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DOI:
10.1016/j.rasd.2024.102492

Citation for published version (Harvard):
Khudiakova, V, Russell, E, Sowden-Carvalho, S & Surtees, ADR 2024, 'A Systematic Review and Meta-Analysis of Mental Health Outcomes Associated with Camouflaging in Autistic People', *Research in Autism Spectrum Disorders*, vol. 118, 102492. https://doi.org/10.1016/j.rasd.2024.102492

Research in Autism Spectrum Disorders 118 (2024) 102492

Contents lists available at ScienceDirect

Research in Autism Spectrum Disorders

journal homepage: www.elsevier.com/locate/rasd

A systematic review and meta-analysis of mental health outcomes associated with camouflaging in autistic people

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ARTICLE INFO

Keywords:
Autism
Camouflaging
Mental health
Anxiety
Depression
Wellbeing

ABSTRACT

Background: This systematic review and meta-analysis aimed to assess the strength and quality of the evidence for the relationship between camouflaging and its potential outcomes in autistic people. With the worryingly high proportions of autistic people experiencing mental illness and suicidality, it is important to understand whether camouflaging is a risk factor in that population.
Methods: Searches of five databases (Web of Science, MEDLINE, PsycINFO, Embase, ProQuest Dissertations & Theses) yielded 16 studies eligible for a meta-analysis using correlations and six additional studies eligible for a narrative review, with 5897 autistic participants in total. Risk of bias was assessed for all studies using a bespoke tool. Based on the 16 studies eligible for the meta-analysis, we computed meta-correlations between camouflaging and anxiety, depression, social anxiety, and psychological wellbeing, using a random-effects model. Meta-regressions examined if study effect sizes were moderated by study quality, participants' mean age, and proportions of female and clinically diagnosed participants.
Results: We found significant moderate positive relationships between camouflaging and anxiety/generalised anxiety, depression, and social anxiety and a significant small negative relationship between camouflaging and mental wellbeing. There was no significant moderating effect of the aforementioned variables on study effect sizes.
Discussion: All of the studies were underpowered to detect small effects, and many used insufficiently validated measures. The established link between camouflaging and mental health difficulties is discussed with reference to future research and clinical practice. Longitudinal studies should also aim to establish causality.
Other: There was no funding associated with this review. The researchers have no conflicts of interest to disclose. The review was preregistered on PROSPERO (registration number: CRD42023473077).

Autism is widely conceptualised as a disorder of social interaction, understanding, and communication (American Psychiatric Association, 2013), manifesting, in part, through inherent "deficits in developing, maintaining, and understanding relationships" (p. 50). However, researchers have increasingly recognised the role of broader interpersonal and societal factors, notably negative attitudes and discrimination, in creating the experience of social marginalisation in autism (Botha & Frost, 2020). A common response to

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https://doi.org/10.1016/j.rasd.2024.102492
Received 11 April 2024; Received in revised form 2 September 2024; Accepted 3 October 2024
Available online 9 October 2024

anti-autism stigma is camouflaging, understood as adopting behavioural strategies aimed at reducing the visibility of one's autistic traits in social situations (Hull et al., 2017).

Despite camouflaging's supposed utility in concealing being autistic and hence possibly avoiding stigmatisation, emerging evidence has linked it to mental health challenges, including anxiety and depression. Evidence for the potential negative impact of camouflaging has mostly come from qualitative studies (e.g., Bargiela et al., 2016; Hull et al., 2017), with quantitative research finding largely mixed results (Hull et al., 2021). This potential relationship between camouflaging and poor mental health is especially concerning, as autistic people are much more vulnerable to experiencing anxiety, depression, suicidal ideation, and reduced quality of life compared to non-autistic people (Joshi et al., 2013; Kõlves et al., 2021). Understanding possible causes of these vulnerabilities could lead to the development of interventions aimed at responding to any unmet mental health needs of the autistic population in the long run. We conducted a systematic review and meta-analysis synthesising the available quantitative research evidence on mental health outcomes of camouflaging in autistic people and discuss the implications of the findings for research in the field.

1. Autism, Stigma, and Camouflaging

Across marginalised and minority groups, stigma has long since been established as a salient factor in perpetuating physical and mental health inequalities. This is partly due to the associated stress, social disadvantages, and structural barriers to accessing resources that would promote better health outcomes for such groups (Hatzenbuehler et al., 2013; Meyer, 2003).

It is well-documented in research that autistic people experience significant stigmatisation in society. For instance, autistic people are stereotyped in ways that are either overwhelmingly disparaging, such as having 'difficult' personalities and lacking in empathy and social skills, or frequently unattainably positive ways, such as having exceptional intelligence and superior abilities in mathematics (Wood & Freeth, 2016). Autistic people report that some of their traits such as atypical conversation patterns and lack of eye contact, elicit negative discriminatory responses from neurotypicals, resulting in experiences of bullying, isolation, and societal disadvantage (Botha et al., 2020; Botha & Frost, 2020). Corroborating these accounts are experimental studies finding evidence in favour of snap negative judgements of autistic people made by their neurotypical peers, which may then translate to acts of discrimination (e.g., Sasson et al., 2017; Sasson & Morrison, 2019).

When a personal characteristic is not immediately apparent to an observer and revealing it may lead to social costs like stigmatisation, concealing such a characteristic is a reasonable and common strategy for many people to navigate the often-hostile social environment (Quinn & Earnshaw, 2013). Autistic people's awareness of the stigma attached to their autistic traits and everyday experiences of acts of discrimination (Botha & Frost, 2020; Botha et al., 2020) may lead them to adopt strategies aimed at minimising the appearance of those traits or possibly even 'passing' as non-autistic in certain situations, such as *camouflaging* (Hull et al., 2017).

Camouflaging can be understood as a form of impression management, or adjusting one's behaviour in response to the social context (Ai et al., 2022; Goffman, 1963). Researchers have conceptualised camouflaging as an umbrella term encompassing a collection of diverse behavioural strategies. Such strategies range from more 'shallow' aspects such as suppressing self-stimulating behaviours, mimicking others' facial expressions, and scripting conversations to 'deep' and more flexible strategies, including consciously applying learned rules about verbal and nonverbal social cues (Livingston et al., 2020). While researchers and autistic community members may use other terms to refer to similar phenomena, such as 'masking,' 'passing,' or 'compensation,' this study will use the term 'camouflaging' for the purposes of consistency, as it remains the most commonly used term in research contexts (Hannon et al., 2023).

2. Camouflaging and mental health in autistic people

Autistic people are significantly more likely than their non-autistic peers to experience impairment to their mental health (Howlin & Magiati, 2017; Joshi et al., 2013), making understanding risk factors for adverse mental health outcomes in autistic people crucial. As many as 79 % of autistic people meet the diagnostic criteria for at least one psychological disorder during their lifetime, with anxiety and depressive disorders being the most common (Lever & Geurts, 2016). Further, autistic people tend to report higher levels of suicidal ideation and lifetime attempts to end their own lives than non-autistic people (Cassidy et al., 2018), as well as have higher rates of completed suicide (Kõlves et al., 2021). Across qualitative narratives, autistic people link camouflaging with mental health challenges, such as through feeling exhausted and anxious due to the behavioural monitoring that goes into camouflaging (Hull et al., 2017). Moreover, camouflaging has been discursively causally connected to suicidality and self-injury in autistic people (Bradley et al., 2021; Miller et al., 2021), which reinforces the importance of elucidating its role in autistic mental health.

In addition, some autistic people describe experiencing *autistic burnout* as one of potential consequences of camouflaging. Defined by autistic people as a debilitating state of profound exhaustion, loss of skills, and social and occupational withdrawal, the academic conceptualisation and measurement of autistic burnout is in their infancy; however, a common thread is that it is often triggered by feelings of exhaustion stemming from the demands of living in a neurotypical world (J. M. Higgins et al., 2021; Raymaker et al., 2020). Qualitative and conceptual research has linked engaging in camouflaging over extended periods of time with autistic burnout (Mantzalas et al., 2022; Raymaker et al., 2020). However, the specific nature of the relationship between camouflaging and autistic burnout is yet to be identified, just like with other mental health challenges.

Despite the clear perceived link between camouflaging and adverse mental health outcomes in qualitative research (Bargiela et al., 2016; Hull et al., 2017; Miller et al., 2021; Radulski, 2022; Raymaker et al., 2020), quantitative evidence remains mixed, with some studies finding significant associations between increased camouflaging and increased symptoms of mental health conditions such as depression and anxiety (Evans et al., 2023; Hull et al., 2021) and some not identifying any significant relationships (e.g., anxiety in Lai et al., 2017 and Schuck et al., 2019). In several studies, any identified significant relationships between camouflaging and symptoms of mental health conditions did not hold during subgroup analyses. For instance, Hull et al. (2021) found a significant moderate positive correlation between camouflaging and depressive symptoms in the entire sample, but this relationship was not significant in women and non-binary participants. This suggests that the relationship between camouflaging and mental health may be affected by additional moderating variables, such as gender.

Not discounting the above, engaging in camouflaging may have positive or at least non-negative effects on an autistic person's life, such as helping to find employment, functioning in a non-autistic society, making connections, and avoiding stigmatisation and discrimination (Hull et al., 2017; Zhuang et al., 2023), which raises the possibility that camouflaging may exert simultaneous and conflicting effects on autistic people's mental health. Indeed, in one study, stigma was found to have a stronger relationship with autistic people's mental health than camouflaging, suggesting that social factors may be more predictive of outcomes in autistic people rather than their own behaviour in social situations (Perry et al., 2022). Yet such an influence would be inextricably tied to the socio-political context; for instance, for non-White autistic people, not engaging in camouflaging may have life-or-death consequences due to ever-present threats of violence (which may also affect mental health), making camouflaging even more likely (Radulski, 2022), which adds to the complexity of the potential relationship between camouflaging and mental health.

3. Rationale

This systematic review aimed to clarify the link between camouflaging and its potential outcomes in autistic people which has been inconsistent across studies. We did so by synthesising available quantitative literature and conducting meta-analyses. At the time of writing, the only published systematic reviews did not perform quantitative synthesis (Cook et al., 2021; Libsack et al., 2021; Zhuang et al., 2023). This review thus aimed to assess the current state of the literature, identify and possibly explain any inconsistencies in the evidence, and suggest directions for further research. In conjunction with qualitative findings from other studies, this review would contribute to a better understanding of the phenomenon of camouflaging through its potential correlates and outcomes. This review initially remained open as to extant literature associating camouflaging and physical health, but the search ultimately found no evidence of data pertaining to this. We have therefore focussed on mental health.

The research questions addressed in this review are as follows:

1.1. What health and mental health outcomes are associated with camouflaging in autistic people?
1.2. What is the strength and quality of the evidence for the relationship between camouflaging and its outcomes in autistic people?

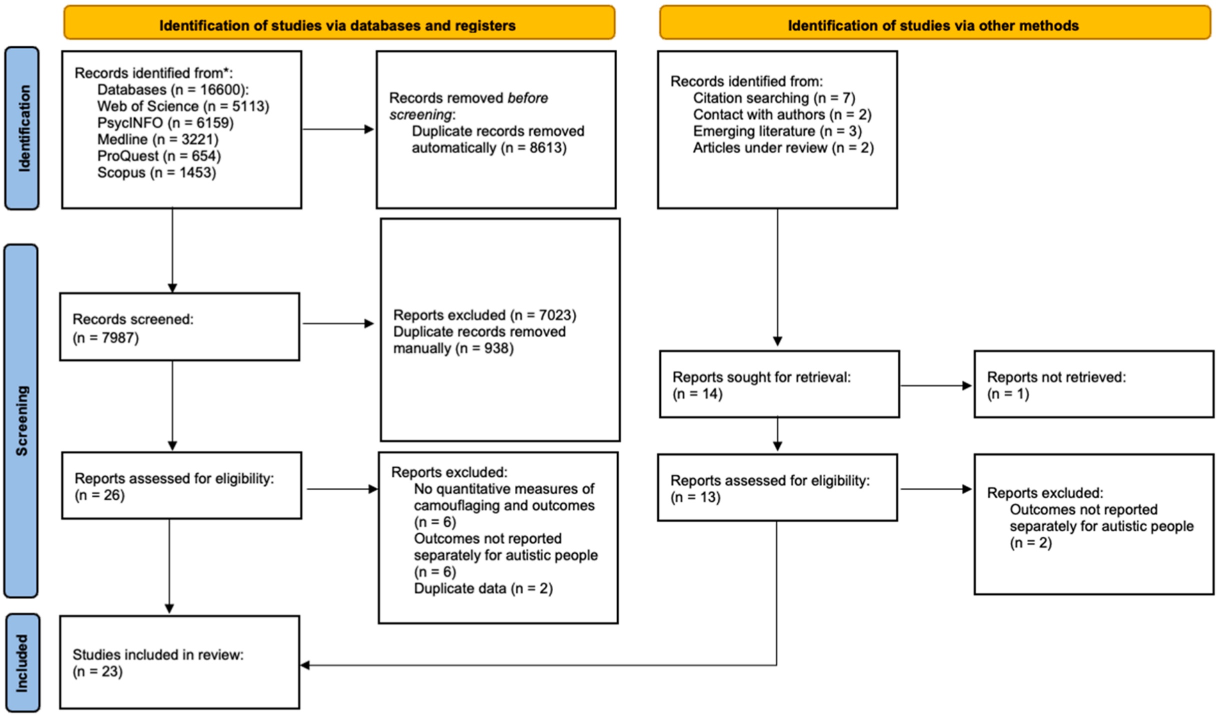

Fig. 1. PRISMA Chart.

4. Methods

We followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement when reporting the results of this review, with the completed PRISMA checklist enclosed in Appendix A (Page et al., 2021). This review was preregistered on the PROSPERO framework prior to beginning the searches and analyses (registration number: CRD42023473077). A protocol was not published. No ethics approval was sought because no original data was collected in this study.

4.1. Search strategy

The following databases were searched on 23 November 2023: MEDLINE, PsycINFO, Scopus, Web of Science, and ProQuest Dissertations & Theses, without limitation on publication date and using search strategies tailored to each database (see Appendix B for the full search terms for all databases). In addition, citation searching was performed on any identified review or opinion articles on the topic, as well as on any included items. Unpublished theses or dissertations, provided that they were examined as appropriate, were eligible. No restrictions were placed on participants' age.

The search strategies involved the following key terms, chosen with reference to extant non-quantitative reviews on the topic (Cook et al., 2021; Libsack et al., 2021; Zhuang et al., 2023):

1.1. Camouflaging OR masking OR compensation OR "impression management" OR concealment
1.2. Autism OR Asperger's OR ASD OR "autism spectrum disorder" OR "autistic spectrum disorder" OR ASC OR "autism spectrum condition" or "autistic spectrum condition" OR PDD OR "pervasive developmental disorder"

We also performed backwards citation searching for any included articles and reviews identified through the searches and consulted experts in the field (defined as those listed as first, second, or final authors on two or more included articles) to identify any sources the searches might have missed. Manuscripts authored by authors of this review that had been submitted for publication and met the criteria were included as well. The completed PRISMA chart is included in Fig. 1.

4.2. Study selection

The results of the five searches were imported into EndNote 20 (Clarivate Analytics, 2013). Duplicates were removed automatically, and the remaining references were exported into Excel. Titles and abstracts were screened against the inclusion/exclusion criteria (Table 1) by the first and second authors unaware of each other's decisions (Cohen's kappa = 0.90). Afterwards, full texts of potentially relevant articles were assessed for eligibility by the lead author and the independent reviewer. The Cohen's kappa for full text screening was 0.66, indicating a substantial level of agreement; lack of agreement was primarily due to issues surrounding data available openly or through author contact in some of the included studies. Any inconsistencies were resolved via discussion.

4.3. Data extraction

For studies found eligible for inclusion, information about study design, location, methodology and participant demographics were extracted by the lead author. Where studies' reporting was unclear, most notably when reporting sex vs. gender, these data were extracted in the authors' own terms, with detail on lack of clarity retained for review. Any effect sizes pertaining to camouflaging and

Table 1
Inclusion/Exclusion Criteria.

Inclusion Criteria	Exclusion Criteria
Camouflaging is measured quantitatively using psychometric scales.	Camouflaging is not measured quantitatively using psychometric scales.
Any health (physical or mental) factors or outcomes are measured using psychometric scales; potential examples include but are not limited to anxiety, depression, suicidality, and psychological distress.	Reported outcomes are not measured quantitatively using psychometric scales.
A quantitative relationship between camouflaging and any reported outcomes is reported in the article. If not, open data is available for those relationships to be calculated.	Camouflaging and any reported outcomes are not related statistically. No open data is available to calculate those relationships.
	Qualitative studies
	Single case or case series designs
	Treatment trials
Published in English or with an English translation	No English translation available
The sample includes autistic people (self-identified or diagnosed using any recognised criteria). If non-autistic participants are included in the study, any relationships between camouflaging and outcomes are reported separately for the autistic subsample. If not, open data is available for them to be calculated.	Non-autistic sample or outcomes are reported together for autistic and non-autistic people. No open data is available to quantify the relationship between camouflaging and any outcomes specifically for the autistic subsample.
	Duplicate data
	Full-text unavailable
	Conference abstracts, conference papers, reviews, editorials, or book chapters

any reported outcomes was extracted and collated in Excel by the lead author. We extracted data pertaining to autistic participants only. Where needed, authors were contacted and requested to provide missing data.

4.4. Quality appraisal

A four-item bespoke quality assessment tool (see Table 2) was devised based on Surtees et al. (2018) and Mingins et al. (2021) to assess the quality of the included studies based on any sampling, psychometric, and statistical limitations. Using a bespoke approach was preferred, over an existing "validated" risk of bias framework to best represent the risks of bias with regards to the specific research question of the review (J. P. Higgins et al., 2011). Working independently, the first and second authors assigned each study a score of 0 to 3 on each of the four factors, resulting in possible total scores of 0 to 12, with higher scores indicating higher study quality based on the tool. This risk of bias assessment tool was used by two independent reviewers (linear weighted Cohen's kappa: 0.84). Any discrepancies were resolved through discussion.

4.5. Data Synthesis and Meta-Analysis Plan

The planned strategy for statistical analysis was as follows:

1.1. If four or more studies with extractable data in the same form (such as Pearson's correlations) on the same outcomes and the same measures were identified, it was planned to provide Pearson's meta-correlations or standardised effect sizes (Hedges' G) as appropriate.
1.2. R (R Core Team, 2022), specifically the *meta* package (Balduzzi et al., 2019), would be used to synthesize the results using the Generic Inverse Variance method; test the data for normality and the applicability of Fixed and Random-Effects Models, including the restricted maximum likelihood estimator; and estimate heterogeneity using Higgins' I^2.
1.3. High statistical heterogeneity ($I^2 > 75$ %) could indicate that the included studies differ from each other too much, possibly making pooled estimates less meaningful and generalisable (Deeks et al., 2023; J. P. Higgins et al., 2003). In the event of high heterogeneity, it was planned to perform leave-one-out cross validation to identify which studies might be contributing to the overall heterogeneity and if such studies displayed significant methodological differences or risk of bias, potentially resulting in their exclusion.
1.4. Subgroup analyses were planned if multiple analysable studies were yielded for each of the following subgroups: gender and/or sex assigned at birth (as reported in each included study), formal diagnostic status, age, and study quality. Subgroup meta regressions would be performed if there were $\geq$10 studies with extractable data for each subgroup.

In a deviation from the pre-registered plan, results from different measures of the same constructs – (generalised) anxiety, depression, and social anxiety – were synthesised in the form of meta-correlations for each of these outcomes in order to prioritise inclusivity. The code and data used for analysis can be found on the Open Science Framework: https://osf.io/ajwkm/?view_only=3918d830d3db4cf2a2668aa72e0e79e9.

5. Results

5.1. Characteristics of included studies

Studies included in the systematic review are summarised in Table 3. Overall, 23 studies with 7238 participants in total, of which 5897 were autistic (age range: 9.0—92), were included in the final review. Of these 23 studies, 16 (4384 participants in total, of which 3619 were autistic) were used for the meta-analysis, while the remaining seven were only included in the narrative review. As per our preregistration, we intended to synthesise mental health outcomes that were reported in at least four studies. Further, the analysis method used to quantify the relationship between these outcomes and camouflaging also had to be reported in at least four studies to enable the data synthesis. As such, the seven studies that were not included in the meta-analysis used outcomes or statistical methods that were reported in fewer than four studies in total.

Nineteen studies were journal articles, while two were graduate dissertations (Park, 2021; Yi, 2020). Another two of the included studies (Keating et al., 2024; Khudiakova et al., 2024) were authored by the co-authors of this review and were under peer review at the time of data analysis. The most common study design was correlational, employed by 17 studies, while the rest used regression or mediation models. All the included studies were cross-sectional. Seven studies used global online samples, while the rest were conducted in the United Kingdom, United States of America, France, the Netherlands, and Australia. One study (Yi, 2020) included participants recruited in a non-Western country (Singapore) along with a global online sample. Another study used a multi-national sample from eight different countries (Keating et al., 2024). Eleven studies reported on participants' gender identity (i.e., lived sense of gender which may or may not match their sex assigned at birth), while three only included data on their sex assigned at birth. The remaining studies were ambiguous as to which one they queried, so we used the term gender/sex to reflect that. Proportions of female (whether in terms of gender identity, assigned sex at birth, or gender/sex where unclear) autistic participants ranged from 30 % to 70.27 %. Eleven studies reported on non-binary participants (range: 0.57 % – 31.36 %). Two studies were conducted solely on children or adolescents (Lei et al., 2023; Ross et al., 2023), while the rest used adult samples. Mean ages of participants ranged from 9.0 to 52.3.

The overwhelming majority of the studies used the CAT-Q (Hull et al., 2019) to quantify camouflaging, while three studies (Lai

Table 2
Bespoke Quality Assessment Tool.

	Poor (0)	Adequate (1)	Good (2)	Excellent (3)
Sample recruitment	Recruitment methods not specified.	Single restricted or non-random sample (e.g., previous studies; single specialist clinics; single regional samples).	Multiple restricted or non-random samples (e.g., multi-region specialist clinics; multi-regional samples).	Random or population-wide sample.
Measurement of camouflaging	Measures not fit for purpose.	Bespoke measures without reported psychometrics or standardised measures with poor psychometric properties in the target population(s).	Bespoke measures with reported psychometrics or standardised measures not validated for use in the target population(s)	Standardised measures validated for use in the target population(s).
Measurement of outcomes	Measures not fit for purpose.	Bespoke measures without reported psychometrics or standardised measures with poor psychometric properties in the target population(s).	Bespoke measures with reported psychometrics or standardised measures not validated for use in the target population(s).	Standardised measures validated for use in the target population(s).
Use of statistics and sample size.	Inadequate descriptive statistics. Statistical methods inappropriate for the research question. Insufficient sample size.	Adequate descriptive statistics. Statistical methods appropriate for the research question. Sample size for reported correlations sufficient to detect a large effect size at p =.05 and a power of.95 (n > 16).	Adequate descriptive statistics. Statistical methods appropriate for the research question. Sample size for reported correlations sufficient to detect a moderate effect size at p =.05 and a power of.95 (n > 70).	Adequate descriptive statistics. Statistical methods appropriate for the research question. Sample size for reported correlations sufficient to detect a small effect size at p =.05 and a power of.95 (n > 1288).

Note. Sample size calculations were conducted in G*Power (Faul et al., 2007).

Table 3
Study Characteristics and Key Findings.

Author, Publication Year	Study Characteristics	Participants	Measures	Results
*Arnold et al., (2023)	**Type**: Journal article. **Design:** Cross-sectional, correlational, regression. **Data collection:** Self-report questionnaires. **Location:** Australia **QA score out of 12:** 9	**N:** 141 **Diagnostic Status:** 100 % clinically diagnosed autistic. **Age:** M = 40.2, SD = 10.8. **Gender/sex:** 16 % male, 64 % female, 20 % other.	**Camouflaging:** CAT-Q **Outcomes of interest:** autistic burnout severity (ABSI[a]), current burnout symptoms (AAMB[b]), depression (PHQ−9[c]).	Camouflaging significantly negatively correlated with autistic burnout severity and current burnout symptoms and was a significant negative predictor of autistic burnout severity but not of current burnout when controlling for various autistic traits. Camouflaging did not significantly correlate with depression.
*Bowri et al., (2021)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** Global online sample. **QA score out of 12:** 9	**N:** 237 **Diagnostic Status:** 100 % clinically diagnosed autistic. **Age:** M = 41.92, SD = 13.3. **Gender/sex:** 35.0 % male, 58.6 % female, 6.3 % other/undisclosed.	**Camouflaging:** CAT-Q. **Outcomes of interest:** alcohol use (AUDIT[d]), depression (PHQ−9[c]), generalised anxiety (GAD−7[e]), social anxiety (LSAS[f]), mental wellbeing (WEMWBS[g]).	Camouflaging had significant positive relationships with symptoms of depression, generalised anxiety, and social anxiety, but not alcohol use or wellbeing.
*Cage et al., (2022)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** Global online sample. **QA score out of 12:** 9	**N:** 196 **Diagnostic Status:** 63.3 % clinically diagnosed autistic, 31.7 % self-identified. **Age:** M = 32.47, SD = 11.15. **Gender/sex:** 12.8 % male, 63.3 % female, 23.9 % nonbinary/other.	**Camouflaging:** CAT-Q. **Outcomes of interest:** mental wellbeing (WEMWBS[g]).	Camouflaging was significantly negatively correlated with mental wellbeing. Autistic community connectedness was not a significant moderator of that relationship.
**Cassidy et al., (2018)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** United Kingdom. **QA score out of 12:** 7	**N:** 333 **Diagnostic Status:** 49.25 % clinically diagnosed autistic, 50.75 % non-autistic. **Age (autistic):** M = 39.93, SD not reported. **Gender/sex (autistic):** 39.63 % male, 60.37 % female.	**Camouflaging:** bespoke **Outcomes of interest:** suicidality (SBQ-R[h]), non-suicidal self-injury (NSSI-AT[i]), depression diagnosis, anxiety diagnosis.	In autistic participants, camouflaging significantly positively correlated with suicidal behaviour but not non-suicidal self-injury or the presence of diagnosed depression or anxiety.
*Evans et al., (2023)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** United States of America. **QA score out of 12:** 9	**N:** 342 **Diagnostic status:** 57.0 % clinically diagnosed autistic, 42.0 % self-diagnosed autistic. **Age:** M = 38.46, SD = 11.41. **Gender:** 7.92 % cisgender men, 60.72 % cisgender women, 31.36 % nonbinary and other.	**Camouflaging:** CAT-Q. **Outcomes of interest:** depression (BDI-II[j]), generalised anxiety (GAD−7[e]), self-esteem (RSES[k]).	Camouflaging was positively correlated with the severity of generalised anxiety and depressive symptoms and negatively associated with self-esteem.
*Howard & Sedgewick, (2021)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** United Kingdom. **QA score out of 12:** 10	**N:** 245 **Diagnostic status:** 83.67 % clinically diagnosed autistic, 16.33 % self-diagnosed autistic. **Age:** M = 40.44, SD = 13.14. **Gender:** 61.63 % women, 24.90 % men, 14.69 % nonbinary/transgender.	**Camouflaging:** CAT-Q. **Outcomes of interest:** generalised anxiety (GAD−7[e]).	Camouflaging was significantly positively correlated with generalised anxiety symptoms (calculated using the publicly available data on the Open Science Framework).
*Hull et al., (2019)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires.	**N:** 832 **Diagnostic status:** 42.55 % clinically diagnosed autistic, 57.45 % non-autistic.	**Camouflaging:** CAT-Q. **Outcomes of interest:** social anxiety (LSAS[f]), generalised anxiety (GAD−7[e]), depression (PHQ−9[c]), wellbeing (WEMWBS[g]).	In the autistic sample, camouflaging was significantly positively correlated with social anxiety, depression, and generalised anxiety, and significantly negatively correlated with wellbeing. The Compensation subscale was significantly

(*continued on next page*)

Table 3 (*continued*)

Author, Publication Year	Study Characteristics	Participants	Measures	Results
	Location: Global online sample. **QA score out of 12:** 9	**Age (autistic):** M = 41.93, SD = 13.55. **Gender (autistic):** 30.51 % male, 50.56 % female, 4.80 % other, 14.12 % not stated.		positively correlated with social anxiety, depression, and generalised anxiety but not wellbeing. The same pattern was observed for Masking. Assimilation was significantly positively correlated with social anxiety, depression, and generalised anxiety, and significantly negatively correlated with wellbeing.
*Hull et al., (2021)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** Global online sample. **QA score out of 12:** 10	**N:** 305 **Diagnostic status:** 100 % clinically diagnosed autistic. **Age:** M = 41.90, SD not reported. **Gender:** 34.10 % cis- and transgender men, 59.34 % cis- and transgender women, 5.90 % non-binary.	**Camouflaging:** CAT-Q. **Outcomes of interest:** social anxiety (LSAS[f]), generalised anxiety (GAD−7[e]), depression (PHQ−9[c]).	Across the entire sample, camouflaging was positively correlated with symptoms of social anxiety, generalised anxiety, and depression. In women, camouflaging was significantly positively correlated with social and generalised anxiety but not depression. In men, all three relationships were positive and significant. In non-binary participants, none of these correlations were significant.
*Keating et al., (2024)	**Type:** Article under review. **Design:** Cross-sectional, regression. **Data collection:** Self-report questionnaires. **Location:** Australia, Belgium, Canada, Japan, New Zealand, South Africa, United Kingdom, United States of America. **QA score out of 12:** 10	**N:** 306 **Diagnostic Status:** 100 % clinically diagnosed autistic. **Age:** 30.72, SD = 9.15. **Gender:** 42.81 % male, 43.46 % female, 13.73 % other.	**Camouflaging:** CAT-Q. **Outcomes of interest:** depression, anxiety, stress (DASS−21[l]).	After adjusting for age and autistic traits, camouflaged predicted greater anxiety, depression, and stress. Camouflaging was positively correlated with symptoms of anxiety, depression, and stress (calculated separately using data provided by the authors).
*Khudiakova et al., (2024)	**Type:** Article under review. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** Global online sample. **QA score out of 12:** 9	**N:** 409 **Diagnostic status:** 34.96 % clinically diagnosed autistic, 65.04 % self-diagnosed. **Age:** M = 31.78, SD = 11.00. **Gender:** 42.05 % cis- and transgender men, 45.48 % cis- and transgender women, 12.47 % non-binary and multiple.	**Camouflaging:** CAT-Q. **Outcomes of interest:** depression (CES-D[m]).	Camouflaging was positively correlated with depressive symptoms. This relationship was mediated by stigma experience but not autistic community connectedness.
*Lai et al., (2017)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires, standardised tests, neuroimaging, diagnostic observations. **Location:** United Kingdom. **QA score out of 12:** 9	**N:** 60 **Diagnostic status:** 100 % clinically diagnosed autistic. **Age:** M_{men} = 27.2, SD_{men} = 7.3; M_{women} = 27.8, SD_{women} = 7.6. **Gender/sex:** 50.00 % men, 50.00 % women.	**Camouflaging:** discrepancy between scores on the ADOS−2[o] and AQ[p] and RMET[q] scores. **Outcomes of interest:** depression (BDI[r]), anxiety (BAI[s]).	Across the entire sample, camouflaging was positively correlated with symptoms of depression but not anxiety. The positive correlation between camouflaging and depression was significant in males but not females.
*Lei et al., (2023)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** United Kingdom. **QA score out of 12:** 10	**N:** 115 **Diagnostic status:** 53.04 % clinically diagnosed autistic, 46.96 % non-autistic. **Age (autistic):** M = 16.34, SD = 1.69. **Gender (autistic):** 59.02 % female, 27.87 % male, 9.84 % other.	**Camouflaging:** CAT-Q. **Outcomes of interest:** social anxiety (SPIN[t]).	In the autistic subgroup, camouflaging was significantly correlated with social anxiety symptoms. The Compensation and Assimilation subscales had significant positive relationships with social anxiety symptoms but the relationship between Masking and social anxiety was not significant. This data was obtained through correspondence with the authors.

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Table 3 (*continued*)

Author, Publication Year	Study Characteristics	Participants	Measures	Results
**McQuaid et al., (2023)	**Type:** Journal article. **Design:** Mediation, regression. **Data collection:** Self-report questionnaires. **Location:** United States. **QA score out of 12:** 10	**N:** 787 **Diagnostic status:** 100 % clinically diagnosed autistic. **Age:** M = 40.16, SD = 13.68. **Sex at birth:** 59.8 % female, 40.2 % male. **Gender:** 9.9 % gender diverse, 90.1 % cisgender.	**Camouflaging:** CAT-Q. **Outcomes of interest:** depression (PHQ−9[c]), anxiety (GAD−7[e]).	In separate models with emotional regulation challenges and stress as mediators, camouflaging had a significant direct effect on depression and anxiety independent of sex at birth. Emotional regulation challenges and perceived stress significantly separately mediated the relationship between camouflaging and depression and anxiety.
**Milner et al., (2023)	**Type:** Journal article. **Design:** Cross-sectional, regression. **Data collection:** Self-report questionnaires. **Location:** United Kingdom. **QA score out of 12:** 10	**N:** 435 **Diagnostic status:** 17.93 % clinically diagnosed autistic, 40.70 % not diagnosed but high autistic traits, 41.38 % non-autistic. **Age (autistic):** M = 22.40, SD not reported. **Sex at birth (autistic):** 39.77 % male, 60.23 % female.	**Camouflaging:** CAT-Q. **Outcomes of interest:** subjective happiness (SHS[u]) quality of life (WHOQOL Bref[v]), emotional difficulties (SDQ[w]).	In the diagnosed autistic subgroup, camouflaging predicted decreased psychological quality of life and increased emotional difficulties but not subjective happiness after controlling for autistic traits and sex.
*H. L. Moore et al., 2023	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** United Kingdom. **QA score out of 12:** 10	**N:** 627 (not all used in correlational analyses) **Diagnostic status:** 59.6 % clinically diagnosed autistic, 40.6 % self-diagnosed autistic. **Age:** M = 34.15, SD = 12.96 **Gender:** 19.3 % men, 52.0 % women, 28.7 % nonbinary/other.	**Camouflaging:** CAT-Q. **Outcomes of interest:** anxiety (HADS[x]), depression (HADS[x]), suicidality (SBQ-ASC[y]), wellbeing (WEMWBS[g]).	The Compensation subscale of the CAT-Q was positively correlated with anxiety and suicidality, but not depression or wellbeing. The Masking subscale of the CAT-Q was positively correlated with anxiety but not depression, suicidality, or wellbeing. The Assimilation subscale was positively correlated with anxiety, depression, and suicidality and negatively correlated with wellbeing.
*Oshima et al., (2024)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** Japan. **QA score out of 12:** 10	**N:** 210 (also used UK data from Hull et al. [2021] for comparison) **Diagnostic status:** 100 % clinically diagnosed autistic. **Age:** M = 37.61, SD = 10.31. **Gender/sex:** 41.34 % female, 59.23 % male.	**Camouflaging:** CAT-Q (Japanese). **Outcomes of interest:** depression (PHQ−9[c]), generalised anxiety (GAD−7[e]), social anxiety (LSAS[f]), mental wellbeing (WEMWBS[g]).	Camouflaging was significantly positively correlated with anxiety, depression, and social anxiety. There was no significant relationship between camouflaging and wellbeing.
**Park, (2021)	**Type:** Doctoral dissertation **Design:** Cross-sectional, structural equation modelling. **Data collection:** Self-report questionnaires. **Location:** United States. **QA score out of 12:** 9	**N:** 148 **Diagnostic status:** all presumed autistic; 79.73 % with a clinical diagnosis confirmed by researchers. **Age:** M and SD not reported; 46.62 % 18 to 24, 30.41 % 25 to 30; 22.03 % over 30. **Sex at birth:** 47.30 % female, 52.02 % male, 0.68 % not reported.	**Camouflaging:** CAT-Q. **Outcomes of interest:** Mental health concerns (PROMIS Anxiety and Depression Scales[z] and IUS−12[aa] combined), vocational and academic achievement (bespoke).	In a structural equation model controlling for autistic traits, camouflaging had a significant positive direct effect on mental health concerns and vocational and academic achievement.
*Perry et al., (2022)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** Global online sample. **QA score out of 12:** 9	**N:** 223 **Diagnostic status:** 52.02 % clinically diagnosed autistic, 47.98 % self-diagnosed autistic. **Age:** M = 34.19, SD = 11.00 **Gender:** 58.3 % female, 23.8 % male, 17.5 % nonbinary.	**Camouflaging:** CAT-Q **Outcomes of interest:** mental wellbeing (WEMWBS[g])	Camouflaging was significantly negatively correlated with mental wellbeing.

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Table 3 (*continued*)

Author, Publication Year	Study Characteristics	Participants	Measures	Results
**Ross et al., (2023)	**Type:** Journal article. **Design:** Cross-sectional, regression. **Data collection:** Diagnostic observations, parent-report questionnaires, standardised tests. **Location:** Australia. **QA score out of 12:** 10	**N:** 734 **Diagnostic status:** 100 % clinically diagnosed autistic. **Age:** M = 9.0, SD = 3.7. **Sex at birth:** 51.19 % male, 48.91 % female	**Camouflaging:** discrepancy between ADOS° scores and scores on the SRS[ab]. **Outcomes of interest:** internalising symptoms (the internalising symptoms subscale on the CBCL[ac]).	After controlling for gender, age, and IQ, camouflaging significantly predicted internalising symptoms.
*Schuck et al., (2019)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** United States of America. **QA score out of 12:** 7	**N:** 62 **Diagnostic status:** 45.16 % clinically diagnosed autistic, 54.84 % non-autistic. **Age (autistic):** M_m = 23, SD_m = 4.09; M_f = 33, SD_f = 9.72. **Gender/sex (autistic):** 39.29 % female, 60.71 % male.	**Camouflaging:** discrepancy between scores on the ADOS° and scores on the AQ[p]. **Outcomes of interest:** social anxiety (SPAI[ad]).	In the autistic subgroup, camouflaging did not correlate with social anxiety symptoms in either males or females.
**van der Putten et al., (2023)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires, diagnostic interviews. **Location:** The Netherlands. **QA score out of 12:** 9	**N:** 352 **Diagnostic status:** 100 % clinically diagnosed autistic. **Age:** M = 52.3, SD = 12.5. **Sex at birth:** 51.99 % male, 47.44 % female, 0.57 % other.	**Camouflaging:** CAT-Q (Dutch). **Outcomes of interest:** psychological problems (SCL−90-R[ae]), psychiatric diagnosis (MINI-plus[af]; for a subsample).	Camouflaging was positively correlated with the severity of psychological problems in the entire sample. For the subsample administered the MINI-plus (N = 161), camouflaging was positively correlated with the number of current and lifetime mental health diagnoses.
*Weiner et al., (2023)	**Type:** Journal article. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** France. **QA score out of 12:** 7	**N:** 74 **Diagnostic status:** 67.52 % clinically diagnosed autistic, 32.43 % non-autistic with borderline personality disorder. **Age (autistic):** M = 30.44, SD not reported. **Gender/sex (autistic):** 56.00 % women, 44.00 % men.	**Camouflaging:** CAT-Q. **Outcomes of interest:** borderline symptoms (BSL[ag]), emotional dysregulation (DERS[ah]), depression (BDI[r]), anxiety (BAI[s]).	In autistic women, camouflaging was significantly positively correlated with borderline and depressive symptoms but not emotional dysregulation or anxiety. In autistic men, none of the relationships were significant.
**Yi, (2020)	**Type:** Master's dissertation. **Design:** Cross-sectional, correlational. **Data collection:** Self-report questionnaires. **Location:** Singapore, additional global online sample. **QA score out of 12:** 9	**N:** 311 **Diagnostic status:** 32.91 % clinically diagnosed autistic, 67.09 % non-autistic. **Age (autistic):** M = 35.09, SD = 11.27. **Gender (autistic):** 62 % male, 30 % female, 8 % other.	**Camouflaging:** CAT-Q. **Outcomes of interest:** depression/anxiety (combined PHQ−9[c] and GAD−7[e]), social anxiety (combined SIAS−6[ai] and SPS−6[aj]), self-esteem (RSES[k]).	In the autistic participants, total scores on the CAT-Q were significantly positively correlated with depression/anxiety, social anxiety, and self-esteem. The Compensation subscale had a significant positive relationship with social anxiety but not depression/anxiety or self-esteem. The Masking subscale did not significantly correlate with any of the variables. The Assimilation subscale did not significantly correlate with self-esteem or depression/anxiety but had a significant positive relationship with social anxiety. This study was not included in the meta-analyses due to its use of Spearman's rho.

Note. Gender refers to self-identified gender identity which may or may not correspond to one's sex assigned at birth. We use the language used in the included studies and use the term "gender/sex" where it was unclear if gender identity or sex assigned at birth was reported. M: mean. SD: standard deviation. NR: not reported.

* Studies included in the meta-analysis.

** Studies included in the narrative review only.

[a]ABSI: Autistic Burnout Severity Index (Arnold et al., 2023); [b] AASPIRE Autistic Burnout Measure (developed by Arnold et al., 2023 based on Raymaker et al., 2020); [c] PHQ-9: Patient Health Questionnaire (Kroenke et al., 2001); [d] AUDIT: Alcohol Use Disorders Identification Test (Saunders et al., 1993); [e] GAD-7 (Spitzer et al., 2006); [f] LSAS: Liebowitz Social Anxiety Scale (Liebowitz, 1987); [g] WEMWBS: Warwick-Edinburgh Mental Well-Being Scale (Tennant et al., 2007); [h] SBQ-R: Suicidal Behaviours Questionnaire-Revised (Osman et al., 2001); [i] NSSI-AT: Non-Suicidal Self-Injury–Assessment Tool (Whitlock et al., 2014); [j] BDI-II: Beck Depression Inventory-II (A. T. Beck et al., 1996); [k] RSES: Rosenberg Self-Esteem Scale (Rosenberg, 1965); [l] DASS-21: Depression Anxiety and Stress Scales (Lovibond &

Lovibond, 1995); [m] CES-D: Center for Epidemiological Studies Depression Scale (Lewinsohn et al., 1997); [o] ADOS-2: Autism Diagnostic Observation Schedule, 2nd Edition (Lord et al., 2012); [p] AQ: Autism Quotient (Baron-Cohen et al., 2001b); [q] RMET: Reading the Mind in the Eyes Test (Baron-Cohen et al., 2001a); [r] BDI: Beck Depression Inventory (A. T. Beck et al., 1961); [s] BAI: Beck Anxiety Inventory (A. T. Beck et al., 1988); [t] SPIN: Social Phobia Inventory (Connor et al., 2000); [u] SHS: Subjective Happiness Scale (Lyubomirsky & Lepper, 1999); [v] WHOQOL Bref: World Health Organization Quality of Life Scale (WHOQOL Group, 1994); [w] SDQ: Strengths and Difficulties Questionnaire (Goodman, 1997); [x] HADS: Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983); [y] SBQ-ASC: Suicidal Behaviours Questionnaire-Autism Spectrum Conditions (Cassidy et al., 2021); [z] PROMIS: Patient-Reported Outcomes Measurement Information System (Cella et al., 2010); [aa] IUS-12: Intolerance of Uncertainty Scale-12 (Carleton et al., 2007); [ab] SRS: Social Responsiveness Scale (Constantino & Gruber, 2012); [ac] CBCL: Child Behavior Checklist (Achenbach, 1999); [ad] SPAI: Social Phobia and Anxiety Inventory (Turner et al., 1989); [ae] SCL-90-R: Symptoms Checklist-90-Revised (Derogatis, 1994); [af] MINI-plus: Mini International Neuropsychiatric Interview Plus (Sheehan et al., 1998); [ag] BSL Borderline Symptom List-23 (Bohus et al., 2009); [ah] DERS: Differences in Emotional Regulation Scale (Gratz & Roemer, 2004); [ai] SIAS-6: Social Interaction Anxiety Scale (Peters et al., 2012); [aj] SPS-6: Social Phobia Scale (Peters et al., 2012) et al., 2017; Ross et al., 2023; Schuck et al., 2019) used the discrepancy approach through calculating the discrepancy between a person's observable behaviour and their 'autism status' (e.g., their autistic traits and social cognition). One study (Cassidy et al., 2018) used a bespoke self-report measure of camouflaging.

Studies reported a variety of outcomes. Anxiety, depression, social anxiety, and wellbeing were reported in at least six studies and were included in the meta-analysis. Other outcomes, such as stress and suicidality, were reported in fewer than four studies and thus were only included in the narrative review. No studies reporting outcomes related to general or physical health were found, thus the focus here will be on mental health outcomes only.

5.2. Quality assessment

The mean quality rating for the included studies was 9.09 out of 12 maximum points (range: 7 – 10, standard deviation: 0.95), indicating at least reasonably acceptable quality overall for all studies. Sample recruitment was rated as adequate to good (mean = 1.91/3.0). No study had a truly random or population-wide sample, but most studies recruited from multiple sources or clinics. Measurement of camouflaging was found to be good to excellent (mean = 2.78). Almost all studies used previously validated methods for assessing camouflaging, whether the CAT-Q or the discrepancy method. Only one study (Cassidy et al., 2018) used a bespoke measure of camouflaging and did not report any of its psychometric properties beyond internal consistency. Two studies (Hull et al., 2019; Lai et al., 2017) piloted and validated their respective measures of camouflaging. Outcome measurement was also rated as good to excellent (mean = 2.48/3.0). A significant proportion, but not all, of the studies used outcome measures previously validated for autistic samples. Statistics and sample size were rated as adequate to good (mean: 1.91/3.0). All studies used appropriate statistical methods, but none recruited enough participants to detect small effects.

5.3. Meta-analysis

As per the analysis strategy, we conducted two meta-analyses: the first meta-analysis yielded meta-correlations for the four outcomes for which there were four or more studies with extractible and synthesisable data (anxiety/generalised anxiety, social anxiety, depression, and wellbeing); the second was a series of meta-regressions predicting the effect sizes from the percentage of female participants, percentage of clinically diagnosed participants from the autistic subsamples, and the mean age. We used a random effects model (REM) and the restricted maximum likelihood estimator (REML), assuming a non-negligible degree of between-study heterogeneity, and tested the included effect sizes for normality prior to analysis.

5.3.1. Meta-analysis 1: correlations

Since H. L. Moore et al. (2023) did not report the correlations between the total CAT-Q score and anxiety, depression, and wellbeing, we first conducted Fisher z-transformations and combined the reported correlations for each subscale to yield composite correlations between the CAT-Q scores and the three outcomes. The composite correlation for anxiety was r =.256, harmonic n = 445.42; the composite correlation for depression was r =.137, harmonic n = 445.42, while the composite correlation for wellbeing was −0.162, harmonic n = 448.33. The harmonic ns were used because the number of participants was different across the three correlations.

Shapiro-Wilk tests revealed that the study-level effect sizes for anxiety, social anxiety, and depression were approximately normally

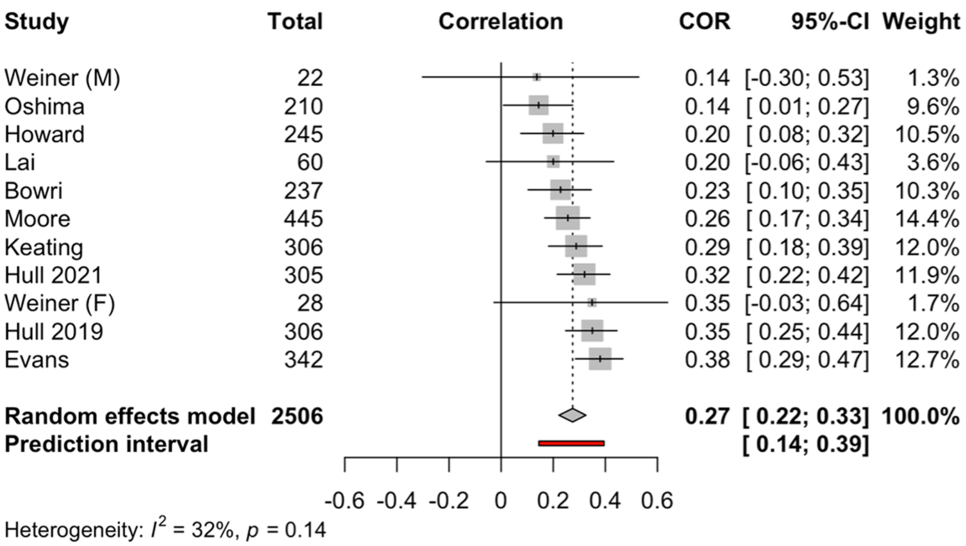

Fig. 2. Forest Plot of the Random Effects Model of Meta-Analysis 1 (Anxiety, Ordered by Effect Size).

distributed (W = 0.94, p =.52 for anxiety; W = 0.98, p =.94 for social anxiety; W = 0.95, p =.59 for depression). However, the effect sizes for wellbeing were not: W = 0.74, p =.015. We thus proceeded with the REML model given its robustness to violations of normality (Joo, 2017). The quantile-quantile plots for each variable are provided in the Supplement.

Meta-correlations were calculated for the four outcomes based on the fourteen studies with 3478 autistic participants. Results of the four REMs demonstrated that there were significant moderate positive correlations between camouflaging and (generalised) anxiety (r = 0.27, 95 % CI [0.22; 0.33], I^2 = 32 %), social anxiety (r = 0.24, 95 % CI [0.19; 0.29], I^2 = 36 %), and depression (r = 0.36, 95 % CI [0.27; 0.45], I^2 = 50 %), respectively, and a significant small negative correlation between camouflaging and wellbeing (r = −0.13, 95 % CI [-0.19; −0.08], I^2 = 21 %), with relatively low levels of heterogeneity, as seen in the respective forest plots in Fig. 2.

5.3.2. Meta-analysis 2: meta-regressions

Given the overlapping findings of Meta-Analysis 1 with reasonably consistent correlations and low heterogeneity and the relatively low numbers of studies per individual outcome, we pooled the study-level correlations to explore potential moderators of the relationship between camouflaging and mental health outcomes. For studies reporting correlations for more than one outcome from the list, we computed the composite correlation scores using weighted mean Fisher's Z and transforming them back into Pearson's r for analysis, thus representing the pooled proxy construct of internalising symptoms. Internalising symptoms is an umbrella term for symptoms such as anxiety and sadness experienced by an individual (Levesque, 2011), and the four constructs we included would fall under this umbrella. For studies measuring wellbeing in addition to the other outcomes, the sign for the wellbeing correlations was reversed. Since Schuck et al. (2019) did not report a correlation between camouflaging and social anxiety for their entire sample, Fisher's Z transformation was used as well. As such, there were 16 correlations, of which nine were composite, to be used in the ensuing meta-regressions. A Shapiro-Wilks test revealed that the 16 correlations were approximately normally distributed (W = 0.94, p =.34). See the Supplement for the corresponding quantile-quantile plot.

[INSERT Table 4] Univariate meta-regressions were conducted to explore potential sources of heterogeneity among the pooled correlations for internalising symptoms. The restricted maximum likelihood estimate of residual heterogeneity (τ^2) was equal to 0.0054 before any of the covariates were added. The meta-regressions, summarised in Table 5, revealed that the mean age, the proportion of female participants (using participants' gender identity where reported; if not, using assigned sex at birth or gender/sex), the proportion of clinically diagnosed rather than self-identifying participants (all in autistic subsamples), and the quality score did not significantly moderate the study effect sizes in this analysis. The bubble plots for all five meta-regressions can be found in the Supplement.

5.4. Narrative review

Overall, all but two studies (Arnold et al., 2023; Schuck et al., 2019) reported at least one significant association between camouflaging and negative mental health outcomes of interest. Studies that used regression models found contradictory results about camouflaging as a predictor of mental health outcomes when controlling for certain demographic variables. Milner et al. (2023) found that camouflaging predicted reduced psychological quality of life and increased emotional difficulties, but not subjective happiness when accounting for autistic traits and sex at birth. One multi-national study reported that camouflaging was a significant predictor of anxiety, depression, and stress after controlling for age and autistic traits (Keating et al., 2024). Ross et al. (2023) additionally

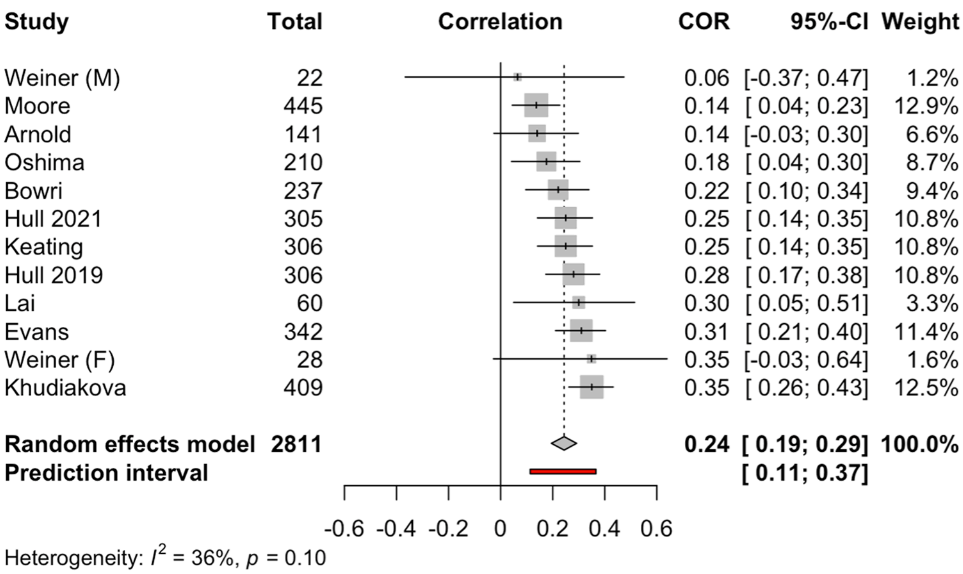

Fig. 3. Forest Plot of the Random Effects Model of Meta-Analysis 1 (Depression, Ordered by Effect Size).

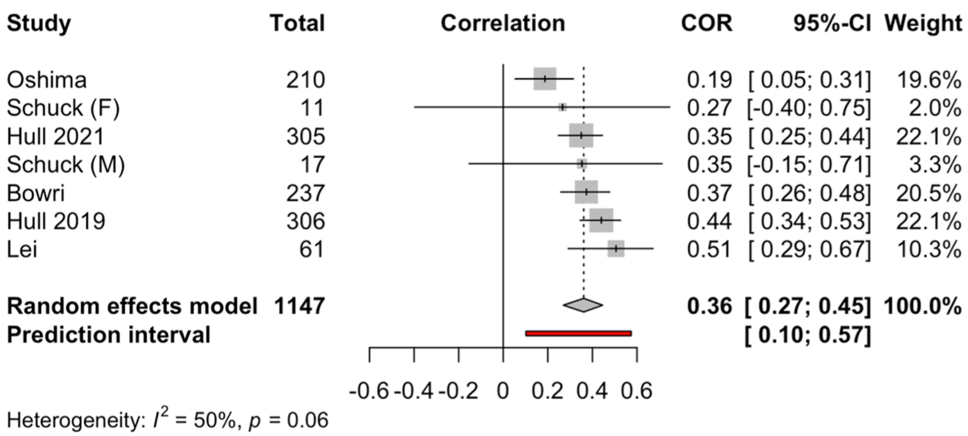

Fig. 4. Forest Plot of the Random Effects Model of Meta-Analysis 1 (Social Anxiety, Ordered by Effect Size).

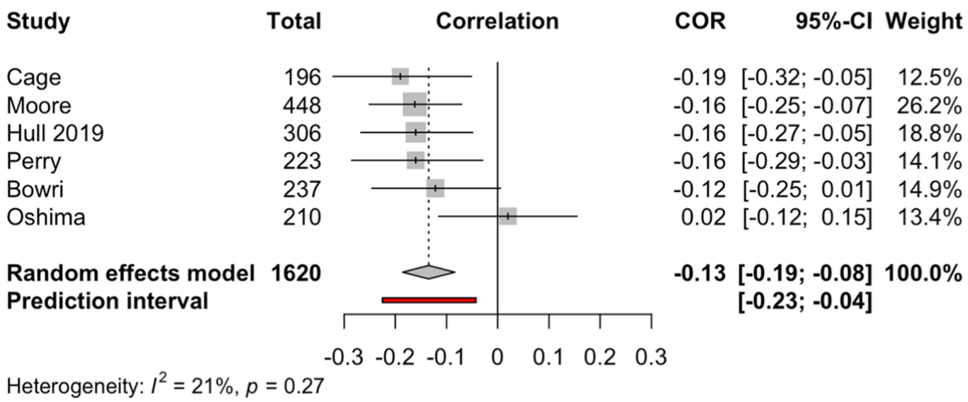

Fig. 5. Forest Plot of the Random Effects Model of Meta-Analysis 1 (Wellbeing, Ordered by Effect Size).

Table 4
Composite Correlations for Studies Measuring More Than One Outcome Included in the Meta Analysis.

Study	Outcomes Measured	N	Composite Correlation
Evans et al. (2023)	Anxiety, depression	324	.345
Hull et al. (2019)	Anxiety, depression, social anxiety, wellbeing	306	.311
Hull et al. (2021)	Anxiety, depression, social anxiety	305	.307
Keating et al. (2024)	Anxiety, depression	306	.270
Lai et al. (2017)	Anxiety, depression	60	.251
H. L. Moore et al. (2023)	Anxiety, depression, wellbeing	446 (harmonic)	.187
Oshima et al. (2024)	Anxiety, depression, social anxiety, wellbeing	210	.132
Schuck et al. (2019)	Social anxiety (broken down by gender)	28	.319
Weiner et al. (2023)	Anxiety, depression	50	.243

Table 5
Univariate Meta-Regression Analysis of Demographic Variables and Study Characteristics on the Relationship Between Camouflaging and Mental Health in Autistic People.

Variables	Number of Studies	Coefficient (SE)	p-Value	τ^2
Proportion of female participants	16	–.072 (0.374)	.847	0.0062
Proportion of clinically diagnosed participants	16	−0.006 (0.118)	.962	0.0064
Quality score	16	−0.051 (0.039)	.896	0.0060
Mean age	16	−0.006 (0.038)	.088	0.0059

Note. SE: standard error.

controlled for intelligence in a child sample and found that camouflaging remained a significant predictor of internalising symptoms. In a study using structural equation modelling, camouflaging had a significant positive effect on mental health concerns and vocational and academic achievement – the only outcome not directly related to health measured in the included studies – after controlling for autistic traits (Park, 2021). Camouflaging was also negatively associated with autistic burnout severity after controlling for autistic traits but not with current burnout (Arnold et al., 2023).

Camouflaging was positively correlated with the severity of psychological problems and the number of current and lifetime psychological diagnoses (van der Putten et al., 2023), suicidality (Cassidy et al., 2018), and stress (Keating et al., 2024), and inversely correlated with self-esteem (Evans et al., 2023). Two studies reported on self-esteem but found discrepant findings: Yi (2020) found a significant positive relationship between camouflaging and self-esteem while Evans et al. (2023) reported a significant negative relationship between the two. Camouflaging had a significant positive relationship with borderline personality disorder symptoms in women but not men (Weiner et al., 2023). In the same study, there were no significant relationships between camouflaging and emotional dysregulation (Weiner et al., 2023). Cassidy et al. (2018) found that there was no relationship between the presence of anxiety and depression diagnoses and camouflaging.

Three studies reported separate correlations by gender for depression. In two of the studies, camouflaging had a significant positive relationship with depression in men but not women (Hull et al., 2021; Lai et al., 2017), but the opposite pattern was found in Weiner et al. (2023). As for anxiety, Hull et al. (2021) found a significant positive correlation in both men and women, while in Weiner et al. (2023), neither relationship was significant. Finally, Hull et al. (2021) reported significant positive relationships between camouflaging and social anxiety in men and women. However, in the same study, none of the relationships between camouflaging and the reported mental health outcomes were significant for non-binary participants, which could have been driven by the lack of power stemming from the small number of such participants ($n = 18$).

Another four studies reported separate correlations between the three subscales of the CAT-Q and at least one outcome of interest. Hull et al. (2019) and H. L. Moore et al. (2023), found the Assimilation (‘putting on an act’ in social interactions) subscale to have significant positive relationships with anxiety and depression and a negative relationship with wellbeing. However, the relationship between Assimilation and a combined anxiety/depression outcome was not significant in Yi (2020). Hull et al. (2019), Yi (2020), and Lei et al. (2023) reported significant positive correlations between Assimilation and social anxiety. The findings for Masking (suppressing one’s autistic traits) and Compensation (making up for perceived social challenges) were mixed. Masking and Compensation were both significantly positively correlated with social anxiety in Hull et al. (2019), but only Compensation had a relationship with social anxiety in Lei et al. (2023) and Yi (2020). These two subscales had a significant relationship with anxiety but not wellbeing in Hull et al. (2019) and H. L. Moore et al. (2023). The latter study also found no relationship between Masking and Compensation and depression, while in Hull et al. (2019), they were both positively correlated with depression.

The potential role of autistic community connectedness in the relationship between camouflaging and mental health was investigated in two studies which found that it neither mediated (Khudiakova et al., 2024) or moderated (Cage et al., 2022) that relationship. However, McQuaid et al. (2023) found significant separate moderation effects of emotional dysregulation and perceived stress.

6. Discussion

Camouflaging is an umbrella term referring to conscious or unconscious impression management strategies aimed at reducing the perception of one’s autistic traits in a predominantly non-autistic world (Ai et al., 2022; Hull et al., 2017). While autistic people have consistently linked camouflaging to adverse mental health outcomes (Bradley et al., 2021; Raymaker et al., 2020), quantitative research has yielded mixed findings (Hull et al., 2021; Lai et al., 2017). This systematic review aimed to address this discrepancy by summarising 23 studies examining the relationship between camouflaging and its outcomes in autistic people. Sixteen studies using correlational designs were included in two meta-analyses and showed that autistic people who camouflaged more scored higher on measures of anxiety, depression, and social anxiety. Autistic people who camouflaged more also reported reduced psychological wellbeing. Meta-regression analyses revealed that the effect sizes in individual studies were not moderated by the quality scores, participants’ mean age, and proportions of female and formally diagnosed participants. Overall, this review demonstrates a significant correlational association between camouflaging and worsened mental health outcomes.

6.1. Camouflaging, measurement, and mental health

In this review, almost all studies using self-report measures (the CAT-Q in all but one case) reported at least one significant association between camouflaging and symptoms of mental health conditions. However, the three studies using the discrepancy approach were far less conclusive in their findings, with one study not finding a significant relationship (Schuck et al., 2019) while others reported a significant relationship (Ross et al., 2023) or mixed findings (Lai et al., 2017). This inconsistency could be due to these two approaches measuring distinct constructs: Cook et al. (2021) argue for the distinction between camouflaging intent, as measured by self-report scales such as the CAT-Q, specifically the Assimilation subscale, and camouflaging ‘efficacy’ minimising the perception of one’s autistic traits based on observable behaviour, which may be captured better by the discrepancy approaches. Indeed, self-report CAT-Q scores have been found to correlate only weakly with camouflaging scores calculated using the discrepancy approach, suggesting that the two are distinct albeit related constructs (Hollocks et al., 2023). As such, it is possible that it is the intent to camouflage that may be one of the major factors associated with adverse mental health outcomes, possibly through the fatigue associated with the efforts to camouflage (Bargiela et al., 2016), which is corroborated by our findings that the Assimilation subscale of the CAT-Q had more consistent relationships with adverse mental health outcomes than the other two subscales. However, causality or directionality cannot be established statistically without longitudinal studies. It is possible that some of the items in Assimilation, such as avoiding interacting with others in social situations, may conceptually overlap with social anxiety safety behaviours as measured by psychometric instruments such as the Social Phobia Inventory (Connor et al., 2000; Lei et al., 2023), potentially accounting for the high correlations. Nonetheless, the finding that Assimilation scores are consistently related to poor mental health outcomes should be replicated and investigated further.

6.2. Why is camouflaging related to poorer mental health?

Despite certain inconsistencies in the literature, this meta-analysis established that camouflaging had a significant association with adverse mental health outcomes. Insights from previous research may help understand why. In qualitative studies, autistic people report that camouflaging feels exhausting, potentially leading to burnout and suicidal ideation (Bradley et al., 2021; Miller et al., 2021; Raymaker et al., 2020). Some have attributed the perceived mental health effects of camouflaging to feeling inauthentic and pressured to 'perform' neurotypically, leading to a disconnect between what one sees as their real self and the way they feel forced to present themselves in interpersonal interactions (Miller et al., 2021; Seers & Hogg, 2023). Indeed, autistic people who camouflage more tend to score lower on measures of perceived authenticity (Evans et al., 2023), suggesting that reduced authenticity could be one of the factors relating camouflaging to poor mental health, although more research is needed.

The directionality and potential causality of the relationship between mental health and camouflaging are unclear. While it is possible that camouflaging may be triggered by feelings of alienation and isolation stemming from social rejection due to one's behaviours being perceived as atypical, the reverse is also possible, with camouflaging being partially driven by those feelings and a desire to fit in (J. S. Beck et al., 2020). Besides, relationships between camouflaging and mental health challenges identified in cross-sectional studies are difficult to interpret from a causal standpoint, as some camouflaging behaviours may mimic safety behaviours stemming from anxiety; in other words, it is possible that autistic people who are already predisposed to anxiety are more likely to engage in at least some aspects of camouflaging (Williams, 2022). From a more longitudinal perspective, it is possible that the drivers of camouflaging, such as social rejection, may eventually become its outcomes, making causal relationships even harder to identify (Ai et al., 2022). Despite emerging evidence showing that camouflaging is associated with certain positive outcomes, such as vocational and educational achievements (Park, 2021) due to its perceived utility in navigating a predominantly neurotypical world (Radulski, 2022), the link between camouflaging and poor mental health is underscored in this review. More research is needed to investigate any other potential positive outcomes of camouflaging in order to gain a more complete picture.

As previously discussed, camouflaging is frequently understood as a response to the pervasive anti-autism stigma in society, which could be a key element in the relationship between camouflaging and mental health at least for some autistic people. For instance, in autistic people, both the perceived need to camouflage and symptoms of social anxiety could be driven by stigma experience, in which case camouflaging would be a sensible response to such experiences (Pearson & Rose, 2021). This aligns with research suggesting that while behaviours resembling camouflaging could be found in neurotypical people, one of the core motivations for camouflaging in autistic people is avoiding anti-autism stigma (Bernardin et al., 2021). Besides, one of the studies included in the review found that stigma experience mediated the relationship between camouflaging and mental health in autistic adults: those who camouflaged more experienced more stigma and poor mental health outcomes (Khudiakova et al., 2024). As such, the role of stigma as a potential factor in that relationship should be followed up on in future research examining social factors affecting wellbeing in autistic people.

6.3. Gender, camouflaging, and mental wellbeing

This review did not find a relationship between the proportion of female participants and effect sizes in the studies included in the meta-analysis. It is noteworthy that in several studies, such relationships differed significantly between men and women, with some correlations being significant in one gender group but not the other but with no consistent pattern (Hull et al., 2021; Lai et al., 2017; Weiner et al., 2023). Such findings highlight the importance of conducting a meta-analysis, in synthesising seemingly contradictory results. However, these nonsignificant results should be interpreted with caution, as the included studies were inconsistent in their reporting of participants' gender. We used the percentage of participants who self-identified as women or female where available. Some studies used assigned sex at birth, so their 'female' group could include transgender men or non-binary people. Future studies should therefore make that distinction clearer to allow to make conclusions about gender as a potential moderator of that relationship.

Notwithstanding those results, it is important to note that the academic study of camouflaging emerged from research into the experiences of autistic women, some of whom identified a causal link between camouflaging and mental health (e.g., Bargiela et al., 2016; Hull et al., 2017). There is some evidence that autistic women score higher on measures of camouflaging (Hull et al., 2020; McQuaid et al., 2022) which could be explained, in part, through the lens of gendered expectations in society and the pressure to 'perform' hegemonic femininity (I. Moore et al., 2022). However, camouflaging should not be essentialised as solely female to avoid shoring up uncritical and frequently problematic positionings of autism, gender, and their intersections (I. Moore et al., 2022). While research suggests that autistic women are more likely to experience adverse mental health outcomes than autistic men (Martini et al., 2022), which could theoretically be related to camouflaging, this review suggests that there is not enough evidence to make conclusions about differential outcomes of camouflaging in autistic people across genders. Moreover, in this review, there were very few studies reporting on nonbinary or transgender participants separately, so this review cannot draw any conclusions about gender diverse autistic people aside from recommending further research to report correlations separated by gender, including non-cisgender identities.

6.4. Limitations

There was sufficient literature to produce two meta-analyses with four meta-correlations and another four meta-regressions, in addition to a narrative review, yet there are several important limitations to consider. Studies measuring generalised anxiety, social anxiety, and depression used a diverse array of measures, which may reflect slightly different conceptualisations of the same constructs and as such might be challenging to use in pooled analyses. However, the psychometric diversity did not translate to high levels of statistical heterogeneity between studies, and most correlations for these outcomes were in the low to moderate range, suggesting that the findings were arguably similar despite the use of different measures. All studies included in the calculation of a meta-correlation for wellbeing used the same measure and all but one of the reported correlations were relatively close to each other. Even so, whilst psychometric heterogeneity remains an issue in the field, this review underscores that camouflaging tends to have a negative relationship with mental health regardless of the measure used.

The overwhelming majority of the studies included in this review used the CAT-Q as a quantitative measure of camouflaging in autistic adults, with very few studies reporting score breakdowns by subscale or their correlations with other variables of interest. While the initial findings that the subscales have different relationships with different outcomes are promising, especially when considering the distinction between the intent to camouflage and the observable behaviours constituting camouflaging, it remains to be studied if the subscales are reflective of the difference between camouflaging intentions and outcomes which could be one of the explanations for the relationship between camouflaging and adverse mental health outcomes.

The lack of evidence for the psychometric properties of the measures included in the studies in the autistic population could call into question the conclusions of this review. Despite the widespread use of the CAT-Q, there is still limited evidence for its psychometric validity (Hannon et al., 2023), and many of the included studies did not use measures sufficiently validated for use in autistic people. The studies by van der Putten et al. (2023), Keating et al. (2024), and Oshima et al. (2024) also used translated versions of the CAT-Q; whilst those versions have been validated, the assumptions that all of the items on the CAT-Q are culturally relevant and the scores on the translated versions can be directly compared to the original English scale remain to be tested. Moreover, the CAT-Q may be limited in identifying unconscious engagement in camouflaging (Cook et al., 2021), which may have a different relationship with mental health outcomes compared to self-identified camouflaging intent or consciously used strategies. As such, the conclusions about the construct of camouflaging are limited to the portion of the umbrella term that is measured by the CAT-Q.

Despite this review identifying a link between camouflaging and adverse mental health, it is important to consider what is *not* measured in the studies included in the review. None of the studies reported outcomes related to physical health, and only one study investigated autistic burnout (Arnold et al., 2023). Only two studies (Lei et al., 2023; Ross et al., 2023) included information on participants' intellectual ability. Coincidentally, these two studies were conducted on children. As such, there is not enough evidence to draw any conclusions about the potential role of intelligence in the relationship between camouflaging and mental health, especially in adults. In the included studies, it was unclear whether participants with intellectual disabilities were excluded deliberately or through self-selection. It is thus unknown what camouflaging may look like in autistic people with an intellectual disability and whether the findings identified in this review would be applicable to that underserved population.

6.5. Research implications

Researchers should strive to establish the nature of the complex relationship between camouflaging and mental health through, for instance, considering its directionality and potential mediators and moderators. Future studies should also address issues surrounding the measurement of both camouflaging and mental health outcomes in the autistic population. Psychometric validation of extant measures, including the CAT-Q, in samples reflecting the diversity of autistic people should continue, with special attention paid to racial, geographical, gender, and socioeconomic diversity. When it comes to autistic people with intellectual disability, extant measures need to be validated or new appropriate measures should be developed if needed so that any relationships between camouflaging and mental health could be identified in that population. Moreover, the causality and directionality of that relationship should be investigated through longitudinal designs, alongside any potential moderators or mediators, such as perceived autism acceptance and perceived 'effectiveness' of camouflaging. Finally, quantitative and qualitative research should further probe the finding regarding the Assimilation subscale of the CAT-Q (which seems to measure the perceived need and intent to camouflage rather than any specific behaviours) potentially having a more robust relationship with adverse mental health outcomes than the other two subscales.

7. Conclusion

This systematic review and meta-analysis of a total of 23 studies found a significant correlational relationship between camouflaging and adverse mental health outcomes (increased anxiety, social anxiety, and depression and poorer wellbeing) in autistic people. This relationship did not depend on the mean age of autistic participants, percentage of female and clinically diagnosed participants, and the assessed quality of the studies. However, these results cannot establish causality, and existing measures used in the included studies may lack sufficient psychometric evidence for their use in autistic people from diverse backgrounds. Further work is needed to clarify the precise mechanisms of that relationship and its applicability to the broader autistic community.

Funding

No funds, grants, or other support was received.

CRediT authorship contribution statement

Sophie Sowden-Carvalho: Writing – review & editing, Supervision. **Andrew Surtees:** Writing – review & editing, Supervision, Conceptualization. **Valeria Khudiakova:** Writing – original draft, Investigation, Formal analysis, Conceptualization. **Emmeline Russell:** Writing – review & editing, Investigation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The research data and code are available on the Open Science Framework and linked in the text.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.rasd.2024.102492.

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