

Understanding camouflaging, stigma, and mental health for autistic people in Japan

Running head: Autism and camouflaging, stigma, and mental health

Masaki Tamura¹, Eilidh Cage², Ella Perry³, Minako Hongo⁴, Toru Takahashi⁵, Mikuko Seto⁴,
Eiji Shimizu^{1,4,6}, Fumiyo Oshima^{4*}

¹Department of Cognitive Behavioral Psychology, Chiba University Graduate School of Medicine, Chiba, Japan

²Division of Psychology, Faculty of Natural Sciences, University of Stirling, Stirling, Scotland, UK

³Department of Psychology, Royal Holloway, University of London, Egham, UK

⁴Research Center for Child Mental Development, Chiba University, Chiba, Japan

⁵Faculty of Human Sciences, Waseda University, Tokorozawa, Japan

⁶Cognitive Behavioral Therapy Center, Chiba University Hospital, Chiba, Japan

***Corresponding author:** Fumiyo Oshima

Research Center for Child Mental Development, Chiba University

1-8-1, Inohana, Chuou-ku, Chiba-shi, Chiba 260-8677, Japan

Phone: +81-43-226-2975

Fax: +81-43-226-8588

Email: c21ujsw35117c@faculty.gs.chiba-u.jp

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Abstract

Background: Camouflaging refers to behaviors in which autistic individuals mask their autistic characteristics and “pass” as non-autistic people. It is postulated that camouflaging is a response to stigma, and preliminary evidence supports this hypothesis. However, research on this topic outside of Western countries is limited. This study replicated and extended previous work in the West that examined the relationships between camouflaging, stigma, and mental health of autistic adults, with a Japanese sample.

Methods: Two-hundred eighty-seven autistic people living in Japan (146 men, 120 women, 14 non-binary, 5 other gender identities, 2 preferred not to say; mean age = 37.5 years, standard deviation = 9.8 years) completed an online survey on camouflaging, perceived stigma, coping strategies for stigma, mental well-being, generalized anxiety, social anxiety, and depression. We used hierarchical multiple regression analyses to investigate the relationships between camouflaging and stigma and coping strategies for stigma. Mediation analyses were also employed to examine whether camouflaging mediated the relationships between stigma and autistic people’s mental health.

Results: Replicating previous work, we found that higher camouflaging was associated with higher perceived stigma. Both coping strategies of hiding/denying and valuing/embracing stigmatized characteristics were positively related to camouflaging. Camouflaging mediated the association of stigma with depression, generalized anxiety, and social anxiety (but not well-being).

Conclusion: Our findings support the hypothesis that camouflaging is closely related to autism-related stigma and can influence the impact of stigma on mental health. More work around social outreach and addressing autism-related stigma would be beneficial to reduce the negative role of camouflaging.

Community Brief

Why is this an important issue?

Social camouflaging is a behavior through which autistic individuals mask their autistic characteristics to “pass” as non-autistic people. While camouflaging can help autistic individuals adapt to a non-autistic society, it is also associated with fatigue, depression, and anxiety. In 2021, Perry et al. surveyed 223 autistic adults residing primarily in Western countries and suggested that camouflaging might be a strategy to avoid stigma against autism, which can impact their mental health. However, whether their findings are cross-cultural is unclear.

What was the purpose of this study?

This study examined whether the results of Perry et al. are applicable to autistic people in Japan. We examined the relationships between camouflaging, stigma, and the mental health of autistic people.

What did the researchers do?

We surveyed 287 autistic adults residing in Japan on perceived stigma, camouflaging, mental health, and their coping strategies for managing stigma. We compared our findings with those of Perry et al.

What were the results of the study?

- (1) The higher the perceived stigma, the higher the extent of camouflaging.
- (2) Autistic people who try to distance themselves from the autistic community are likely to camouflage. Those with stronger autistic identity and stronger pride in the autistic community are also likely to camouflage.
- (3) Higher perceived stigma can contribute to higher degrees of depression, generalized anxiety, and social anxiety among autistic individuals, in part because higher stigma is associated with higher degree of camouflaging. Stigma was also associated with poor mental well-being, but camouflaging has limited roles in it.

What do these findings add to what was already known?

- (1) Camouflaging is closely related to stigma against autism, much like in Perry et al.'s study. There was no significant cross-cultural difference in the degree of influence of stigma on camouflaging.
- (2) Similar to individuals residing in Western countries, both people who hide/deny their autistic characteristics and who value/embrace their characteristics are likely to camouflage. Regardless of how autistic people perceive their identity, they might have no choice but to continue camouflaging if they feel stigmatized.
- (3) Camouflaging may play an important role in explaining the relationship between stigma, depression, and generalized and social anxiety. However, these relationships warrant further investigation.

What are potential weaknesses in the study?

(1) Compared with the general autistic population, participants could have differed in terms of gender, age, and education. Whether our findings apply to all autistic people is unclear.

(2) This study surveyed autistic people only once. Therefore, we could not show whether stigma directly triggers camouflaging.

(3) The reliability of the questionnaires quantifying the levels of stigma, coping strategies, and autistic characteristics were questionable.

(4) This study did not consider the motives, contexts, and the consequences of camouflaging. The impacts of camouflaging could differ depending on these factors.

How will these findings help autistic adults now or in the future?

These findings highlight the importance in reducing stigma against autism and creating an environment in which autistic people can openly reveal their identity.

Background

Autistic people have specific styles of social communication and interaction and unique preference in interests and activities. They often experience mental health problems,¹ with the lifetime prevalence of mental health conditions being 79%, higher than in non-autistic people (41%).^{2,3} Over the past few years, several studies have asserted social camouflaging as a factor associating with the mental health of autistic people.⁴⁻⁸ Social camouflaging refers to behaviors in which autistic people conceal their social differences to get by in a predominantly neurotypical world.^{7,9} It includes several types of behaviors, such as masking autistic behaviors like repetitive hand movements, learning social cues from TV programs, movies, and books, and assimilating with non-autistic people by forcing interaction.^{10,11}

Autistic people are both benefited and disadvantaged by camouflaging. It helps some autistic people achieve social goals, such as establishing close relationships with others, getting jobs or an education, and building their careers.^{7,12,13} These social achievements foster self-confidence and increased feeling of connectedness to others among autistic people.¹² However, camouflaging is also related to substantial costs to autistic people. Qualitative studies have described how camouflaging can contribute to fatigue, burnout, a sense of falsifying their identity, and feelings of “false relationships” with others.^{4,7} Quantitative studies have shown associations between camouflaging and depression, generalized anxiety, social anxiety, and suicidality.^{5,6} Additionally, camouflaging makes autistic traits harder to recognize and could prevent autistic people from receiving a timely diagnosis.^{14,15}

Although the relationship between camouflaging and mental health of autistic people has not been established clearly, in prior qualitative studies, most autistic people emphasized the disadvantages of camouflaging over its advantages.^{7,12,16} Ai et al.¹⁷ proposed that camouflaging is a type of impression management (IM) used by various neurotypes,¹⁸ and suggested the possibility that autistic people are more negatively affected by IM/camouflaging compared with neurotypicals. IM refers to behavior in which people attempt to adjust their behavior to create a particular impression of themselves.^{18,19} IM encourages success in interpersonal relationships,²⁰ while being related to loneliness and lower levels of life satisfaction.²¹ IM (camouflaging) can contribute to mental loads for both autistic and non-autistic individuals;^{22,23} however, in a qualitative study,²³ only autistic individuals mentioned that masking is linked with dangerous thoughts such as suicidal ideation.

Ai et al.¹⁷ noted the reasons why IM/camouflaging has different impacts on autistic people and neurotypicals.

First, as members of a stigmatized group, autistic people might be compelled to camouflage. Stigma refers to negative attitudes toward characteristics that do not conform to culturally established norms.²⁴ When members of a certain group perceive stigma that the general population has toward them (public stigma), they develop the awareness of stigma or a belief that others hold stigmatizing thoughts toward one's condition (perceived stigma). As members of the stigmatized group begin to endorse and apply these stigmatized beliefs to themselves (internalized stigma), this is associated with lower self-esteem and lower quality of life.^{25,26} As disclosing a stigmatized identity is associated with further stigmatization, those with stigmatized identities, such as sexual minorities, people with mental illnesses impaired, and people who are HIV positive, try to hide their characteristics.²⁷⁻²⁹ To them, impression management is not behavior aimed at being "better than others," but rather at not being rejected by society, which has been linked with severe depression and reduced quality of life.^{29,30} Moreover, autistic people have long been socially stigmatized and labeled as "dangerous and unstable," "unloved," or "introverted and withdrawn."³¹⁻³³ Further, non-autistic people form more negative first impressions of autistic people and display dehumanizing attitudes toward them.³⁴⁻³⁸ These stigmas can even promote bullying and difficulty finding employment.³⁹ Autistic people might be forced to camouflage to avoid imminent threats, such as violence, which could heighten their anxiety toward the possibility of their camouflage failing, which could, in time, exhaust them.

Perry et al.⁸ quantitatively investigated the relationship between perceived stigma and camouflaging using social identity theory (SIT).⁴⁰ Social identity is one's perception of the social group one belongs to. SIT proposes that people are motivated to create, maintain, and protect the positivity of their social identity to maintain positive self-esteem.⁴¹ When a group is stigmatized, and the self-esteem of in-group members is threatened, they could adopt two different coping strategies. Those who use "collective strategies" seek to restore positive social identity, redefining the stigmatized group as valuable and centrally defining aspects of identity.⁴² They resist social norms and values underpinning stigma⁴³ and try to improve the in-group's status by restructuring oppressive cultural and structural systems (e.g., by participating in social movements).⁴⁴ In contrast, those who use "individualistic strategies" try to hide, minimize, or overcome stigmatized characteristics and move from stigmatized in-group to a higher status out-group.⁴² For autistic people, individualistic strategies include masking their autistic characteristics, denying being autistic, and trying to correct their characteristics to become less autistic.^{8,42}

Of the two strategies, using individualistic strategies seems similar to camouflaging, although camouflaging does not include minimizing or trying to overcome autistic characteristics. If camouflaging is highly related to using individualistic strategies (a response to stigma), one can infer that perceived stigma facilitates camouflaging. Perry et al.⁸ examined the relationship between perceived stigma, individualistic strategies, collective strategies, and camouflaging. Further, they proposed that camouflaging mediates the relationship between stigma and autistic people's mental well-being, considering the idea that camouflaging is a response to stigma. This hypothesis was based on Botha and Frost's⁴⁵ proposition that stigma severely impacts autistic individuals' mental well-being and is associated with lower quality of life and lower self-esteem.^{45,46} Botha and Frost⁴⁵ interpreted these negative effects of stigma within the framework of the minority stress model. The model proposes that people with minority identities are exposed to higher stress burdens, such as stigma or lack of social support, resulting in greater physical and mental health problems.⁴⁷ The hypothesis of Perry et al.⁸ suggested that there are indirect pathways wherein stigma affects mental well-being through increased camouflaging, in addition to the direct effects of stigma that the minority stress model posits.

Perry et al.⁸ conducted an online survey of 223 autistic adults (130 women, 53 men, 39 non-binary or other gender identities, 1 preferred not to say; mean age (M) = 34.19 years, standard deviation (SD) = 11.00) mainly living in the UK and North America. Multiple regression analyses showed that perceived stigma was positively related to camouflaging, supporting their hypothesis that camouflaging is a response to stigma. As for strategy use, individualistic strategy use was positively associated with camouflaging, suggesting that the two are highly related. However, collective strategy use, which could seem to be the opposite of individualistic strategies, was also positively related to camouflaging. Contrary to the hypothesis, camouflaging did not mediate the relationship between stigma and mental well-being. The mediation of camouflaging between stigma and mental health warrants further investigation by considering other aspects of mental health, including depression, generalized anxiety, and social anxiety, which relate to camouflaging.⁶

While the study by Perry et al.⁸ is meaningful, being the first to interpret camouflaging in the framework of SIT, it has some limitations. One of these is the regional, racial, and ethnic bias of participants. Most were Caucasians living in the UK or North America—almost none living in Asian countries. Since social-cultural factors differ between Asia and the West, the style in which autistic people react to stigma and the impacts of camouflaging could differ.

In East Asia, people emphasize “inter-dependence”; they respect cooperation with others and avoid rejection by not disturbing the harmony of the group.^{45,46} In such environments, people try to find their faults that do not conform to others’ expectations and correct them to achieve self-fulfillment.⁴⁷ Over-adaptation behavior— an attitude in which an individual attempts to conform to the demands of the environment suppressing their personal demands⁴⁸ is a well-known concept in Japan,⁵² and is a good reflection of this nature. In Western countries, “independence” is respected, where the self is a unique reality separate from others.⁴⁹ Under such a self-view, people find attributes to be proud of in themselves and try to gain self-esteem by expressing them outwardly.⁵⁰ Although there are certain criticisms of perceiving national characteristics in this way,^{53,54} it is possible that Asian autistic individuals are more sensitive to stigma and camouflage at a higher level. Indeed, autism-related stigma varies by region, with autistic people in Asian countries more stigmatized than those in Western countries.⁵⁵⁻⁵⁷ Someki et al.⁵⁶ compared the levels of autism-related stigma and knowledge of autism that Japanese and American college students had. Their finding showed that Japanese students exhibited greater social distance and less knowledge than those in U.S. In addition, a multinational comparison study⁵⁸ showed that nearly 70% of parents in Japan believe that autistic individuals differ from their peers in intellectual ability. Such beliefs could contribute to higher levels of stigma.^{56,59} Outside Japan, Yu et al.⁵⁷ showed that only 57-65% of Chinese people have enough knowledge about autism, and 38% supported the discrimination against autistic people. In an environment where the level of autism-related stigma is higher and harmony with others is more expected than in the West, perceived stigma might be more facilitative of camouflaging. Moreover, Japanese people prefer indirect forms of communication compared with those in the West.⁶⁰ Tezuka stated that the mutual complementarity between speaker and listener makes Japanese communication effective.⁶¹ This mutual complementarity may make effective camouflaging more difficult as it may require more prudence and mental resources, which may be linked with poor mental well-being. These differences in socio-cultural backgrounds may influence the relationship between stigma, camouflaging, and the mental health of autistic individuals. Therefore, verifying whether the results of Perry et al.⁸ are replicated in Japan—where the cultural background and experience of stigma could differ—and whether the level of stigma, camouflaging, and coping strategies used by autistic people are different, is meaningful.

This study is a quasi-replication of Perry et al.⁸ that verifies whether their results are replicated in Japan. We also re-examined the mediation of camouflaging, adding several

different mental health questionnaires to the ones they used. Further, we examined whether the degree to which stigma affects camouflaging differs between samples from different cultural backgrounds, specifically the Japanese and Western cultures.

We hypothesized that, in Japan, (1) perceived stigma is more positively related to camouflaging than in the West; (2) both individualistic and collective strategy use positively relate to camouflaging; (3) and camouflaging mediates the relationship between stigma and autistic people's mental health (mental well-being, depression, generalized anxiety, and social anxiety).

Methods

Participants

Individuals who self-reported receiving a diagnosis of autism by physicians according to the Diagnostic and Statistical Manual of Mental Disorders fifth edition⁶² were eligible to participate. Since the inclusion criteria were verified only by participants' self-reports, we also used the Japanese version of the Autism-Spectrum Quotient 10-item short version⁶³ to measure autistic characteristics, and excluded those who scored below the cut-off point of 7 (n = 163 excluded). We also excluded those who had received the diagnosis from someone other than a physician¹ or had self-diagnosed (none were excluded). Thus, there were 287 participants.

To recruit participants, we sent one email newsletter to individuals who belonged to a private firm's research panel and another to individuals registered with a support facility that helped autistic people find employment. We recruited participants and collected data between January and March 2022. We obtained informed consent from all participants.

Of the participants, 146 (50.9%), 120 (41.8%), and 14 (4.9%) identified as men, women, and non-binary, respectively. Five participants (1.7%) used other terminologies to describe their gender, and two (0.3%) preferred not to disclose. Participants' ages ranged from 20 to 63 years (M = 37.5 years, SD = 9.8 years), and their age at diagnosis ranged from 1 to 60 years (M = 31.8 years, SD = 12.2 years). Most participants (n = 280, 97.6%) reported being Asian, followed by those who reported being White (n = 4, 1.4%), Hispanic (n = 1, 0.3%), mixed race (n = 1, 0.3%), and other ethnicities (n = 1, 0.3%). Regarding the highest level of education, most participants had a bachelor's degree from a four-year college (n =

¹ Since only physicians can make the official diagnosis in Japan, this study excluded those who received the diagnosis from someone other than a physician.

136, 47.4%), followed by those who had a middle or high school diploma ($n = 73$, 25.4%), a technical or junior college degree ($n = 38$, 13.2%), other educational backgrounds ($n = 28$, 9.6%), and a master's degree or doctorate ($n = 12$, 4.2%). All participants resided in Japan, and 177 (61.7%) were employed at the time of participation.

Materials and procedure

This study was approved by the Research Ethics Committee at Chiba University (Reference No: M10319). This study did not include autistic consultation, engagement, or coproduction.

Potential participants accessed the research website and were screened to check whether they were eligible for the study. The questionnaires were presented in the order mentioned below. Those who scored below the cut-off on the AQ-J-10 did not complete the questionnaires after that point.

In selecting the scales, we chose the same scale as Perry et al.⁸ when possible. In quantifying participants' autistic traits, we chose the AQ-J-10 because the scale that Perry et al.⁸ used (Ritvo Autism and Asperger Diagnostic Scale)⁶⁴ was not validated and standardized in Japanese. Moreover, in the absence of similar measures in Japanese, we translated the stigma consciousness scale,⁶⁵ the individualistic strategy use scale,⁴² and the collective strategy use scale,⁴² which were used by Perry et al.⁸ When scales had to be translated, the Japanese version was back-translated and verified by native English speakers. The translated versions of the scales are shown in Supplemental material 1.

Demographic information

Participants first provided their demographic information, including their age, age at diagnosis, gender, ethnicity, residency, highest level of education, and employment status.

Autism-Spectrum Quotient 10-item short version (AQ-J-10)

The AQ-J-10 is a short version of the Autism Quotient, which quantifies autistic traits.^{63,66} Participants rated 10 items, such as "I prefer to do things with others rather than on my own," on a four-point Likert scale. Participants scored zero or one point per sentence, depending on their ratings. The total score could range between 0 and 10, and higher scores indicated higher levels of autistic traits. With a cut-off value of 7, the AQ-J-10 has a high negative predictive value (0.97) for autism without intellectual disability.⁶³ The scale had poor internal consistency in this study ($\alpha = 0.448$).

Patient Health Questionnaire-9–Japanese version

The Patient Health Questionnaire-9 (PHQ-9)⁶⁷ is a nine-item, self-administered measure to assess depressive symptoms in the past two weeks. Participants rated each item (e.g., “Little interest or pleasure in doing things”) on a Likert scale of 0 (not at all) to 3 (nearly every day). The total score could range from 0 to 27, with higher scores suggesting more depressive symptoms. Ten is the threshold for the presence of major depressive disorder.⁶⁷ We used the PHQ-9 Japanese version developed by Muramatsu et al.⁶⁸ The scale had good internal consistency in this study ($\alpha = 0.867$).

Generalized Anxiety Disorder-7–Japanese version

The General Anxiety Disorder-7 (GAD-7)⁶⁹ comprises seven items related to generalized anxiety symptoms. Participants rated items such as “Feeling nervous, anxious, or on edge” on the same Likert scale as the PHQ-9. Total scores could range from 0 to 21, with 10 as the cut-off for the presence of generalized anxiety disorder. We used the Japanese version of the GAD-7.⁷⁰ The scale had good internal consistency in this study ($\alpha = 0.899$).

Liebowitz Social Anxiety Scale–Japanese version

The Liebowitz Social Anxiety Scale (LSAS)⁷¹ is a 24-item self-reported measure of social anxiety symptoms over the past week. Items were related to various social situations, and participants rated the extent that they feared and avoided the situation separately on a Likert scale of 0 to 3. The total scores could range between 0 and 144, and higher scores suggested more social anxiety. Asakura et al.⁷² developed and validated the Japanese version. The scale had excellent internal consistency in this study ($\alpha = 0.972$).

Camouflaging Autistic Traits Questionnaire (CAT-Q)–Japanese version

This 25-item measure was designed to quantify camouflaging for autistic people.¹¹ The scale has three subscales: masking, compensation, and assimilation. The masking subscale contains items related to hiding autistic characteristics and pretending to non-autistic (e.g., “I always think about the impression I make on other people”). The compensation subscale includes items regarding strategies to compensate for difficulties in social situations (e.g., “When I am interacting with someone, I deliberately copy their body language or facial expressions”). Assimilation contains strategies to fit in with others in social situations (e.g., “In social situations, I feel like I’m ‘performing’ rather than being myself.”). Items were rated on a seven-point scale (*strongly disagree* to *strongly agree*). Total scores range from 25 to 175.

Those with higher scores camouflaged more. The Japanese version of Hongo et al.⁷³ was reliable and valid, and the scale had good internal consistency in this study ($\alpha = 0.888$).

Warwick-Edinburgh Mental Wellbeing Scale–Japanese version

Participants' mental well-being was assessed using the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS), which has 14 items.⁷⁴ Participants rated items such as "I've been feeling relaxed" on a five-point Likert scale ranging from "none of the time" to "all of the time." The total scores could be between 14 and 70, with higher scores suggesting more positive mental well-being. We used the WEMWBS's Japanese version that Suganuma et al.⁷⁵ developed, which has excellent internal consistency ($\alpha = 0.905$).

Stigma consciousness scale

The stigma consciousness scale comprised five items related to perceived stigma⁶⁵ adapted by Perry et al.⁸ for autistic people. Participants rated items such as "Stereotypes about autistic people have not affected me personally" (reversed item) and "Most people do not judge someone based on their being autistic" (reversed) on a Likert scale of 0 (strongly disagree) to 3 (strongly agree). The total score could be between 0 and 15, with higher scores indicating a stronger consciousness of social stigma. Since there was no Japanese version of this scale, we translated it into Japanese. It had moderate internal consistency ($\alpha = 0.606$).

Individualistic strategy use

We translated the 13-item scale of individualistic strategy use⁴² adapted for autistic people.⁸ Participants reported the extent that they agreed with each item on a seven-point Likert scale. The scale includes three subscales: "concealing status" (e.g., "I try to hide my autistic traits from others in certain situations"), "deny/minimize" (e.g., "I don't think of myself as an autistic person."), and "attempt to overcome" (e.g., "I do not need to be "cured" of autism;" reversed item). The total score could be between 13 and 91, and those with higher scores used individualistic strategies more frequently. It had poor internal consistency ($\alpha = 0.598$).

Collective Strategy Use

We modified and translated the collective strategy use scale⁴² into Japanese.⁸ The scale comprised 13 items related to pride in the autistic community, "I have a lot of pride in the

autistic community”, or social change activism, “I am an autistic rights activist.” Each item was rated on a seven-point agreement scale, with total scores ranging from 13 to 91. Those who scored high used collective strategies more frequently. It had excellent internal consistency ($\alpha = 0.905$).

Design and data analysis

Being a quasi-replication of Perry et al.⁸, this study had a cross-sectional correlational design. We performed all statistical analyses using SPSS statistics version 28.0 and mediation analyses using PROCESS add-on version 3.3.⁷⁶ For hierarchical linear multiple regression analyses, we created two dummy codes for gender: “male versus female” and “male versus non-binary.” We set male as the reference category and coded it zero because most participants identified as male.

To test hypothesis one, we performed a hierarchical linear multiple regression analysis to test whether perceived stigma significantly correlated with camouflaging. We set camouflaging as the dependent variable and entered demographic variables (gender, age, age at diagnosis, and autistic traits) as independent variables at Step 1, and perceived stigma at Step 2. All demographic variables have been previously found to be related to camouflaging and were therefore controlled for in our analyses.⁷⁷ In examining the extent that stigma affects camouflaging, we compared Cohen’s f^2 of stigma in our study with that of Perry et al.⁸ We considered f^2 values of .02 as a small effect, .15 as a medium effect, and .35 as a large effect.⁷⁸ For comparison, we used the values showed in Perry et al.⁸ since we did not have access to the dataset used by them.

We tested hypothesis 2 by performing a hierarchical linear multiple regression analysis with camouflaging as the dependent variable. We entered demographic variables as above at Step 1 and individualistic and collective strategy use at Step 2 as independent variables.

The “masking” subscale of the CAT-Q and the “concealing status” subscale of the individualistic strategy scale contain similar items; thus, the degree of correlation between the two may be affected by the overlap of items between the scales. To examine this effect, we also performed the above analysis replacing the individualistic strategy scale with that without the “concealing status” subscale.

To test hypothesis 3, we used four mediation models. In all models, stigma was the independent variable, and camouflaging was the mediating variable. The dependent variables

were mental well-being (Model 1), depression (Model 2), generalized anxiety (Model 3), and social anxiety (Model 4).

As this was a quasi-replication study, we employed the same analysis method as Perry et al.⁸ However, in testing Hypothesis 1 and 2, we used hierarchical multiple regression analysis instead of multiple regression analysis, to determine how much variance in camouflaging was accounted for by perceived stigma or coping strategies. We considered two-tailed p-values of .05 as significant and 95% confidence intervals (CIs) as appropriate. Using G*power and referring to the effect size in Perry et al.⁸, the adequate sample size for hierarchical multiple regression analyses ($f^2 = 0.06$, $\alpha = .05$, $1-\beta = 0.80$) was 234. The variance inflation factor was between 1.05 and 3.61 for hierarchical multiple regression analyses, indicating no multicollinearity.

Results

All variables used in the analysis were normally distributed with skewness and kurtosis in the range of -2 to 2.⁷⁹ Levene's tests showed that there was homogeneity of variance across all variables. For mediation analyses, variables were normally distributed, and variance for all variables was homogeneous. Further, no missing values existed. The average, SD, range, kurtosis, and skewness of all variables are presented in Table 1. The correlation matrix is also presented in Supplemental Table 1.

[Insert Table 1 here]

Hypothesis 1: Perceived stigma and camouflaging

The results of hierarchical multiple regression analysis are presented in Table 2. In Steps 1 and 2, the model accounted for 9.2 and 17.2% of the variation in camouflaging, respectively. The likelihood ratio test showed that the goodness-of-fit model of Step 2 was significantly better than that of Step 1 (likelihood ratio $\chi^2(1) = 26.30$, $p < .001$). Stigma was a significant predictor of camouflaging; greater stigma scores suggested greater camouflaging. Moreover, identifying as female or non-binary, younger age, and older age at diagnosis were significantly related to higher degree of camouflaging. Cohen's f^2 of stigma (0.09) was small, and comparable to that in Perry et al.⁸ (0.07).

[Insert Table 2 here]

Hypothesis 2: Camouflaging and strategy use

The results of hierarchical multiple regression analysis are presented in Table 3A. In Steps 1 and 2, the model accounted for 9.2% and 19.4% of the variation in camouflaging, respectively. The likelihood ratio test showed that the goodness-of-fit model of Step 2 was significantly better than that of Step 1 (likelihood ratio $\chi^2(2) = 33.07$, $p < .001$). Greater individual and collective strategy use and identifying female or non-binary were significant predictors of more camouflaging.

The results of the same analysis replacing the individualistic strategy use scale with that without “concealing status” subscale is shown in Table 3B. In Steps 1 and 2, the model accounted for 9.2% and 9.9% of the variation in camouflaging, respectively. The likelihood ratio test revealed that the goodness-of-fit model of Step 2 was not significantly better than that of Step 1 (likelihood ratio $\chi^2(2) = 2.13$, $p = .345$). Older age at diagnosis and identifying as female or non-binary were significant predictors of more camouflaging. However, the correlation between the CAT-Q and the individualistic strategy use scale (without the “concealing status” subscale) was not significant.

[Insert Table 3A and 3B here]

Hypothesis 3: Camouflaging, stigma, and the mental health of autistic people

Regarding Model 1 (stigma, camouflaging, and mental well-being), the total effect was significant ($b = -1.08$, $t(285) = 23.0$, $p < .001$). The path between stigma and camouflaging was significant ($b = 2.35$, $t(285) = 4.95$, $p < .001$); however, the path between camouflaging and well-being was not ($b = -0.001$, $t(284) = 0.05$, $p = .96$). The direct effect was significant ($b = -1.08$, $t(284) = 4.81$, $p < .001$); however, there was no significant indirect effect, with the 95% CI including zero (0.67 to -0.13). Thus, stigma affected autistic people’s mental well-being directly, and camouflaging did not mediate this relationship. Further, camouflaging were not related to mental well-being significantly.

Regarding Model 2 (stigma, camouflaging, and depression), the total effect was significant ($b = 0.46$, $t(285) = 3.20$, $p < .001$). The direct effect was not significant ($b = 0.28$, $t(284) = 1.96$, $p = .05$), while the indirect effect was significant (95% CI: 0.06–0.07). Thus, camouflaging mediated the relationship between stigma and depression completely.

Regarding Model 3 (stigma, camouflaging, and generalized anxiety), mediation analyses showed a significant total effect ($b = 0.54$, $t(285) = 4.36$, $p < .001$). Both the direct effect ($b = 0.35$, $t(284) = 2.89$, $p = .004$) and the indirect effect (95% CI: 0.05–0.09) were significant. Thus, camouflaging partially mediated the relationship between stigma and generalized anxiety.

Regarding Model 4 (stigma, camouflaging, and social anxiety), the total effect was significant ($b = 3.72$, $t(285) = 5.10$, $p < .001$). Both the direct effect ($b = 2.89$, $t(284) = 3.90$, $p < .01$) and the indirect effect were significant (95% CI: 0.29–0.32). Thus, camouflaging partially mediated the effect of stigma on social anxiety. Figures 1A–1D present the mediation diagram of each model.

Discussion

This study examined the relationship between perceived stigma, camouflaging, and the mental health of Japanese autistic people using the SIT framework. Replicating Perry et al.⁸, we found that higher perceived stigma contributed to more camouflaging, and both individualistic and collective strategy use were positively related to camouflaging. Camouflaging did not mediate the relationship between stigma and mental well-being; however, it mediated the relationships between stigma and depression, generalized anxiety, and social anxiety. One point to note is that these findings should be interpreted with caution because the internal consistencies of the three questionnaires in this study (the AQ-J-10, the stigma consciousness scale and the individualistic strategy use scale) are not good.

Although causal relationships cannot be inferred from our findings, the results support the hypothesis that camouflaging is a response to stigma. In perceiving stigma, autistic people might be motivated to camouflage and avoid bullying, abuse, or rejection by others.^{7,35} This finding aligns with that in Perry et al.⁸ and previous discussions.^{4,80} The fact that stigma is closely related to camouflaging is of great importance. Often, support available for autistic individuals is based on the biomedical model and focuses on reducing “maladaptive behaviors” by intervening with being autistic.^{81,82} Contrastingly, the current findings support the view of the social model, which considers the difficulties of people with disabilities to be due to mismatches between their characteristics and the environment.⁸³ To reduce the negative role of camouflaging, it is essential to create societies where autistic people are accepted as they are and not forced to become “less autistic.” Although there is still no consistent knowledge of factors associated with reducing autism-related stigma, several previous studies have suggested that accurate knowledge about autism and positive contact

experiences with autistic individuals could reduce stigma.^{84,85} In Japan, where knowledge of autism is significantly less than in the West,⁵⁶ education about autism will play an especially important role.

We hypothesized that in Japan, where the level of autism-related stigma is higher and inter-dependence is emphasized, stigma is more facilitative of camouflaging. Contrary to our hypothesis, there was no difference in the effect size of perceived stigma on the level of camouflaging between Japan and the West. This finding showed that the relationship between stigma and camouflaging could be generalizable across different cultural groups. Investigations of camouflaging outside of the West have only just begun. In addition, there is still insufficient insight into the differences in how people perceive autism and their attitudes toward autistic individuals depending on their cultural backgrounds, such as an emphasis on inter-dependence. Further studies are warranted to examine the differences in contributing factors of camouflaging owing to cultural differences.

Regarding hypothesis 2, individualistic strategy use was a positive predictor of camouflaging, supporting the hypothesis that camouflaging is highly related to individualistic strategies and a response to stigma. Further, collective strategy use- a concept that theoretically opposes individualistic strategy use- was also positively related to camouflaging: people with stronger and more positive autistic identity were more likely to camouflage. This finding aligned with that of Perry et al.⁸, although Cohen's f^2 in our sample (0.017) was relatively smaller than that in the Western sample (0.042). Further study is required to determine why collective strategy use positively predicted camouflaging; however, one possibility is the "double bind" in which autistic people are caught. For example, using mediation analysis, Cage and Troxell-Whitman⁸⁶ showed that higher autistic identity contributed to less camouflaging via autistic individuals disclosing their diagnosis. However, when disclosure was controlled for, higher autistic identity directly increased camouflaging. This competitive mediation suggests that people with higher autistic identity have a dilemma; they want to disclose their diagnosis and stop camouflaging; however, it is hard to do so. Cage and Troxell-Whitman⁸⁶ cited fear of stigma as a reason they cannot stop camouflaging.

Disclosure of autistic status could foster to further stigma^{45,87} and negative labeling.³³ In an environment wherein disclosing an autistic diagnosis is unsafe, autistic people could have no choice but continue to camouflage, even if they are proud of being autistic.

Notably, those who mostly use collective strategies might have different motivations to camouflage than those who use individualistic strategies. They might perceive, but do not

internalize autism-related stigma, and consider camouflaging simply as a tool to get along with others. Therefore, the psychological burden of camouflaging could be relatively small for them. The finding that collective strategy use was positively correlated to positive well-being in this study suggests this. This study did not consider differences in the impacts of camouflaging by motives, and further study is needed.

As for hypothesis 3, perceived stigma was significantly and negatively related to mental well-being, depression, generalized anxiety, and social anxiety for autistic people. Moreover, camouflaging mediated the relationship of stigma with depression, generalized anxiety, and social anxiety completely or partially. This suggests that an indirect pathway exists in which stigma impairs autistic people's mental health, although stigma also directly affects generalized anxiety and social anxiety. These findings offer a new perspective on interpreting mental health problems in autistic individuals, supporting the minority stress model.⁴⁵

Contrastingly, we found that camouflaging did not mediate the relationship between stigma and mental well-being. Moreover, camouflaging was not related to mental well-being significantly in our analyses. One possible reason for camouflaging not being related to mental well-being is that well-being is a more general concept that includes positive feelings, life satisfaction, autonomy, good relationships with others, and positive self-esteem.^{88,89} Qualitative studies have suggested that camouflaging links to a sense of career accomplishment, good relationships with colleagues and friends, and pride in masking skills^{4,12,16} while contributing to depression and exhaustion,^{4,6} thus undermining any perceived "successful camouflaging" and off-setting any possible benefits of masking.⁹⁰ Another reason is that we used a standardized measure of well-being that could not fully capture autistic-specific aspects of well-being, which could differ from neuro-normative conceptualizations.⁹¹ Our finding on well-being is consistent with that in Perry et al.⁸, contrary to the hypothesis that camouflaging is negatively related to mental well-being in Japan, where camouflaging requires greater mental resources. The relationship between camouflaging and the overall well-being of autistic individuals has rarely been examined and warrants further investigation. It is also important to consider whether these offsets occur within or between individuals.

Limitations

This study had several limitations. First, because this was an online survey, we could not ascertain whether participants had a formal diagnosis of autism. One participant reported the

age at diagnosis as one year, but it is difficult to make a diagnosis of autism at this age. To verify participants' level of autistic traits we used the AQ-J-10, which has problems with internal reliability although it has a high diagnostic concordance rate.^{63,92} There were 163 participants in this study who were excluded for not exceeding the AQ-J-10 cut-off, which might have compromised study generalizability. Additionally, participants were mostly college educated, employed at the time of participation, and had used the support facility. Therefore, the results may not be generalizable to the population. Finally, in this study, identifying as non-binary was positively correlated with camouflaging. However, the sample size of non-binary individuals ($n = 14$) is relatively small. Camouflaging among non-binary autistic people has been reported,^{6,16} but the sample size of non-binary people for those studies had been small and the findings inconsistent. Future studies with a larger sample of non-binary participants should address the relationship between the levels of camouflaging and self-identified gender.

Second, the internal consistencies of the three questionnaires (the AQ-J-10, the stigma consciousness scale, and the individualistic strategy use scale) in this study were not good: Cronbach's α s were 0.448, 0.606, and 0.598, respectively. For the AQ-J-10, we excluded participants who did not meet the cut-off of seven. When the range of a variable is limited by truncating participants below a certain score, correlations between variables will be calculated lower than they are. Cronbach's alpha is based on the correlation between each item, so the alpha might be calculated lower than it actually was.^{93,94} As for the stigma consciousness scale and the individualistic strategy use scale, α s were not unacceptable,^{95,96} but the issues of internal consistency in these questionnaires may have affected our findings. As a replication study, we used the same scale as Perry et al.⁸ developed in Western countries. However, scales quantifying the levels of stigma and individualistic strategy use that are unique to Japanese autistic people, in collaboration with Japanese autistic researchers and/or advisors, should be developed.

Third, in the analysis testing hypothesis 2, individualistic strategy use was correlated with the degree of camouflaging significantly, but when the "concealing status" subscale was removed from the individualistic strategy use scale, the correlation was not significant. The "concealing status" subscale contains similar items with the "masking" subscale of the CAT-Q; thus, the significant correlation between camouflaging and individualistic strategy use might be due to overlapping items of the CAT-Q and the "concealing status" subscale. Since camouflaging and individualistic strategy might be similar concepts, it is natural for both

scales to include similar items. However, the overlap of items might result in significant correlation in the multiple regression analysis.

Fourth, this study employed a cross-sectional design, and we could not clarify causal relationships between variables. There are criticisms that most studies on camouflaging are cross-sectional,^{77,97-99} and some studies suggest reverse causality between some variables (e.g., pre-existing anxiety could promote camouflaging; camouflaging reaffirms the stigma that autistic characteristics must be hidden).^{98,100} To resolve this limitation of cross-sectional studies, longitudinal studies assessing perceived stigma, camouflaging, and mental health of autistic individuals are needed.

Finally, examining the relationships between camouflaging and mental health, we focused on camouflaging behavior itself and did not consider contexts for camouflaging or consequences of camouflaging. Some autistic individuals might consider camouflaging simply a skill for survival, and camouflage consciously. They might camouflage only in certain situations, such as at job interviews, and be themselves around people who accept their autistic characteristics. In that case, they might gain more confidence in their adaptability and more positive well-being by camouflaging. However, for those who believe that they must be “normal” and camouflage unknowingly, camouflaging would have significant negative impacts. They might mask their characteristics at every turn, even with their families. In addition, whether camouflaging works effectively may also affect the relationships between camouflaging and mental health. If camouflaging does not result in good social adaptation, it will not promote social well-being or resilience,¹⁰¹ but rather will only consume mental resources. The CAT-Q does not take the contexts and effectiveness of camouflaging into account, and this study did not involve scales that evaluate social adaptation or social well-being. Researchers recently began studying the factors influencing the impact of camouflaging,¹⁶ and further quantitative research is needed.

Conclusion

This study replicated the findings in Perry et al.⁸ It showed that camouflaging is closely related to stigma among Japanese autistic adults. Beyond replication, it also showed that camouflaging mediates the association of stigma with depression, generalized anxiety, and social anxiety. These findings show how stigma is deeply problematic for autistic people across different cultural groups and highlight the importance of focusing on the social environment to reduce stigma and the negative role of camouflaging on mental health of autistic people.

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Author contribution statement

Masaki Tamura: Conceptualization (equal); Methodology (lead); Resources (lead); Investigation (lead); Formal analysis (lead); Writing—original draft (lead). **Eilidh Cage:** Conceptualization (equal); Methodology (equal); Writing-Review and Editing (equal). **Ella Perry:** Conceptualization (lead); Methodology (equal); Resource (supporting); Writing-Review and Editing (equal). **Minako Hongo:** Writing-Review and Editing (equal). **Toru Takahashi:** Formal analysis (equal). **Mikuko Seto:** Resource (equal). **Eiji Shimizu:** Writing-Review and Editing (supporting). **Fumiyo Oshima:** Funding acquisition (lead); Methodology (equal); Project administration (lead); Writing-Review and Editing (lead).

Conflict of Interest

The authors declare no conflict of interest.

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Ethics Approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Research Ethics Committee of Chiba University (Reference No: M10319).

Consent

Full informed consent was obtained from all participants included in the study.

Data Availability

The data used in this study are available from the corresponding author upon reasonable request.

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Tables

Table 1 Mean, standard deviation, range, kurtosis, and skewness of all variables

	Mean (SD)	Range	Skewness	Kurtosis
Age (years)	37.52 (9.81)	20–63	-0.49	0.63
Age at diagnosis (years)	31.80 (12.19)	1–60	-0.13	-0.48
WEMWBS	34.71 (10.10)	14–62	0.26	-0.23
PHQ-9	14.42 (6.54)	0–27	-0.05	-0.74
GAD-7	10.70 (7.57)	0–21	-0.02	-1.03
LSAS	80.48 (34.43)	0–144	-0.41	-0.44
AQ-J-10	8.47 (1.05)	7–10	0.10	-1.17
Collective strategy use	39.70 (15.31)	13–83	0.25	-0.37
Individualistic strategy use	50.17 (9.10)	19–74	-0.49	0.63
Stigma consciousness scale	8.48 (2.68)	0–15	-0.43	0.46
CAT-Q	110.86 (22.36)	47–173	-0.28	0.09

SD: standard deviation; WEMWBS: Warwick-Edinburgh Mental Well-being Scale; PHQ-9: Patient Health Questionnaire-9; GAD-7: Generalized Anxiety Disorder-7; LSAS: Liebowitz Social Anxiety Scale; AQ-J-10: Autism-Spectrum Quotient 10-item short version; CAT-Q: Camouflaging Autistic Traits Questionnaire.

Table 2 Hierarchical multiple regression model examining the predictive value of stigma, age, age at diagnosis, gender, and autistic characteristics in predicting camouflaging

Variable	B	95% CI	SE	β	P	f^2	Delta R^2
Step 1							0.092
Age	-0.49	[-0.98, -0.01]	0.24	-0.22	.046	0.013	
Age at diagnosis	0.40	[0.02, 0.79]	0.20	0.22	.039	0.014	
Male versus female	11.55	[6.38, 16.73]	2.63	0.26	< .001	0.066	
Male versus non-binary	15.02	[2.99, 27.06]	6.11	0.15	.015	0.019	
Autistic characteristics	1.34	[-1.08, 3.76]	1.23	0.06	.278	0.004	
Step 2							0.080
Age	-0.59	[-1.05, -0.12]	0.24	-0.26	.014	0.019	
Age at diagnosis	0.39	[0.02, 0.76]	0.19	0.21	.038	0.013	
Male versus female	11.27	[6.31, 16.22]	2.52	0.25	< .001	0.064	
Male versus non-binary	14.23	[2.71, 25.75]	5.85	0.14	.016	0.018	

Autistic characteristics	0.32	[-2.03, 2.67]	1.19	0.02	.787	0.001
Stigma	2.43	[1.51, 3.35]	0.47	0.29	< .001	0.087

B: unstandardized partial regression coefficient; CI: confidence interval; SE: standard error, β : standardized partial regression coefficient; f^2 : Cohen's f^2 ; Delta R: delta coefficient of determination; In Step 1, $F = 5.7$; $df (5,281)$; $p < .001$; $R^2 = 0.092$; In Step 2, $F = 9.7$; $df (6,280)$; $p < .001$; $R^2 = 0.172$.

Table 3A Hierarchical multiple regression model examining the predictive value of individualistic and collective strategy use, age, age at diagnosis, gender, and autistic characteristics in predicting camouflaging

Variable	B	95% CI	SE	β	P	f^2	Delta R ²
Step 1							0.092
Age	-0.49	[-0.98, -0.01]	0.24	-0.22	.046	0.013	
Age at diagnosis	0.40	[0.02, 0.79]	0.20	0.22	.039	0.014	
Male versus female	11.55	[6.38, 16.73]	2.63	0.26	< .001	0.066	
Male versus non-binary	15.02	[2.99, 27.06]	6.11	0.15	.015	0.019	
Autistic characteristic	1.34	[-1.08, 3.76]	1.23	0.06	.278	0.004	
Step 2							0.102
Age	-0.40	[-0.86, 0.06]	0.23	-0.18	0.087	0.007	
Age at diagnosis	0.36	[-0.003, 0.73]	0.19	0.20	0.052	0.009	
Male versus female	10.10	[5.17, 15.02]	2.50	0.22	< .001	0.047	
Male versus non-binary	18.19	[6.73, 29.65]	5.82	0.18	.002	0.028	
Autistic characteristic	2.25	[-0.07, 4.58]	1.18	0.11	.058	0.009	
Individualistic strategy	0.83	[0.55, 1.10]	0.14	0.34	< .001	0.112	

Collective strategy	0.20	[0.04, 0.36]	0.08	0.14	.017	0.017
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B: unstandardized partial regression coefficient; CI: confidence interval; SE: standard error, β : standardized partial regression coefficient; f^2 : Cohen's f^2 ; Delta R: delta coefficient of determination; In Step 1, $F = 5.7$; $df (5,281)$; $p < .001$; $R^2 = 0.092$; In Step 2, $F = 9.6$; $df (7,279)$; $p < .001$; $R^2 = 0.194$.

Table 3B Hierarchical multiple regression model examining the predictive value of individualistic strategy (without the subscale of “Concealing status”) and collective strategy use, age, age at diagnosis, gender, and autistic characteristics in predicting camouflaging

Variable	B	95% CI	SE	β	P	f^2	Delta R^2
Step 1							0.092
Age	-0.49	[-0.98, -0.01]	0.24	-0.22	.046	0.013	
Age at diagnosis	0.40	[0.02, 0.79]	0.20	0.22	.039	0.014	
Male versus female	11.55	[6.38, 16.73]	2.63	0.26	< .001	0.066	
Male versus non-binary	15.02	[2.99, 27.06]	6.11	0.15	.015	0.019	
Autistic characteristic	1.34	[-1.08, 3.76]	1.23	0.06	.278	0.004	
Step 2							0.007
Age	-0.48	[-0.96, 0.003]	0.25	-0.21	.051	0.014	
Age at diagnosis	0.40	[0.01, 0.78]	0.20	0.22	.042	0.016	
Male versus female	11.68	[6.50, 16.86]	2.63	0.26	< .001	0.071	
Male versus non-binary	15.84	[3.74, 27.94]	6.15	0.15	.010	0.024	
Autistic characteristic	1.69	[-0.78, 4.16]	1.26	0.08	.179	0.007	

Individualistic strategy	0.26	[-0.13, 0.64]	0.20	0.08	.194	0.007
(Excluding “Concealing status”)						
Collective strategy	0.09	[-0.09, 0.27]	0.09	0.06	.310	0.004

B: unstandardized partial regression coefficient; CI: confidence interval; SE: standard error, β : standardized partial regression coefficient; f^2 : Cohen's f^2 ; Delta R: delta coefficient of determination; In Step 1, $F = 5.7$; $df (5,281)$; $p < .001$; $R^2 = 0.092$; In Step 2, $F = 4.4$; $df (7,279)$; $p < .001$; $R^2 = 0.099$.

Figure Legend

Figure 1. Mediation diagrams showing the relationships between stigma; camouflaging; and (A) mental well-being, (B) depression, (C) generalized anxiety, and (D) social anxiety *p = .015; **p = .004; ***p < .001

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Supplemental Information Legends

Supplemental Material 1. The translated version of the stigma consciousness scale, the individualistic use scale, and the collective strategy use scale

Supplemental Table 1. Correlation matrix of variables

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