al., 2017; Taylor et al., 2020). Autistic adults and those with attention deficit hyperactivity disorder (ADHD), report that prolonged sensory overstimulation in the workplace is draining and contributes to increased stress (Högstedt et al., 2022). These participants did not specifically refer to their experiences as 'autistic burnout' but there are similarities between their descriptions and those reported in the autistic burnout literature (Higgins et al., 2021;Mantzalas et al., 2021; Raymaker et al., 2020). The CBI-P '*Emotional Exhaustion*' factor showed strong positive relationships with depression, anxiety, stress, and fatigue, and the CBI-P '*Physical Exhaustion*' factor showed strong correlations with depression and fatigue. Similar relationships have been found in previous research where the CBI-P was used to examine burnout with a non-autistic sample (Martins et al., 2022).

Autistic burnout was not a strong contributor to poor well-being as measured by life satisfaction, social integration or social contribution in the current sample. Our analyses revealed weak negative correlations between the ABM (total and factors) and the three well-being measures, however, correlations between the CBI-P (total) and well-being variables were moderate. Weak correlations between the CBI-P (total) and life satisfaction have been reported previously among non-autistic adults (Martins et al., 2022). While there was a strong negative correlation between *Emotional Exhaustion* and life satisfaction ($r_s = -0.42$), the overall relationship between the CBI-P and well-being seemed primarily driven by moderate associations between the '*Emotional Exhaustion*' factor and well-being variables. Further, correlations between the well-being variables and the ABM were negligible after controlling for depression, anxiety, stress and fatigue, indicating that, compared to the mental strain and fatigue measures, the ABM demonstrates poor incremental validity as a predictor of well-being. However, we did not examine this further with regression analyses. Arnold et al. (2023a) did not include well-being measures in their study, but their regression analyses found that depression was the strongest predictor of autistic burnout as measured by the ABM. Overall, our well-being findings were somewhat surprising given strong indications from qualitative research that autistic burnout can be extremely harmful to autistic people's wellbeing and quality of life (Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020). Future research should investigate other correlates of autistic wellbeing, such as self-determination, access to healthcare (McConachie et al., 2020), sleep quality and physical health (Lawson et al., 2020) which may be more strongly related with autistic burnout.

While some symptoms and consequences of burnout and depression may overlap, their etiology may differ. For example, while stress is a risk factor for depression and burnout in non-autistic populations (Plieger et al., 2015), and chronic life stress is a main risk factor for autistic burnout (Raymaker et al., 2020), some sources of stress may be more amenable to change than others among autistic and non-autistic people. For example, workplace burnout could be addressed by changing job roles; athletes may retire from competitive sports; and small children eventually grow up; however, autism is a lifelong neurodevelopmental condition. Some risk factors for autistic burnout seem inherent to being an autistic person (e.g., sensory sensitivities; social and communication differences), and external factors associated with belonging to a minority group are difficult for individuals to control (e.g., stigma, negative attitudes of others).

Regardless of whether autistic burnout is labeled a form of burnout or a type of 'autistic depression', current research indicates that it can negatively impact autistic people's mental health and wellbeing; thus, it is essential to develop effective detection and support pathways. A second vital reason for recognizing autistic burnout relates to the elevated risk of suicidal thoughts and behaviors among autistic youth and adults compared to the general population (Hedley & Uljarević, 2018; Hill & Katusic, 2020; Newell et al., 2023; O'Halloran et al., 2022). Qualitative research indicates that co-occurring depression and autistic burnout can be extremely harmful, contributing to suicidal thoughts and behaviors (Higgins et al., 2021; Mantzalas et al., 2021; Raymaker et al., 2020). This association was supported

by our findings as 63% of participants who self-reported being in autistic burnout had experienced recent thoughts of suicide or self-harm. Interestingly, research suggests that suicidal thoughts and behaviors during autistic burnout may not indicate feelings of worthlessness or hopelessness as they can during depression but may be attributed to a need for respite from the sheer emotional, physical, and cognitive exhaustion that defines autistic burnout (Mantzalas et al., 2021; Raymaker et al., 2020). As one autistic person poignantly described: "I did not want to die, I've never wanted to die…I needed to remove myself from the environment and take myself elsewhere…But the only way I knew how to do that was to die. So I tried." (Raymaker et al., 2020, p.9).

It is also possible that inherent life stress associated with life as an autistic person *plus* the burden of one or more other (often chronic) conditions could increase individuals' vulnerability to autistic burnout and lengthen recovery. Autistic people are more likely to report physical and mental health conditions including alexithymia, epilepsy, depression, anxiety, ADHD, and insomnia than the general population (Jovevska et al., 2020; Kinnaird et al., 2019; Lai et al., 2019; Lukmanji et al., 2019). In the current study, 76% of participants self-reported at least one co-occurring condition, and 78% of participants in Arnold et al.'s study (Arnold et al., 2023a) reported a co-occurring internalizing condition (e.g., depression or anxiety), while 53% recorded high scores for alexithymia. Co-occurring conditions may partly explain the high recurrence rates of autistic burnout reported by most participants (63%) in this study and provide some support for the theory that autistic burnout could itself be a chronic condition (Higgins et al., 2021; Mantzalas et al., 2021). It is also vital to understand how autistic people co-manage autistic burnout and other conditions to inform prevention and recovery strategies.

Examining transdiagnostic pathways using tools such as the Hierarchical Taxonomy of Psychopathology (HiTOP) may be useful for understanding symptom overlap and risk factors between autistic burnout, depression, anxiety, and stress. This approach could improve our understanding of autistic burnout's relationships with other conditions and improve detection and classification. For example, autistic burnout could be included in the 'distress' category of the internalizing spectrum which includes conditions (e.g., PTSD, major depressive disorder) that share symptoms with autistic burnout including depressivity, suicidality, and anxiousness (Watson et al., 2022).

Limitations

While there are many novel aspects to this study, several study limitations need to be considered. First there was no group of non-autistic adults to compare rates of co-occurring conditions, mental strain, fatigue and wellbeing with those reported by our autistic adults. Second, the relatively small number of male and gender diverse participants precluded statistically robust comparisons of gender relationships or inferences about claiming multiple marginalized identities (e.g., being gender diverse and autistic) in autistic burnout. It must also be noted that the majority of participants had a tertiary education and the study excluded individuals with an intellectual disability, thus limiting the wider generalisability of the current findings. Third, although all participants scored above the cut-off score for elevated autistic traits on the AQ-Short, it was not possible to confirm what proportion of participants had a formal diagnosis or self-identified as autistic. This limitation also prevented a comparison of the CAT-Q scores among the two groups to assess measurement invariance. Nevertheless, it is important to include self-identifying people in autism research due to well established barriers to formal diagnosis (see Lewis, 2017; Sarrett, 2016). Fourth, as only a small proportion of participants reported an early autism diagnosis (8.4%), the influence of autistic burnout on younger autistic people was unclear. Fifth, the data screening process may not have eliminated all spurious responses. Sixth, method variance could not be controlled for to determine divergent validity among the burnout, depression and fatigue measures which may have influenced the results. Finally, while we asked participants to self-report any co-occurring conditions, we did not ask participants to specify whether they were currently experiencing depression.

Implications and future directions

The present study compared the psychometric properties of the ABM and CBI-P and concluded that the ABM and *Emotional Exhaustion* subscale of the CBI-P were both valid preliminary screening tools for autistic burnout in the current sample, although further psychometric testing is required. The development of robust and valid measures is important to estimate the prevalence of autistic burnout and counteract poor awareness among healthcare providers, which can contribute to misdiagnosis, inflexibility, incorrect treatment, and to autistic people mistrusting healthcare professionals (Malik-Soni et al., 2022; Nicolaidis et al., 2015). Future studies could test the psychometric properties of an abbreviated version of the ABM, as suggested by the S-L results presented in this study. Future studies could further examine the dimensionality of the CBI-P to determine whether it is more appropriate to interpret a total score or subscale scores with autistic samples.

Alternatively, new screening tools that would require respondents to agree or disagree with them could be developed to operationalize the core characteristics of autistic burnout. An algorithm that standardizes responses could then be developed allowing clinicians to

assign a 'provisional diagnosis'. This process would be more rigorous than simply asking people whether they are experiencing autistic burnout. It would also improve our understanding of the characteristics of autistic burnout and how they differ (or not) from depression or other internalizing conditions. Further qualitative studies are also needed to clarify how autistic people differentiate between autistic burnout and depression experiences (e.g., precipitating factors, symptoms, impact, and recovery).

Our findings showed the ABM is primarily a unidimensional measure, however, its items grouped into factors that reflected those reported in qualitative research, and provided insights into the cognitive, functional, and behavioral impact of autistic burnout. While the ABM and CBI-P-E were equally able to accurately detect self-reported autistic burnout among our study participants, an advantage of the ABM over the CBI-P is that the ABM captures unique facets of autistic burnout, beyond the hallmark symptom of exhaustion, likely because it was designed using a community-based participatory research approach in consultation with autistic people. The additional information the ABM can provide would also be helpful in clinical settings to develop targeted support plans for individuals, and in future burnout research. Future research should include participants who represent a broad spectrum of autistic people, particularly those with diagnosed depression, to investigate the potential overlap between autistic burnout and depression. These studies could use bifactor ESEM techniques to explore factors common and/or unique to each syndrome. Inclusion of autistic burnout in future mental health and well-being research could also assist in the examination of burnout and its impact. Finally, the ABM should be used in prospective studies to examine its measurement invariance and test–retest reliability.

Conclusion

As one of the first studies to comprehensively validate the ABM, our results are promising and indicate the ABM is a reliable preliminary screening tool for autistic burnout. However, rigorous work is needed to further understand the profile of autistic burnout and to elucidate similarities and differences with depression to ensure that measures are grounded in sound theoretical and clinical foundations. The ABM would greatly benefit from further validation with larger, balanced samples of autistic people, especially males and gender diverse individuals, and those with higher support needs.

Findings from this and Arnold et al.'s (2023a) study suggested some overlap between autistic burnout and depression; therefore, it remains to be seen whether autistic burnout could more accurately be considered a form of 'autistic depression'. Regardless, acknowledging an overlap between autistic burnout and depression could lead to two-pronged treatment approaches, similar to those suggested by Ahola et al. (2005), where external factors such as sensory and cognitive demands could be addressed with lifestyle changes (e.g., wearing noise-canceling headphones, working from home, or career change), and internalizing (depressive) factors could be treated with therapy or medication. We must be cognisant, however, not to focus on assigning labels at the expense of validating what autistic people tell us is a pervasive and debilitating experience that demands urgent awareness and support.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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