

A Systematic Review of the Predictions of the Interpersonal–Psychological Theory of Suicidal Behavior in Autistic and Possibly Autistic Individuals.

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Article

Keywords: autism, interpersonal theory of suicide, thwarted belongingness, acquired capability

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6 Behavior in Autistic and Possibly Autistic Individuals.

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Abstract

12 Autistic individuals face a heightened risk of suicide. Over the past five years, the Interpersonal
13 Theory of Suicide (IPTS) has gained attention as a framework for understanding this
14 vulnerability. This review systematically searched seven databases, identifying 10 studies that
15 met inclusion criteria. Findings highlight the importance of IPTS facets in predicting suicidality
16 in autistic individuals but reveal differences compared to non-autistic individuals. The review
17 discusses the IPTS's relevance in explaining suicidality among autistic populations, emphasizing
18 unique pathways compared to the original model. Given the limited research on this topic,
19 further studies are needed, particularly on interactions between all three IPTS facets, to better
20 understand suicidality in autistic individuals.

21 *Keywords: autism, interpersonal theory of suicide, thwarted belongingness, acquired*
22 *capability*

A Systematic Review of the Predictions of the Interpersonal–Psychological Theory of Suicidal Behavior in Autistic and Possibly Autistic Individuals.

Every year, over 700,000 lives are lost to suicide, rendering it a global public health crisis (World Health Organisation, 2019). Notably, suicide affects individuals diagnosed with autistic spectrum disorders¹ (ASD; henceforth referred to as autistic people²) disproportionately, with recent reviews estimating up to 47% of autistic individuals having attempted suicide in their lifetime (Newell et al., 2023). Research speculates that this heightened vulnerability to suicide in autistic people is often unique to the myriad of difficulties that they face as a direct result of their traits³, such as unmet support needs (Cassidy et al., 2018), psychiatric illness (Kolves et al., 2021), self injury (Blanchard et al., 2021), camouflaging of autistic traits, and unemployment (Cassidy et al., 2018). Importantly, death by suicide is entirely preventable and many recent interventions have been largely effective at reducing these deaths in non-autistic individuals (Hofstra et al., 2020), however, limited research or effective interventions exist for their autistic counterparts (Hedley & Uljarevic, 2018; O’Halloran et al., 2022). To maximise effectiveness of suicide prevention interventions, they often rely on the use of theoretical models, which although somewhat effective at explaining suicide in non-autistic individuals, remain largely untested in the autistic population (Moseley et al., 2022a). Due to the specific traits seen in autistic individuals that heighten their vulnerability to suicide, it is not yet known to what extent these theories can be applied to the autistic population. As a result, without autism specific iterations

¹ Use of the term ‘disorder’ is a topic of ongoing debate. Due to the lack of consensus in the literature on the preferred terminology, this review will use language consistent with the The Diagnostic and Statistical Manual of Mental Disorders (5th ed.; American Psychiatric Association, 2013), using the term “disorder.”

² Terminology debates extend to the use of “person-first language” (PFL) or “identity-first language” (IFL). In this review, IFL will be used, referring to individuals diagnosed with ASD as “autistic people.”

³ This review will refer to autistic “traits” as opposed to “symptoms” as this is the language preferred by the autistic community (Keating et al., 2023).

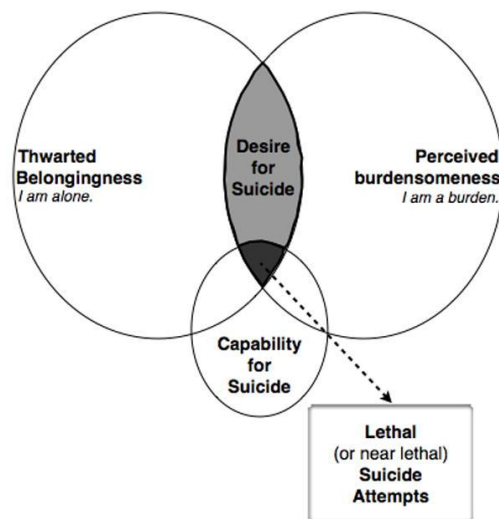
of theoretical models of suicide, or adequate research in autistic populations, interventions to prevent suicide in such populations may not be maximally effective. However, through leveraging existing theories through the lens of the specific characteristics that heighten an autistic individuals risk of suicide, relevant iterations can be proposed, thus equipping clinicians with the tools to understand suicide risk in this specific population, and subsequently prevent suicide in autistic individuals (Cassidy et al., 2020).

Theoretical Conceptualisations of Suicide

One of the most influential theoretical conceptualisations of suicide is the Interpersonal Psychological Theory of Suicide (IPTs; Joiner et al., 2005; Van Orden et al., 2010) which suggests that suicide is as a result of the interaction between three constructs: (1) Thwarted Belongingness, (2) Perceived Burdensomeness, (3) Acquired Capability (see Figure 1).

Figure 1

The Interpersonal Psychological Theory of Suicide.



Note. Reprinted from “The interpersonal theory of suicide” by Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner Jr, T. E, 2010, *Psychological review*, 117(2), 575.

53 **Thwarted Belongingness**

54 Social isolation has been found to be one of the most reliable predictors of suicidal
 55 ideation and suicide attempts stemming from the fundamental human psychological need to
 56 belong (Baumeister & Leary, 1995). When an individual's need to belong is unmet, this leads to
 57 a plethora of negative health outcomes, such as suicidal ideation (Verhagen et al., 2018). In the
 58 IPTS, this unmet need to belong is termed thwarted belongingness and consists of two facets: (1)
 59 loneliness and lacking social connections, and (2) the absence of reciprocal caring relationships
 60 (Van Orden et al., 2010). Each facet of thwarted belongingness encompasses the many
 61 potentially influential risk factors related to the construct (see Figure 2).

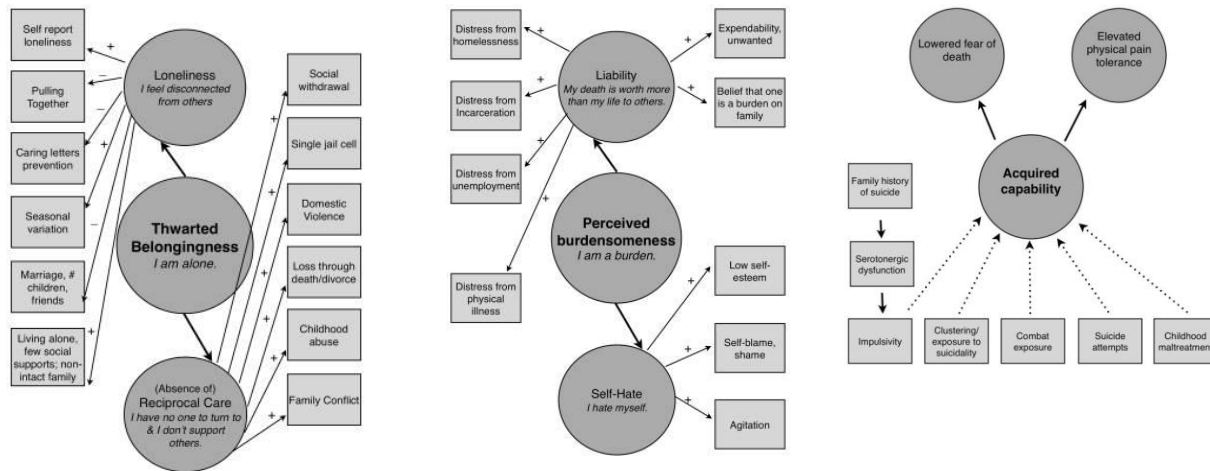
62 **Perceived Burdensomeness**

Another facet of the IPTS relates to the incorrect calculation made by an individual that their death is worth more to others than their life, referred to as perceived burdensomeness (Van Orden et al., 2010). Perceived burdensomeness comprises perceptions of liability and self-hate. Importantly, the concept that these are *perceived* is important to note; it may be that there is no objective presence of liability, however, it is the perception of such liability that results in perceived burdensomeness (Van Orden et al., 2010). As with thwarted belongingness, each component of perceived burdensomeness encompasses the empirically supported risk factors associated with them (see Figure 2).

Acquired Capability

Humans have an innate fear of pain and death, and therefore to be able to engage in suicidal behaviours, an individual must lose some of this fear (Van Orden et al., 2010). According to the IPTS, an acquired capability for suicide develops in a dose-response to lifetime experiences of painful and/or fear-inducing experiences, meaning that the more exposure to these experiences an individual has, the more their acquired capability for suicide develops, which in turn lowers fear of death and elevates an individual's pain tolerance (Van Orden et al., 2010; see Figure 2).

80

Figure 2*The Interpersonal Psychological Theory of Suicide Constructs and their Composite Parts*

Note. Reprinted from “The interpersonal theory of suicide” by Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner Jr, T. E, 2010, *Psychological review*, 117(2), 575.

81 IPTS Predictions

82 The IPTS posits several hypotheses relating to the effects of the constructs alone, and
 83 their interactions on suicidality. According to the IPTS, thwarted belongingness and perceived
 84 burdensomeness are sufficient causes of passive suicidal desire, with the presence of one causing
 85 passive suicide desire, culminating in thoughts such as “I wish I was dead”. The simultaneous
 86 presence of thwarted belongingness and perceived burdensomeness, when accompanied by
 87 feelings of hopelessness regarding the changing of these two states (Joiner et al., 2005),

transforms a passive suicidal ideation into an active suicidal ideation (“I want to kill myself”). The presence of suicidal ideation, accompanied by a lower fear of death (a component of acquired capability) serves as the conditions for suicidal ideation transforming into suicidal intent which can subsequently lead to lethal or near lethal suicide attempts (see Figure 1; Van Orden et al., 2010). An outcome of attempted suicide is therefore most likely to occur in the context of thwarted belongingness, perceived burdensomeness (and hopelessness regarding both), reduced fear of suicide, and elevated physical pain tolerance (components that sum to acquired capability).

Since the emergence of the IPTS, considerable research has been conducted on the various constructs to assess the validity of these hypotheses. Chu et al. (2017) conducted a meta-analysis of these predictions, with their results generally substantiating the main predictions of the theory. Both thwarted belongingness and perceived burdensomeness alone were associated with increased suicidal ideation, and their simultaneous presence was significantly correlated with suicidal ideation, beyond their main effects. Alone, acquired capability was related to suicide attempts and suicidal ideation, however with weak effects, which does not support the IPTS predictions. Interaction between all three components (thwarted belongingness, perceived burdensomeness, acquired capability) was also associated with a greater number of suicide attempts, beyond the main and two-way interactions. However, this three way interaction was not significant when considering attempt history measured dichotomously, which may suggest that measuring attempt history dichotomously is too simplistic, and alternative measurements may present a more accurate picture of this interaction. Generally, this analysis supports the findings of the IPTS, albeit with relatively weak effect sizes, which challenge the utility of

employing the IPTS to predict suicide risk however this is not unique to the IPTS as it corresponds with the broader suicide risk factor literature (Chu et al., 2017).

IPTS in the Context of Autism

Autistic traits share significant overlap with the constructs of the IPTS.

Thwarted Belongingness

Notably autism is characterised by persistent challenges across three domains, one of which is social communication (American Psychiatric Association, 2013). Due to the challenges in this area, autistic individuals often engage in camouflaging, which is the process whereby an individual masks and compensates for their traits to fit in socially with others (Cage et al., 2019). Camouflaging indicates a feeling of lacking acceptance in society, and subsequently thwarted belongingness. As camouflaging does not typically occur in non-autistic populations, this may be a risk factor specific to autistic individuals in relation to the IPTS (Cassidy et al., 2020). Many autistic individuals also struggle to form and maintain relationships with others, whether as a result of their own traits, or a lack of understanding from others, and this is associated with reduced social belonging (Cage et al., 2018). Similarly, the double-empathy problem (the expectation that autistic people communicate social preferences and emotional states according to non-autistic norms; Milton, 2012) can confer an additional risk for thwarted belongingness as the pressure to conform to non-autistic norms and misunderstandings can contribute to feelings of alienation (Chapple et al., 2021).

Perceived Burdensomeness

Autistic individuals also frequently report disproportionate rates of homelessness (Stone, 2019), incarceration (Fazio et al., 2012), physical illness (Ward et al., 2023), and unemployment (Riedel et al., 2015), all of which contribute to perception of liability and subsequent perceived burdensomeness. These perceptions stem from a sense of reliance on others for resources or support for autistic individuals to live their life which can, over time, result in feelings of burdensomeness.

Acquired Capability

Compared to their non-autistic counterparts, autistic individuals are at greater risk of experiencing adverse childhood experiences which refer to traumatic events in childhood (Hartley et al., 2023). Exposure to trauma also appears to potentially continue across the lifespan, with autistic individuals showing higher rates of PTSD than non autistic individuals (Haruvi-Lamdan et al., 2020). Repeated exposure to this trauma may lower their fear of death to the point that suicide no longer appears alarming (Joiner, 2015; Smith & Cukrowicz), and elevate their physical pain tolerance, subsequently establishing their acquired capability for suicide.

Previous Reviews

The past decade has drawn attention to the heightened vulnerability to suicide for autistic individuals, with a total of seven systematic reviews of suicide and the associated risk factors in autistic individuals published (Hedley & Mirko, 2018; Mournet et al., 2023; Newell et al., 2023; O'Halloran et al., 2022; Richa et al., 2014; Segers & Rawana, 2014; Zahid & Upthegrove, 2017).

Generally, a heightened vulnerability to suicide was identified in these reviews, however, great variance in the prevalence of suicidal ideation and suicide attempts was identified, with estimates of overall suicidality ranging from 7% (Seegers & Rawana, 2014) to 50% (Zahid &

Upthegrove, 2017). Estimates of specific components of suicidality were reported with similar variance, ranging from 11% (Hedley & Mirko, 2018) to 72% (Zahid & Upthegrove, 2017) of samples experiencing ideation and 1% to 35% of samples having a history of attempting suicide (Hedley & Mirko, 2018).

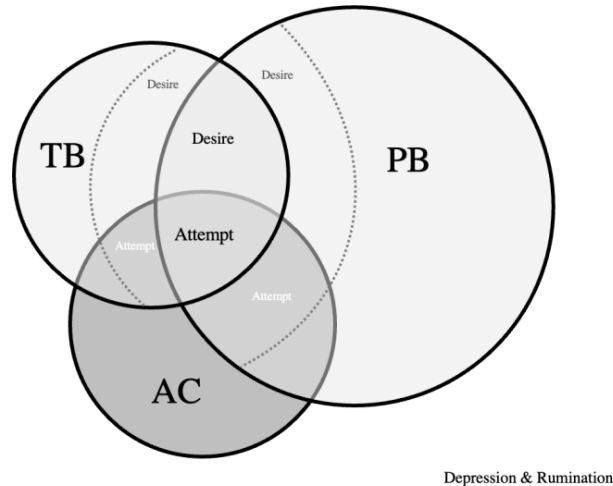
These reviews have further identified a wide range of risk factors for suicidality in autistic individuals, however, the literature on protective factors is more limited. Demographic characteristics including Black or Hispanic race, male sex, lower levels of education, and lower socioeconomic status were frequently identified as risk factors in autistic populations (Hedley & Mirko, 2018; Segers & Rawana, 2014; Zahid & Upthegrove, 2017). Psychosocial stressors in the form of peer victimisation, behavioural problems, and a range of mental health conditions were similarly identified as risk factors in autistic populations (Hedley & Mirko, 2018; Newell et al., 2023; O'Halloran et al., 2022; Zahid & Upthegrove, 2017). Notably, these psychosocial stressors exhibit potential overlap with the constructs of the IPTS, despite not being directly measured or labelled as such.

To date, only one (unpublished) systematic review of IPS in autistic individuals exists: a Master's thesis (Grieve, 2023), however, due to the lack of established papers within the literature, their review took a systematic scoping approach instead. In their review of 37 papers, significant prevalence of suicidality was identified in autistic individuals. Generally, the components of IPTS were supported, however, an autism-specific version of the IPTS, known as ITS-A (see Figure 3), was proposed. Rather than replacing or adding components, Grieve (2023) extended the model, acknowledging the importance of both stable and dynamic elements in providing a more comprehensive approach of suicidality in autistic individuals. Due to their findings that autistic individuals exhibit higher levels of perceived burdensomeness compared to

175 their non-autistic counterparts, this construct was enlarged in the model. Further, perceived
176 burdensomeness or thwarted belongingness alone were found to potentially drive an individual
177 towards suicidal ideation, and therefore dotted lines were added to allow these constructs to
178 overlap with acquired capability, even without the other component. Notably, this review
179 interpreted measures to be related to constructs of the IPTS and therefore only a handful of the
180 included studies directly measured constructs of the IPTS; subsequently, due to the lack of direct
181 measures of constructs, the findings may be too unspecific to draw accurate conclusions
182 regarding the application of the IPTS to autistic individuals.

Figure 3

Proposed ITS-A



Note. AC: Acquired Capability; TB: Thwarted Belongingness; PB: Perceived Burdensomeness; Desire: desire for suicide; Attempt: Lethal (or near lethal) suicide attempt; Depression & Rumination: The exacerbating effect of depression and rumination on all features of the ITS constructs. Reprinted from “Using the Interpersonal Theory of Suicide to Inform Our Understanding of Suicidality Risk in Autism Spectrum Disorder: A Systematic Scoping Review” by Grieve, C. M., 2023.

183 **Current Review**

184 Due to the focus of existing reviews more broadly on suicide, as opposed to suicide
185 theories, such as the IPTS and its application to autistic individuals, this review seeks to fill that
186 gap by systematically reviewing the literature on IPTS in the context of autism. Importantly, this
187 review will loosely replicate a systematic review of the IPTS in the general population (Ma et al.,
188 2016) in order to assess the relevance of the IPTS in autistic individuals.

189 **Research Question**

190 This review aims to answer one main question: “To what extent does the IPTS predict
191 suicidality in autistic individuals and those with high autistic traits?”. To address this question,
192 three specific aims have been identified: (1) To determine risk factors for suicidality through the
193 lens of the IPTS autistic individuals and those with high autistic traits; (2) To explore the
194 hypotheses of the IPTS relating to the main effects and interactions of the constructs; (3) To
195 identify any autism-specific constructs associated with the IPTS.

196 **Methodology**

A systematic review was conducted in July 2024 in accordance with the parameters and checklist detailed in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA, Page et al., 2021).

Search Strategy

Relevant literature was identified through a search of the following electronic databases: Ovid (meta-search engine) and Web of Science. The following search terms and their synonyms were used: “Autism”, “Asperger”, “Suicide”, “Thwarted Belongingness”, “Perceived Burdensomeness”, and “Acquired Capability”. See Table 1 for a complete list of Boolean search strings.

Table 1

Boolean Search Strings	
Database	Search String
OVID (CAB Abstracts, Embase, Global Health Archive on TRIAL, Inspec Archive, International Pharmaceutical Abstracts, MEDLINE (B), APA PsychInfo, Ovid, APA)	1.(ASC or ASD or Asperg* or Autis* or 'high#functioning' or 'pervasive developmental disorder' or PDD or HFA).ab
	2.(suicid* or 'suicide plans' or 'suicide attempts' or 'attempted suicide' or parasuicide 'self-harm' or 'self-inj*').ab
	3.(thwarted belong* or perceived burden* or acquired capability).ab
	4.(1 and 2 and 3)

Web of Science ((AB=(Asperg* or Autis*)) AND AB=(suicid*)) AND
AB=(Interpersonal psychological)

Selection Criteria

Articles were included in the review if they were written in English, used quantitative measures of ITS constructs, were observational, and published after 1992 (as 1992 coincides with the date when Asperger’s Syndrome was recognised in the WHO International Classification of Diseases and thus autistic people without intellectual disability may be more frequently included in the literature). Table 2 details the inclusion and exclusion criteria.

Table 2
Systematic Review Inclusion and Exclusion Criteria

Inclusion	Exclusion
- Employed quantitative measures of IPTS constructs - Observational studies (e.g. cross-sectional, cohort, case-control) - Published/available in English - Published data - Published after 1992	- Employed qualitative methods - Case studies, reviews and commentaries - Unavailable in English - Unpublished data

Screening

Screening consisted of three phases. 1) Removal of duplicate articles, 2) screening of titles and abstracts, 3) evaluation of full texts. Additionally, ‘reference tracking’ was used to identify any articles not retrieved through database searches. This involved scanning the reference lists of the included articles and using individual judgement to determine whether to examine articles further (Hirt et al., 2023). All screening was initially conducted by the author, and then reviewed by SC.

Extraction

Characteristics of each study were extracted using a standardised template based on the categories specified in Table 3 which was adapted from an existing review of IPTS in autistic individuals (Grieve, 2023).

Table 3

Data Extraction Categories

Category	Specifics Captured
Study characteristics	Author, Publication Year, Country of Origin, Study Design, Comparison Group
Sample characteristics	Sample Size, Mean Age (SD), Percentage of Male Participants, Autism Diagnosis Tool
Suicidity measures	Type of Suicidity, Standardised Measure Employed
IPTS measures	Construct Measured, Standardised Measures Employed

223 Risk of Bias

224 After extraction, each study was then formally evaluated in terms of its quality. All
225 studies were assessed using a modified version of the Newcastle-Ottawa Scale (NOS; see
226 O'Halloran et al. 2022 for details of modifying the NOS) to perform a risk of bias assessment
227 with an emphasis on the following criteria: (1) sample representativeness, (2) sample size, (3)
228 comparability between respondent and non-respondent characteristics, (4) ascertainment of
229 suicidal thoughts and/or behaviors (5) ascertainment of IPTS constructs, and (6) quality of
230 descriptive statistics reporting. Each study was assigned a summary score in terms of its risk of
231 bias ranging from 0 (high risk of bias) to 6 (low risk of bias). Studies were deemed to be of low
232 risk of bias (≥ 3 points) or high risk of bias (< 3 points; Rotenstein et al., 2016). The rating
233 procedure is reported as in Appendix B. Regardless of risk of bias scores, all studies were
234 retained in the review.

235 Evidence Synthesis

236 Given the heterogeneity of the data extracted, a narrative synthesis approach (Verescove
237 et al., 2024) was taken.

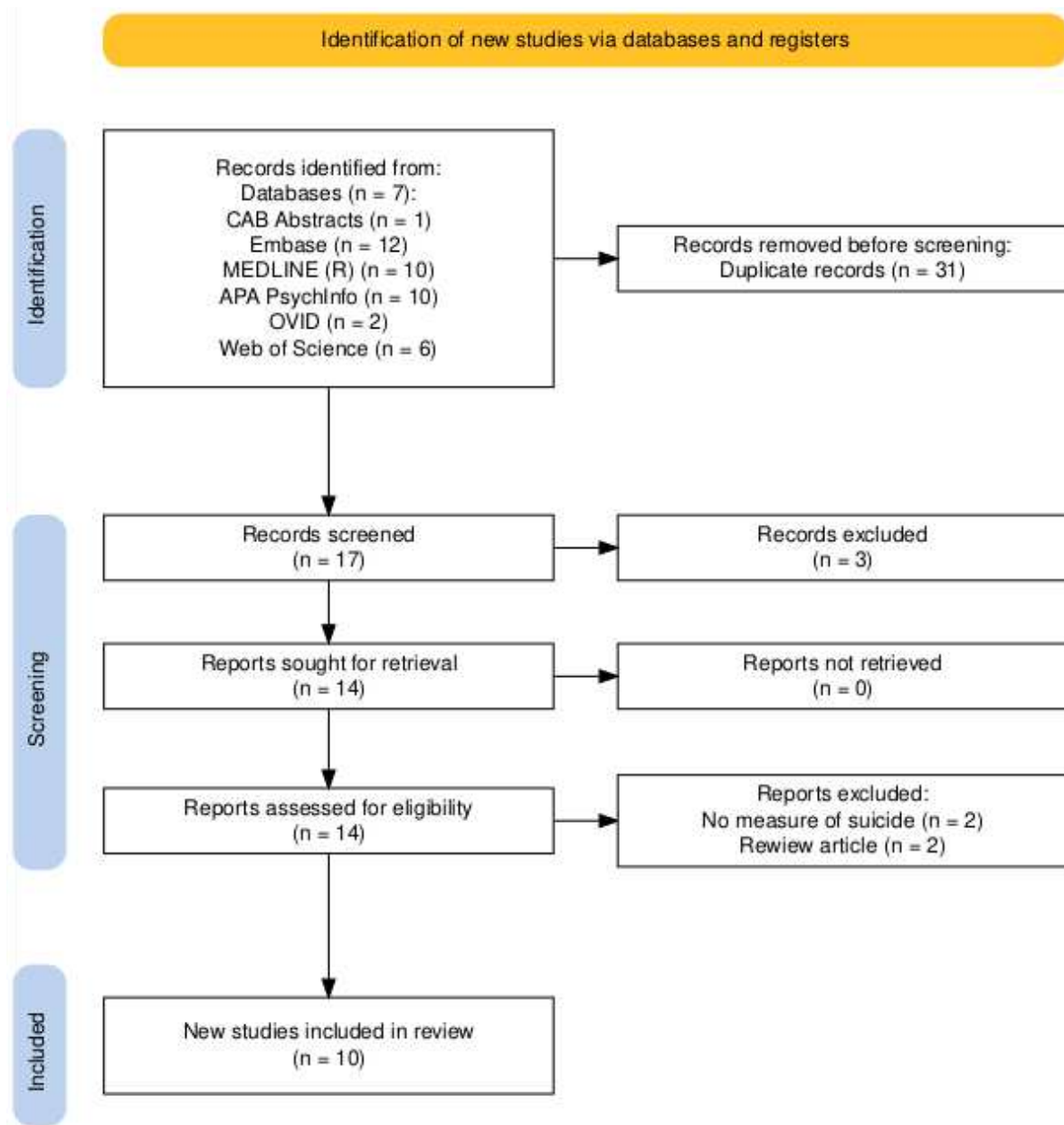
238 Results

239 Database searches conducted in July 2024 resulted in 38 articles. After excluding 22
240 duplicates, the remaining 16 studies were screened based on their title and abstract, resulting in
241 two studies being excluded in this initial screening due to not relating to the IPTS. After this, the
242 14 remaining studies were reviewed based on their full text, with four more studies excluded for
243 failure to meet the inclusion criteria. The 10 remaining studies met the inclusion criteria and

244 were included in the review. The PRISMA diagram (Figure 4) depicts the reasons for exclusion
245 of articles during examination of the full texts.

246

247

Figure 4*PRISMA Flow Diagram*

248 Study Characteristics

249 Of the 10 included studies, all were cross sectional, with 70% having been conducted in
 250 the UK (Cassidy et al., 2020; Moseley et al., 2022a; Moseley et al., 2022b; Moseley et al., 2023;
 251 Pelton & Cassidy, 2017; Pelton et al., 2020; Pelton et al., 2023) and the remaining 30%
 252 conducted in the US (Dow et al., 2019; Smith et al., 2021; Stanley et al., 2021). Only 30% of the
 253 studies made use of a comparison group. Across the included studies, the number of participants
 254 ranged from 98 to 626. The mean age of the autistic (or possibly autistic) individuals ranged
 255 from 21.09 to 41.9. All studies reported the gender of participants, with the percentage of male
 256 participants ranging from 23.3% to 68.6%. Data collected in all studies was self-reported by the
 257 participant. Overlapping samples were described in one group of studies: Moseley et al. (2022a),
 258 Moseley et al. (2022b), and Moseley et al. (2023).

259 Comprehensive information on the sample characteristics can be found in Table 4.
 260 Additional charting of further characteristics can be found in Appendices C and D.

Table 4

Characteristics of Included Studies and Their Autistic Participants

Author(s) and Year	Country	N	Mean Age (SD)	% Male	Autism Diagnosis	Data Source	ROB Score
Cassidy et al. (2020)	UK	160	21.09(6)	13.1	AQ-S	Self	5
Dow et al.	US	98	28.2 (10.9)	68.4	Documentation	Self	5

(2019)							
Moseley et al.(2022a)	UK	314	41.9 (13.4)	26.8	Self-report	Self	5
Moseley et al. (2022b)	UK	626	41.9 (13.4)	26.8	Self-report	Self	5
Moseley et al. (2023)	UK	314	41.9 (13.4)	26.8	Self-report	Self	5
Pelton & Cassidy (2017)	UK	163	21.58	33.7	AQ	Self	5
Pelton et al. (2020)	UK	463	41.55(13.9)	49	AQ Short Form	Self	6
Pelton et al. (2023)	UK	350	41.9 (range 18 – 90)	35.4	AQ Short Form	Self	6
Smith et al. (2021)	US	287	28.61(7.38)	68.6	AQ Short Form	Self	5
Stanley et al. (2021)	US	292	28.67(7.40)	68.5	AQ	Self	4
<i>Note.</i> AQ: Autism Quotient; ROB: Risk of Bias							

The risk of bias assessment revealed that all (100%) of studies had a low risk of bias.

The IPTS

All 10 studies explicitly tested one or more components of the IPTS. 90% of the studies explored thwarted belongingness (Cassidy et al., 2020; Dow et al., 2019; Moseley et al., 2022a; Moseley et al., 2023; Pelton & Cassidy, 2017; Pelton et al., 2017; Pelton et al., 2020; Pelton et al., 2023; Smith et al., 2021; Stanley et al., 2021), 80% explored perceived burdensomeness (Dow et al., 2019; Moseley et al., 2022a; Moseley et al., 2023; Pelton & Cassidy, 2017; Pelton et al., 2017; Pelton et al., 2020; Pelton et al., 2023; Smith et al., 2021; Stanley et al., 2021) and 50% explored acquired capability (Dow et al., 2019; Moseley et al., 2022a; Moseley et al., 2023; Pelton et al., 2023). Only 40% of the studies explored the entire model (thwarted belongingness, perceived burdensomeness, and acquired capability). Table 5 shows the components of the IPTS measured in each study, as well as the validated measures used to study said concepts. Importantly, despite many studies exploring the constructs of the IPTS, not all exploring a certain construct went on to include this in relevant statistical testing. Table 6 shows whether the results of the test of the main effect and interaction effects of the IPTS were significant.

Table 5

Identified Components of the ITS, Relevant Validated Measures of the IPTS and Suicidality

Author(s) and Year	Thwarted Belongingness	Perceived Burdensomeness	Acquired Capability	Validated	Validated
				Measures of the IPTS Utilised	Measures of Suicidality Utilised

Cassidy et al. (2020)	X			PHQ-8, GAD-7, CAT-Q, SDES, INQ- 15	SBQ-R
Dow et al. (2019)	X	X	X	INQ, CSAQ, HDSQ, AOS	DSI-SS
Moseley et al.(2022a)	X	X	X	INQ-15	NSSI, SITBI
Moseley et al. (2022b)			X	PHQ-9, SITBI, ACWRSS	NSSI, SITBI
Moseley et al. (2023)	X	X	X	INQ-15	ACWRSS, SITBI
Pelton & Cassidy (2017)	X	X		INQ-15, CESD-R, SBQ-R	SBQ-R
Pelton et al. (2020)	X	X		INQ-10, GAD-7, PHQ-9	SBQ-R

Pelton et al. (2023)	X	X	X	INQ-10, ACC-FAD, VEQ	SBQ-R
Smith et al. (2021)	X	X		RBQ-2A, INQ, ACSS- FAD, PHQ-8	SRS
Stanley et al. (2021)	X	X		MPSS, RBQ- 2A, INQ, ERQ	SITBI

Note. ACSSFAD: Acquired Capability for Suicide Scale-Fearlessness of Death; AOS: Adult Outcomes Survey; CAT-Q: Camouflaging Autistic Traits Questionnaire; CES-D: The Center for Epidemiological Studies-Depression Scale Revised; CSAQ: Cognitive-Somatic Anxiety Questionnaire; DSI-SS: Depressive Symptom Inventory-Suicidality Subscale; ERQ: Emotion Regulation Questionnaire; GAD-7: Generalised Anxiety Disorder-7; HDSQ: Hopelessness Depression Symptom Questionnaire; INQ: Interpersonal Needs Questionnaire; INQ-10: The Interpersonal Needs Questionnaire-10; INQ-15: The Interpersonal Needs Questionnaire-15; NSSI: The Non-Suicidal Self-Injury Assessment Tool; MPSS: Multidimensional Scale of Perceived Social Support; PHQ-8: Patient Health Questionnaire-8; PHQ-9: Patient Health Questionnaire-9; RBQ-2A Repetitive Behaviours Questionnaire-2 for Adults; SBQ-R: Suicide Behaviour Questionnaire Revised; SITBI: Self-Injurious Thoughts and Behaviours Interview; SDES: Short Defeat and Entrapment Scale; SRS: Suicide Rumination Scale; VEQ: Vulnerability Experience Quotient.

According to the IPTS, thwarted belongingness is associated with passive suicidal ideation.

Suicide Ideation

Seven tests of the main effect of thwarted belongingness on suicidal ideation were conducted, with 57% of these reporting significant associations and the remaining 43% being non-significant. Sample sizes among the significant studies ranged from 163 to 350, with a mean of 240. For the non-significant studies, the sample sizes ranged from 98 to 463, with a mean of 284.3. Of the significant studies, 75% demonstrated a small but significant association between thwarted belongingness and suicidal ideation, whilst only one demonstrated a moderate to strong association (Smith et al., 2021).

Thwarted belongingness was found to predict suicidal ideation across university students, the general population, and members of the active military. Thwarted belongingness was frequently identified to mediate the relationship between autistic traits and suicidal ideation (Cassidy et al., 2020; Pelton et al., 2020; Pelton & Cassidy, 2017; Smith et al., 2021). In a non-clinical sample of 163 young adults, Pelton and Cassidy (2017) found that as autistic traits increased, this reduced thwarted belongingness in a potentially diametric effect. Similarly, Cassidy et al. (2020) identified thwarted belongingness to mediate the relationship between autistic traits and suicidal ideation in another non-clinical sample. Pelton et al. (2020) also identified that autistic traits significantly attenuated suicidality in relation to thwarted belongingness, but no other facet of the IPTS. Smith et al. (2021) highlighted similar findings in a sample of 287 active members of the military, identifying that autistic traits, specifically

299 deficits in social skills, to be a meaningful bridge between thwarted belongingness and suicidal
300 ideation.

301 ***Suicide Attempt***

302 As expected, there was less research on the impact of thwarted belongingness on suicide
303 attempts, with only one study testing the main effect of thwarted belongingness on suicide
304 attempts (Pelton & Cassidy, 2017). These results were non-significant, in line with the
305 predictions of the IPTS.

306 **IPTS Main Effect: Perceived Burdensomeness**

307 According to the IPTS, perceived burdensomeness is associated with passive suicidal
308 ideation.

309 ***Suicide Ideation***

310 Eight tests of the main effect of perceived burdensomeness on suicidal ideation were
311 conducted, with 88% identifying a significant association and the remaining 12% reporting non-
312 significant associations. In the significant findings, the sample size ranged from 98 to 463, with
313 mean size being 284 participants. The non-significant study had 287 participants. Of the
314 significant studies, 86% demonstrated a small association between perceived burdensomeness
315 and suicidal ideation. The remaining articles did not include effect sizes.

316 Perceived burdensomeness was similarly found to predict suicidal ideation in a range of
317 samples, including university students, the general population and members of the active
318 military. Multiple different factors were found to either predict or mediate the relationship
319 between perceived burdensomeness and suicidal ideation. In a community sample of 98 adults,

Dow et al. (2019) identified that perceived burdensomeness mediated the relationship between loneliness, social dissatisfaction and suicide ideation, but thwarted belongingness did not. This underscores the significant impact of social functioning on burdensomeness, and subsequently suicidal ideation. Moreover, Pelton et al. (2020) identified the pathway between burdensomeness and suicidality to be attenuated in autistic individuals, but no other pathway in the IPTS was affected. Pelton and Cassidy (2017) further found that gender, age, depression, and level of autistic traits could predict perceived burdensomeness separately, but not in combination, suggesting that these each act as separate additive contributions to this experience.

Suicide Attempt

Three studies investigated the main effect of perceived burdensomeness on suicide attempts, with 100% identifying a significant association. The sample size ranged from 163 to 314, with a mean of 264 participants. All studies reported effect sizes, with 67% finding a small effect size and 33% finding a medium effect size.

Perceived burdensomeness was found to predict suicide attempts in university students and the general population. Pelton and Cassidy (2017) identified that autistic traits did not moderate the effects of perceived burdensomeness on suicide attempts in a non-clinical sample, indicating the impact of burdensomeness to be consistent, regardless of autistic traits. Interestingly, while Moseley et al. (2023) identified a significant effect of perceived burdensomeness on suicide attempts, female sex emerged as a stronger predictor of suicide attempts than perceived burdensomeness alone. In the same sample of 314 autistic adults, relationship status was found to be indirectly associated with suicide attempts via the effects on suicidal ideation.

342 **IPTS Main Effect: Acquired Capability**

343 According to the IPTS, acquired capability is not associated with any of the constructs of
344 the IPTS alone.

345 *Suicidal Ideation*

346 Three studies investigated the main effect of acquired capability on suicidal ideation,
347 with 67% identifying a significant association, and the remaining 33% finding a non-significant
348 result. In the studies with significant associations, the sample size ranged from 314 to 463 with a
349 mean of 389. The non-significant study had a sample of 98 participants. The significant studies
350 both reported small associations between acquired capability and suicidal ideation.

351 In an online study of 314 autistic adults, Moseley et al. (2022a) identified only the mental
352 rehearsal component of acquired capability to impact suicidal ideation, with a greater mental
353 rehearsal score associated with the presence of suicidal ideation with a stronger effect than that
354 of depression. Conversely, Pelton et al. (2020) identified lower overall levels of acquired
355 capability to be associated with suicidal ideation in a sample of 239 autistic adults.

356 *Suicide Attempt*

357 Only three studies investigated the main effect of acquired capability on suicide attempts.
358 All three reported a significant association between acquired capability and suicide attempts. The
359 sample size was 314 in all studies and the same participant group was used each time. Two
360 studies reported effect sizes, both of which demonstrated a small effect size.

361 Moseley et al. (2022a) identified that suicide attempts were directly and indirectly
362 predicted by acquired capability. When considering the different facets of acquired capability,

Moseley et al. (2022b) found that the reduced fear of death component of acquired capability, but not the elevated pain tolerance component, was a significant predictor of suicide attempts. Similarly Moseley et al. (2023) identified a reduced fear of death to differentiate between those with suicidal ideation and suicide attempts.

IPTS Interaction Effect: Thwarted Belongingness and Perceived Burdensomeness

According to the IPTS, the interaction between thwarted belongingness and perceived burdensomeness can give rise to active suicidal ideation.

Suicidal Ideation

Four studies investigated the interaction between thwarted belongingness, perceived burdensomeness and suicidal ideation. Three (75%) of these found a significant association, with a sample size ranging from 163 to 350, and a mean of 268. The sample size of the non-significant study was 314. All studies reported effect sizes, with one study reporting a small effect (Stanley et al., 2021), one reporting a medium effect size (Pelton & Cassidy, 2017) and one reporting a large effect size (Moseley et al., 2022a).

The interaction between thwarted belongingness and perceived burdensomeness was found to predict suicidal ideation across university students, the general population, and members of the active military. Moseley et al. (2022a) identified the interaction between thwarted belongingness and perceived burdensomeness to explain 53% of the variance in suicidal ideation, however, this effect was not greater than the effect of each construct alone. Additionally, autistic traits were also potentially involved in this interaction in other samples (Pelton & Cassidy, 2017; Stanley et al., 2021). Pelton & Cassidy (2017) found the interaction between thwarted belongingness and perceived burdensomeness to predict lifetime suicidality, In

contrast, Stanley et al. (2021) observed this interaction to only account for suicidal ideation since joining the military, highlighting the varying impacts based on sample characteristics.

Suicide Attempt

Two studies investigated the interaction between thwarted belongingness, perceived burdensomeness and suicide attempts. Only one (50%) of these identified a significant association, with a sample size of 463. The non-significant study had fewer participants, with 314. The significant study had a small effect size.

Although Moseley et al. (2022a) identified the interaction between thwarted belongingness and perceived burdensomeness to be significant, this interaction was no stronger than the impact of each individual construct. Conversely, Pelton et al. (2020) observed that despite the autistic group reporting greater thwarted belongingness and perceived burdensomeness scores than their non-autistic counterparts, the interaction effect was not significant for autistic individuals, but was for their non-autistic counterparts.

IPTS Interaction Effect: Thwarted Belongingness, Perceived Burdensomeness and Acquired Capability

According to the IPTS, the interaction between thwarted belongingness and perceived burdensomeness and acquired capability can give rise to suicide attempts.

Suicidal ideation

The interaction effect between all three constructs of the IPTS was only tested once on suicidal ideation, however, this reported a significant association. The sample size was 314. A large effect size was reported.

Moseley et al. (2022a) identified that the combination of all three constructs of the IPTS contributed to 17% of variance in suicidal ideation, accounting for more variance than just the interaction between thwarted belongingness and perceived burdensomeness. It was further identified that depression was a distinct contributor in both of these interactions.

Suicide Attempt

Similarly, only one study tested the interaction between the all three components of the IPTS and suicide attempts, again reporting a significant association. The sample size was 314. Again, the effect size was large.

Combining all constructs of the IPTS accounted for 20% of the variance in lifetime suicide attempts reported by Moseley et al. (2022a). This was a significantly greater proportion compared to the variance explained by depression and anxiety alone, underscoring the utility of the IPTS.

Additional Constructs

Several distinct constructs not associated with the IPTS model were found to be associated with suicidality in autistic individuals. These constructs included autistic traits (Cassidy et al., 2020; Pelton & Cassidy, 2017; Stanley et al., 2021), sex (Moseley et al., 2022a; Pelton & Cassidy, 2017), ADHD (Moseley et al., 2023), anxiety (Cassidy et al., 2020), and depression (Cassidy et al., 2020; Dow et al., 2019; Pelton & Cassidy, 2017).

Autistic traits were found to predict lifetime suicidality both alone (Cassidy et al., 2020) or through thwarted belongingness and perceived burdensomeness (Pelton & Cassidy, 2017).

Although the effect of autistic traits on suicidality through these mediators was observed across

all levels of autistic traits, the effect was slightly larger, albeit not statistically significant, at lower levels of autistic traits as measured by the AQ-short form. Autistic traits were also found to have a significant indirect effect on lifetime suicidality through camouflaging, defeat, and entrapment (Cassidy et al., 2020). Interestingly, in a military sample, higher levels of autistic traits increased the likelihood of both suicidal ideation and suicide attempts, but only since joining the military (Stanley et al., 2021).

Sex and/or gender was found to contribute to suicidal ideation, with males demonstrating lower ideation (Moseley et al., 2022a) in a sample of the general population. When gender was combined with age as a set of predictors, they were also found to contribute to perceived burdensomeness, which subsequently predicted suicidal ideation (Pelton & Cassidy, 2017)

In a sample of 314 members of the general population, suspected ADHD was indirectly associated with suicidal ideation through greater depression and perceived burdensomeness. Hyperactive and impulsive features were also associated with exposure to painful and provocative events through acquired capability (Moseley et al., 2023); both of these features were associated with more suicide attempts sequentially.

Anxiety was also associated with suicidal ideation, however, only in combination with depression (Cassidy et al., 2020) in which it accounted for 28% of variance in suicidal ideation.

Depression was associated with thwarted belongingness alone (Pelton & Cassidy, 2017), as well as thwarted belongingness and perceived burdensomeness in combination (Dow et al., 2021). Interestingly, depression interacted with autistic traits, accounting for 1.6% of the variation in thwarted belongingness (Pelton & Cassidy, 2017).

Table 6

<i>Statistical Significance of the Effects of IPTS Constructs on Suicide Ideation and Attempt</i>		
	No. tests included	% significant
TB on SI	7	4 (57%)
TB on SA	1	0(0%)
PB on SI	8	7(88%)
PB on SA	3	3(100%)
AC on SI	3	2(67%)
AC on SA	3	3(100%)
TB × PB on SI	4	3(75%)
TB × PB on SA	2	1(50%)
TB × PB × AC on SI	1	1(100%)
TB × PB × AC on SA	1	1(100%)

Note. TB = thwarted belongingness, PB = perceived burdensomeness, AC = acquired capability, SI = suicide ideation, SA = suicide attempt, × = interaction.

This systematic review represents the first of its kind conducted to assess the relevance of the IPTS in explaining suicidality among autistic individuals. A total of 10 studies that directly tested measures of suicidality and constructs of the IPTS were identified, the majority of which were published in the last five years, suggesting a growing interest in this area of research. Interestingly, the oldest study included in this review only dates back seven years (Cassidy & Pelton, 2017), demonstrating that it wasn't until over a decade after its conception that the theory was considered in the context of autism, despite the pressing national crisis of disproportionate autistic suicides being a well established issue.

Thwarted Belongingness

Thwarted belongingness was the most frequently explored component of the IPTS, tested by 90% of studies. According to the IPTS, presence of thwarted belongingness alone can result in passive suicidal ideation "I wish I was dead", however, this only becomes active suicidal ideation "I want to kill myself" in conjunction with perceived burdensomeness. Notably, more than half (57%) of studies identified a significant effect of thwarted belongingness on suicidal ideation, however, it is important to note that the validated measures of suicidality used in these studies did not consider passive suicidal ideation, and only measured active suicidal ideation. Subsequently, this reported effect of thwarted belongingness goes against the hypotheses of the IPTS, as active suicidal ideation was present without both proximal risk factors, weakening the potential application of the IPTS to autistic individuals. However, consistent with the IPTS, thwarted belongingness alone could not predict suicide attempts.

Across the reports, various different features of thwarted belongingness were explored such as dissatisfaction with one's social life (Dow et al., 2019), camouflaging (Cassidy et al.,

2020), being an outsider (Pelton et al., 2023), lacking caring friends (Pelton et al., 2023), deficits in social skills (Smith et al., 2021), and general social disconnectedness (Stanley et al., 2021). Generally, these are consistent with the features of thwarted belongingness reported in the original IPTS, however, when considering these in the context of the two dimensions of the IPTS (loneliness and absence of reciprocal care; Van Orden et al., 2010) they suggest a potential different weighting of each component. Reported features of thwarted belongingness appear to fall more consistently in the dimension of loneliness, as opposed to the (absence of) reciprocal care, indicating that this has a greater impact on suicidal ideation. While this is consistent with previous research identifying the importance of loneliness as a predictor of suicidal ideation (Hedley et al., 2018a; Hedley et al., 2018b), reciprocal care has also been associated with suicidal ideation (Hedley et al., 2018b) and therefore the lack of support for such finding in this review raises questions. The majority of studies included in this review utilised a variation of the INQ to assess thwarted belongingness and despite this assessing all aspects of thwarted belongingness, separate analyses for each facet were not conducted, and therefore conclusions can only be drawn from the reported overall findings. As a result, drawing exact conclusions as to the importance of each facet of thwarted belongingness in autistic individuals is challenging. Despite this, from the reported findings, it can be suggested that loneliness may have more impact on suicidal ideation than the absence of reciprocal care.

Interestingly, some of the reported features of thwarted belongingness were autism-specific, such as camouflaging (Cassidy et al., 2020) and deficits in social skills (Smith et al., 2021). Given that deficits in social skills are a defining characteristic of autism, further exploring their influence on suicidality presents a promising avenue for research and interventions to reduce their impact on loneliness. Interestingly, attempting to hide these characteristics

(camouflaging; Cook et al., 2021) was also associated with thwarted belongingness. This association is supported by the findings that engaging in camouflaging can result in feelings of detachment due to obstructing the expression of one's true self (Ragins, 2008).

Perceived Burdensomeness

Perceived burdensomeness was explored as a concept slightly less than thwarted belongingness (80% of studies). As with thwarted belongingness, according to the IPTS, perceived burdensomeness alone should only result in passive, rather than active suicidal ideation, however, the majority (88%) of tests exploring the effect of perceived burdensomeness on suicidal ideation were significant, challenging the application of the model to autistic suicidality. Of the significant tests, the average effect size was generally greater compared to thwarted belongingness, suggesting it to be a potentially greater predictor of suicidality. The IPTS further hypothesised that perceived burdensomeness alone does not predict suicide attempts, however this assumption was challenged in the context of autistic individuals, by all of the studies which tested the effect of perceived burdensomeness on suicide attempts reporting significant findings.

Interestingly, studies in the general population have also identified perceived burdensomeness to be more relevant than thwarted belongingness in relation to suicidality (Hallensleben et al., 2019; Rogers & Joiner, 2019; Wolford-Clevenger et al., 2020) suggesting that any modification to the IPTS to better include these findings may not be autism-specific, and instead apply to both autistic and non-autistic individuals. However, as with thwarted belongingness, perceived burdensomeness was largely measured by the INQ and subsequent analyses of the influence of the two facets of perceived burdensomeness (liability and self hate)

were not conducted, making it challenging to identify the most common sources of this feeling in autistic individuals. Despite not being explicitly tested, indicators of the liability dimension within perceived burdensomeness, specifically unemployment, were identified in a large proportion of studies, which hints at the importance of the dimensions of perceived burdensomeness, despite failing to separate them.

Acquired Capability

Of all the constructs of the IPTS, acquired capability was tested in the least studies (50%). According to the IPTS, the presence of the acquired capability facet in combination with both thwarted belongingness and perceived burdensomeness transforms suicidal ideation into suicide attempts, and therefore the presence of acquired capability should not predict suicidality. Interestingly, results in autistic populations, although somewhat limited, appear to contrast this, with 67% of studies on acquired capability finding it to predict suicidal ideation, and 100% of studies on acquired capability alone finding it to predict suicide attempts.

Traumatic events act as an important risk factor associated with lifetime suicidality through acquired capability, with multiple studies reporting this relationship in autistic individuals (Pelton et al., 2020; Moseley et al., 2023). Pelton et al. (2020) reported an indirect effect of lifetime trauma on lifetime suicidality via acquired capability and a direct effect of lifetime trauma on suicidality. Moseley et al. (2023) drew an interesting parallel in autistic individuals with co-occurring ADHD, highlighting that hyperactivity and impulsivity were associated with suicide attempts via painful and provocative events and acquired capability sequentially, whilst also exerting an indirect effect on suicide attempts via exposure to painful and provocative events alone. In non-autistic populations, this relationship appears to be similar,

with painful and provocative events contributing to acquired capability and acting as a differentiating contributor between those who attempt suicide, those who ideate about suicide, and controls (Bayliss et al., 2022).

Non suicidal self injury (NSSI) was also associated with acquired capability, with a higher frequency of NSSI predicting suicide attempts via the dimension of a reduced fear of death in autistic individuals (Moseley et al., 2022a; Moseley et al., 2022b). Interestingly, reduced fear of death as a dimension of acquired capability was similarly identified to differentiate between suicidal ideation and suicide attempts (Pelton et al., 2020; Moseley et al., 2022a), and act as a highly important predictor within the IPTS. However, the lack of evidence supporting the relevance of a heightened pain tolerance may be as a result of the chosen measure of acquired capability, which is commonly the ACWRSS, only including two items for pain tolerance. It may be that the scale itself is at fault, however, this difference may also simply be that pain tolerance is less relevant for suicidality as pain perception is often atypical in autistic populations (Williams et al., 2019); regardless, even in the general population this facet has been queried (Moseley et al., 2022b; Rogers & Joiner, 2021).

IPTS Interactions

Notably, the main application of the IPTS regards the interactions between constructs to bring about suicidal ideation or suicide attempts. According to the model, the combination of thwarted belongingness and perceived burdensomeness leads to suicidal ideation; these interactions were investigated less than the main effects of individual constructs, with only four studies investigating the effect of thwarted belongingness and perceived burdensomeness on suicidal ideation, and an additional two investigating this effect on suicide attempts. Seventy-five

percent of studies testing the effect of this interaction on suicidal ideation identified support for the model, and contrary to the hypotheses of the model, 50% of studies found support for the ability of this interaction to predict suicide attempts. Interestingly, despite identifying support for the model, Pelton et al. (2020) reported this interaction to explain less variance in the autistic group, compared to the non-autistic group, suggesting that the constructs other than those in the IPTS may explain suicidality in autistic populations, a notion which has been supported by research highlighting associated constructs that interact with facets of the IPTS to result in suicidality. Similarly, Moseley et al. (2022b) highlighted that despite the interaction between thwarted belongingness and perceived burdensomeness being significant, the combined effect was no larger than the effect of each construct alone. Both of these findings highlight that, regardless of the significant findings, the interaction between thwarted belongingness and perceived burdensomeness in autistic individuals may be unable to fully predict suicidal ideation, whether due to other constructs being involved, or the potential that only one of these constructs is required to result in suicidality, which was supported in a large proportion of the research. Contrary to the hypotheses of the IPTS, Moseley et al. (2022a) identified that the combination of thwarted belongingness and perceived burdensomeness could predict suicide attempts in autistic, but not non-autistic adults, however, it was noted that the combination could in fact predict less variance in the autistic compared to the non-autistic group.

According to the IPTS, the combination of all three facets (thwarted belongingness, perceived burdensomeness and acquired capability) can account for the outcome of suicide attempts, however, only one study (Moseley et al., 2022a) considered the entire model and its relation to suicidality, highlighting a clear lack of research on arguably the most important relationship within the model. Despite the lack of evidence, the existing study did in fact find a

significant effect of this interaction, noting it to be able to predict both suicidal ideation and suicide attempts, accounting for 17% and 20% of variance respectively. Notably, this is far greater variance than identified in a recent meta-analysis (Chu et al., 2017), however, this may be as a result of the selected methodology, as opposed to the IPTS simply explaining more variance in autistic than non-autistic individuals. Further, despite contributing to the limited body of literature regarding the relevance of IPTS in autistic individuals, as noted by the authors themselves, there were limitations which may have influenced their findings and therefore adequate conclusions cannot be drawn from the results of only one sample.

Associated Constructs

Interestingly, many distinct constructs were found to be connected to both constructs of the IPTS, and suicidality as a whole in autistic individuals. Several of these constructs have been identified to be associated with suicidality in both autistic and non-autistic individuals, ranging from sex to the presence of a mental health condition such as depression or anxiety (Cassidy et al., 2020; Dow et al., 2019; Favril et al., 2022; Pelton & Cassidy, 2017; Moseley et al., 2022a). Although these risk factors may affect both autistic and non-autistic individuals, the way that they interact with suicidality in autistic individuals appears to demonstrate some differences. For instance, Dow et al. (2021) identified that rather than the presence of depression increasing suicidality directly, it was associated with higher rates of thwarted belongingness and perceived burdensomeness, which was subsequently associated with suicidality. This amplifies the idea that depression may increase the risk of suicidal ideation (Van Orden et al., 2010) suggested in the original IPTS model.

Autistic traits were the only autism-specific construct found to be associated with facets of the IPTS and subsequent suicidality. As with depression, they were found to predict suicidality alone (Cassidy et al., 2020) , or through thwarted belongingness and perceived burdensomeness (Pelton & Cassidy, 2017). This is consistent with what has been identified in the larger scope of literature (Cassidy et al., 2022; Chen et al., 2020; Richards et al., 2019; Takara & Kondo, 2014) in both autistic and non-autistic individuals. Despite this, it is highly unlikely that autistic traits alone are responsible for elevated suicidality in autistic individuals. It is instead more likely that the interaction between autistic traits and other constructs, such as the interaction between autistic traits and mental disorders (Lundstrom et al., 2011; Stimpson et al., 2020), accounts for this variance.

Overall Relevance of the IPTS to Autism

Although there is a limited body of research regarding the IPTS in autistic individuals, this research provides conflicting evidence for its application (see Table 7 for details). One notable difference between our findings and the hypotheses of the IPTS is the identification that only one construct (out of thwarted belongingness or perceived burdensomeness) was required to predict suicidal ideation, and in some cases even suicide attempts. This is consistent with the only other existing review on this topic (Grieve, 2023), which similarly identified that either construct alone could predict suicidal ideation. Interestingly, the acquired capability construct alone was also identified to predict suicidal ideation in several studies, suggesting that the presence of either construct of the IPTS alone, rather than in combination with one another could result in suicidal ideation. Further, the IPTS seems to assume equal importance of thwarted belongingness and perceived burdensomeness, however, our review suggests a potential difference in that perceived burdensomeness holds more relevance in explaining suicidality in

627 autistic individuals. However, this has similarly been found in non-autistic populations (Chu et
 628 al., 2017) and therefore is not autism-specific, but a more general potential modification to the
 629 IPTS.

Table 7*Identified Components of the ITS and Relevant Validated Measures*

Author(s) and Year	Supports IPTS?	Notes	
		For	Against
Cassidy et al. (2020)	No		TB alone could predict SI.
Dow et al. (2019)	Partially	TB alone could not predict SI.	PB alone could predict SI.
Moseley et al. (2022a)	Partially	TB x PB x AC could predict SA. TB x PB x AC could predict SI.	PB alone could predict SI. PB alone could also predict SA. AC alone could predict SI. AC alone could predict SA. TB x PB did not predict SI. TB x PB could predict SA.
Moseley et al.	No		AC could predict SA.

(2022b)

Moseley et al.	No		PB alone could predict SI.
(2023)			PB alone could also predict SA.
Pelton & Cassidy (2017)	Partially	TB x PB could predict SI.	TB alone could predict SI. PB alone could predict SA.
Pelton et al. (2020)	Partially	TB x PB could not predict SA.	TB alone could predict SI. PB alone could predict SI. AC alone could predict SI.
Pelton et al. (2023)	Partially	TB alone could not predict SI. TB x PB could predict SI.	PB alone could predict SI.
Smith et al. (2021)	Partially	PB alone could not predict SI.	TB alone could predict SI.
Stanley et al. (2021)	Partially	TB alone could not predict SI.	PB alone could predict SI.

Note. TB = thwarted belongingness, PB = perceived burdensomeness, AC = acquired capability, SI = suicide ideation, SA = suicide attempt, × = interaction.

The findings of this review highlight the urgent need for suicide prevention interventions directly tailored towards the needs and challenges of autistic individuals. Considering the differences in contributing factors towards suicidality in autistic individuals compared to their non-autistic counterparts, ensuring that interventions are built on empirical evidence from autistic individuals, rather than drawing conclusions from non-autistic individuals is vital.

Importantly, when studying autistic populations in relation to the IPTS, further research is needed. Due to the conflicting findings from the current, albeit limited, body of research on the matter, further research is needed to establish conclusive trends and explore the extent to which the IPTS explains suicidality in autistic individuals. This research should not only focus on exploring the different facets of the IPTS, but specifically the interactions between them as this is where the current review identified differences that may be autism-specific. Further, autism-specific constructs, such as the influence of autistic traits on suicidality, should be considered in this research due to the potential that these traits, combined with their interaction with facets of the IPTS may contribute to higher prevalence of suicide in autistic individuals.

Limitations

The results of this review should be interpreted in the context of limitations, both with the included studies themselves, and with the review itself. Firstly, all studies utilised a cross-sectional design examining previous suicidality, considering that the IPTS suggests the constructs to predict future suicide risk (Joiner, 2005), a longitudinal design would be more appropriate. Further, the lack of comparison group in the majority of studies prevents adequate autism-specific differences in the IPTS to be identified as there is often the reliance on statistics from other studies, in which the sample composition may not be comparable. Additionally,

several studies included individuals who self-identified as autistic, which although having good predictive validity (Bezemer et al., 2012; Sizoo et al., 2015) is still subjective and influenced by various factors, subsequently allowing for potential biases to have been introduced in the review. On a similar note, samples were highly limited in terms of their generalisability due to the lack of diversity both in terms of composition, and sample acquisition. A further limitation, which was briefly mentioned earlier, regards the use of existing measures of constructs of the IPTS. Importantly, the most commonly used measures (INQ and subsequent variations) do not distinguish between the complex facets of each construct of the IPTS. Further, these measures are designed for use in the general population, however, often rely on hypotheticals or perspective taking, both of which are areas of difficulty for autistic individuals (Baron-Cohen, 2000; Pelton & Cassidy, 2017)

Regarding the review itself, due to only one researcher being involved in the process, the potential for human error or bias due to subjectivity may have arisen. To minimise these effects, the 10 selected papers had their titles reviewed by a supervisor, however, there may still have been potential bias in the reporting of articles. Further, as the interest in this topic is fairly recent, with new papers being published frequently, there is the potential that papers were missed in this review due to the failure to search grey literature bases.

Conclusion

This systematic review examined the predictions of the IPTS in autistic and possibly autistic individuals. The results demonstrated some support for the constructs of the IPTS in predicting suicidality in the autistic population, however, evidence against the hypotheses of the IPTS was also found. Importantly, this review highlights the need for further research to allow

675 for more comprehensive conclusions to be drawn. Additional studies in the future need to make
676 use of longitudinal designs and comparison groups whilst ensuring to test the interactions
677 between all facets of the IPTS, particularly focussing on testing the full model which lacks
678 research. Research targeting these shortcomings will support the refinement of the IPTS and
679 subsequent application to autistic individuals to improve efforts towards suicide prevention.

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Appendix A**895 Prisma 2020 Checklist**

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	10-12
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	12
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	13-14
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	13
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	13
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	14

Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	14-15
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	14-15
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	14-15
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	15
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	14-15
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	14-15
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	N/A

	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	N/A
	13d	Describe any methods used to synthesise results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	N/A
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesised results.	N/A
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	13-14
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	N/A
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	14-15
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	N/A
Study characteristics	17	Cite each included study and present its characteristics.	17

Risk of bias in studies	18	Present assessments of risk of bias for each included study.	18
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	N/A
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	17
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesised results.	N/A
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	28-35
	23b	Discuss any limitations of the evidence included in the review.	37

	23c	Discuss any limitations of the review processes used.	37
	23d	Discuss implications of the results for practice, policy, and future research.	36
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	26
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	N/A
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/A
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	N/A
Competing interests	26	Declare any competing interests of review authors.	N/A
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	N/A

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71

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Appendix B

Adapted Newcastle-Ottawa Scale (NOS) Rating Procedure.

Selection

(1) Representativeness of the sample

- 1 point - Representative of autistic population as determined by at least 25% females and 25% males per autistic sample and autism diagnosis assessed with a standardized measure.
- 0 points - Potential for selection biases based on less than 25% females or 25% males per autistic sample and self-reported as having a formal autism diagnosis.

(2) Sample size

- 1 point - Sample size greater than or equal to 10 participants.
- 0 points - Sample size less than 10 participants.

Comparability

(3) Comparison group

- 1 point - Use of a comparison/control group, including either another cohort (e.g., autistic versus non-autistic adults) or comparability between respondent and non-respondent characteristics established with a satisfactory response rate or non-respondents described.
- 0 points - Lack of a comparison/control group, unsatisfactory response rate, or if no other cohort included in the study to compare to, there was no description of the response rate or the characteristics of the responders compared to non-responders.

Outcome

(4) Ascertainment of suicidal thoughts and/or behaviors

- 1 point - A commonly used standardized measurement tool that explicitly measures at least one item of suicidal ideation or suicidal behavior.
- 0 points - No standardized measurement tool of suicidal thoughts and/or behaviors.

(5) Ascertainment of IPTS constructs

- 1 point - A commonly used standardized measurement tool that explicitly measures at least one construct of the IPTS
- 0 points - No standardized measurement tool of the IPTS

(6) Descriptive statistics reporting

- 1 point - Descriptive statistics to describe the population (e.g., age, sex, intellectual ability) reported with proper measures (e.g., mean, standard deviation).
- 0 points - Descriptive statistics are not reported or are incomplete, or measures of dispersion are not reported.

Note. For each study, scores on the criteria above are summed to compute a total risk of bias score, with totals ranging from 0 to 6. Modifications of the NOS rating procedure are based on the adaptations of O'Halloran et al. (2022).

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Appendix C

Additional Coding of Study and Sample Characteristics

Author(s) and Year	Study Design	Comparison Group	CG Sample Size	Sample Ascertainment Method
Cassidy et al. (2020)	Cross-sectional	N	N/A	Volunteer
Dow et al. (2019)	Cross-sectional	N	N/A	Volunteer
Moseley et al.(2022a)	Cross-sectional	N	N/A	Volunteer
Moseley et al. (2022b)	Cross-sectional	Y	312	Volunteer
Moseley et al. (2023)	Cross-sectional	N	N/A	Volunteer
Pelton & Cassidy (2017)	Cross-sectional	N	N/A	Volunteer
Pelton et al. (2020)	Cross-sectional	Y	342	Volunteer
Pelton et al. (2023)	Cross-sectional	Y	239	Volunteer
Smith et al. (2021)	Cross-sectional	N	N/A	Volunteer
Stanley et al. (2021)	Cross-sectional	N	N/A	Volunteer

Appendix D

Full Charting of IPTS Constructs

Author(s) and Year	Thwarted Belongingness	Perceived Burdensomeness	Acquired Capability
Cassidy et al. (2020)	Results suggest that camouflaging autistic traits is associated with increased risk of experiencing thwarted belongingness and lifetime suicidality.	N/A	N/A
Dow et al. (2019)	Approximately one-third of the sample (32.6%) reported that they rarely feel they belong Thwarted belongingness was significantly correlated with	22.4% reported they occasionally or often feel that they make life worse for others. Perceived burdensomeness was also significantly correlated with suicidal ideation,	55.1% reported overall fearlessness, and 47.4% reported a lack of fear of death Capability was significantly correlated with

	perceived	plans, and attempts.	suicidal attempts.
	burdensomeness,	Dissatisfaction with	Capability was
	suicidal ideation, and	one's social life was	significantly
	impulses.	also significantly	correlated with
	Dissatisfaction with	correlated with	suicidal attempts.
	one's social life was	thwarted	
	also significantly	belongingness and	
	correlated with	perceived	
	thwarted	burdensomeness.	
	belongingness and		
	perceived		
	burdensomeness.		
Moseley et al.(2022a)	The findings cast doubt on the relevance of thwarted belongingness, as it failed to predict suicide ideation or attempts. Thwarted belongingness also	Perceived burdensomeness was found to be highly associated with past- year suicide ideation, past-year suicide attempts, and lifetime suicide attempts.	Among individuals who engaged in self- harm, the frequency of NSSI Behaviours and specific types of self-harm, such as cutting, were

	failed to differentiate between non-suicidal participants and those who had experienced suicide ideation and attempts.		directly and indirectly linked to lifetime suicide attempts through acquired capability for suicide.
Moseley et al. (2022b)	N/A	N/A	The higher lifetime incidence of NSSI was associated with all three facets of acquired capability: with higher pain tolerance with reduced fear of death by suicide and with more mental rehearsal of suicide plans

Higher frequency of NSSI predicted higher suicide attempts via reduced fear of death by suicide. Only acquired capability, however, significantly predicted lifetime suicide attempts.

Moseley et al. (2023)	In autistic individuals with likely ADHD, no relationship was found between higher levels of thwarted belongingness and suicidality. Thwarted belongingness did	Autistic participants with likely ADHD who reported higher levels of perceived burdensomeness had a greater number of suicide attempts. Higher rates of depression and perceived	Individuals with higher hyperactive/impulsive features had a greater exposure to painful, traumatic, and thrill- seeking events.
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not significantly predict past-year suicide ideation or lifetime suicide attempts. burdensomeness in autistic participants with likely ADHD were associated with increased suicidal thoughts in the past year. Perceived burdensomeness contributed to the model for past-year suicide ideation.

Pelton & Cassidy (2017)	Perceived burdensomeness , and Thwarted belonging significantly predicted lifetime suicidality. There was a significant indirect effect of autistic traits on suicidal	All variables—autistic traits, depression, belonging, and burdensomeness—were significantly correlated with lifetime suicidal behavior Perceived burdensomeness , and	N/A
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	behavior through	Thwarted belonging	
	thwarted belonging,	significantly predicted	
	with a medium effect	lifetime suicidality.	
	.	There was a	
		significant indirect	
		effect of autistic traits	
		on suicidal behavior	
		through perceived	
		burdensomeness, with	
		a medium effect	
Pelton et al. (2020)	Autistic adults	Autistic adults	N/A
	reported	reported experiencing	
	experiencing more	perceived	
	frequent thwarted	burdensomeness more	
	belongingness	frequently than non-	
	compared to non-	autistic adults.	
	autistic adults.	The feeling of being	
	Exploratory analyses	an outsider was	
	revealed that being	connected to suicidal	
	autistic was directly	thoughts through low	
	linked to feelings of	mood (such as	
	being an outsider and	feelings of	

lacking caring and supportive friends. hopelessness or failure) and burdensomeness (believing that others wish you were gone).

Pelton et al. (2023)	Autistic adults reported stronger feelings of thwarted belonging, perceived burdensomeness, and a higher frequency of traumatic life events compared to non- autistic adults.	
Smith et al. (2021)	It is worth noting that thwarted belongingness meaningfully bridged the ASD symptoms and suicidality symptom networks, while perceived burdensomeness did not.	N/A
Stanley et al. (2021)	The indirect effect of AQ SCI difficulties on perimilitary suicidal ideation through INQ-PB perceived burdensomeness (B 0.025, SE 0.010,	N/A

bootstrap 95% CI [0.012, 0.049]), but not
through INQ-TB
thwarted belongingness (B 0.014, SE 0.015,
bootstrap 95%
CI [0.016, 0.044]), was significant
N

Appendix E

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