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Unconscious stereotypes: An investigation into public attitudes toward disabled groups



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Abstract

Background China has a large population of individuals with physical disabilities and mental disorders. The public's implicit stereotypes of these groups are significant factors influencing their daily lives, social integration, and mental health. The intergroup contact theory implies that the public may have positive implicit stereotypes of physically disabled groups and negative implicit stereotypes of individuals with mental disorders. In contrast, the theory of intergroup discrimination and ingroup favoritism implies that the public may have opposite implicit stereotypes of these two groups.

Objective This study employed two IRAP experiments to examine whether there is a difference in the public's implicit stereotypes toward these two groups of disabled individuals and to determine which theory aligns more closely with contemporary reality.

Method The Implicit Relational Assessment Procedure (IRAP) was employed to assess 60 participants.

Result IRAP1 found that participants tended to affirm "physically disabled groups + positive words" (p<0.05) as well as "the group with mental disorder + negative words" (p<0.05), while IRAP2 found that participants tended to deny "physically disabled groups + positive words" (p<0.05).

Conclusion IRAP1 directly supports the theory of intergroup contact, whereas IRAP2 provides indirect support for the theory of intergroup discrimination and ingroup favoritism. The public holds both positive and negative implicit stereotypes towards these two groups of disabilities. This study expands the application of IRAP, uncovers the public's complex implicit stereotypes, and enhances two theories closely related to the people with disabilities. It is crucial for understanding these implicit stereotypes and for mitigating and alleviating negative implicit stereotypes.

Keywords Implicit stereotypes, Physically disabled group, Mental disorder, Implicit relational assessment procedure, Attitude

Introduction

Currently, China has the largest population of individuals with disabilities, exceeding 85 million people, which accounts for more than 6% of the total population [45]. Within this demographic, individuals with physical disa-

bilities comprise nearly 25 million, making up the largest

proportion of the disabled population. Concurrently, the

growing prevalence of mental disorders in China has cor-

responded with an increased incidence of mental disabil-

ities [87]. Compared with the mental disorder, the brain

function of the physically disabled group is normal, but

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Stereotypes represent the nascent phase of prejudice, discrimination, and stigmatization [57]. Stereotypes refer to individuals' beliefs about the characteristics, attributes, and behaviors of certain group members [32]. The general public frequently exhibits a dearth of objective and holistic comprehension regarding disabled populations, and the spread of one-sided stereotypes can engender entrenched biases against these groups, hindering their better adaptation to society and self-development [49]. Although scholars worldwide have investigated stereotypes about disabled groups, most compare these populations with the general population [25, 62, 72]. Understanding the public's stereotypes about different groups of people with disabilities can help take more targeted measures to alleviate stereotypes and create a harmonious society. However, currently, only a few number of research delves into the intergroup comparisons among various types of disabled individuals, yielding findings that are subject to ongoing debate and require further elucidation.

Generally, attitudes towards disability groups can be categorized into explicit and implicit attitudes. Explicit attitudes are easily influenced by social desirability and may not reflect the true attitudes of participants, whereas implicit attitudes are unconscious and automatically activated, thus yielding more authentic and reliable results [3]. Nevertheless, current research findings indicate considerable inconsistency in the results.

Some scholars argue that a single, overarching stereotype influences the perception of disabled groups. This perspective suggests that the public's generalized stereotypes toward various disabled groups are similar and not readily distinguishable [4, 83]. For example, Chen and Zhang [14] found no significant difference in the implicit attitudes of college students toward individuals with mental versus physical disabilities. Similarly, empirical investigations into the implicit attitudes of college students toward distinct disabled groups have revealed that students tend to exhibit a relatively negative implicit bias toward both those with mental disorder and those who are paralyzed, with effect sizes of moderate magnitude [79]. The latest meta-analysis study also suggests that individuals have negative implicit attitudes towards both physical and mental disabilities [4].

Nonetheless, a contingent of scholars argues that the public holds distinct implicit stereotypes about different types of disabled groups. This is due to the fact that disabled groups are not monolithic; they consist of diverse subgroups, each with unique manifestations of disability and significant variations in both physiological and psychological traits [65]. The prevailing perspective suggests that the public tends to harbor more favorable implicit stereotypes about physically disabled individuals, while ascribing more unfavorable implicit stereotypes to those with mental disorder [80]. Empirical evidence corroborates this stance, with studies indicating that individuals with mental disorders are more prone to negative evaluations [7], and are commonly perceived as less competent and courageous compared to their physically disabled counterparts [63]. Thibodeau and Finley [76] conducted an implicit association test on 95 undergraduate students and found that individuals with mental disorders are subjected to highly destructive stigma, which can even extend to their family members. This perspective aligns with intergroup contact theory, which posits that the more frequently one interacts with a particular group, the more likely they are to develop more positive attitudes toward that group [42]. Individuals with physical disabilities are more likely to be noticed and approached by the public in daily situations due to the visibility of their disability. This frequent visual contact can trigger a "familiarity effect," reducing the fear of unfamiliarity [66]. Individuals with mental disorders may often experience physical isolation due to hospitalization and have limited access to the public [47]. Simultaneously, the media often portrays individuals with physical disabilities as inspirational, reinforcing the public's positive stereotypes of these groups and evaluating them more favorably [9]. In contrast, the media is less likely to report positive images of individuals with mental disorders. News outlets typically focus on the abnormal behaviors of this group when they experience a seizure of their condition and may even portray them as villains or the subject of ridicule in television programs, reinforcing negative stereotypes among the public [71].

However, some researchers have obtained results that contradict this. They found that people have more negative attitudes towards individuals with physical disabilities and more positive attitudes towards individuals with mental disorders [84]. For example, Yokota and Tanaka [85] compared the implicit attitudes of college students towards individuals with autism spectrum disorder and those with physical disabilities, and found that participants had fewer negative attitudes towards individuals with autism spectrum disorder. This viewpoint is consistent with the theory of intergroup discrimination and ingroup favoritism, which suggest that people evaluate members within a group more positively than those outside the group [6]. Individuals with physical disabilities are often categorized as out-group members due to their physical differences from the general public and are perceived as objects in need of special care, reinforcing negative stereotypes such as "lack of ability" and "dependence" [86]. In contrast, mental disorders are frequently classified as invisible disabilities. These conditions are not outwardly visible, yet they manifest through a variety of symptoms that significantly impact daily functioning, such as post-traumatic stress disorder, depression, and others [16, 17, 50]. The covert nature of these symptoms facilitates their categorization as in-group members [85]. Simultaneously, some individuals with mental disorders may also exhibit heightened perceptual sensitivity or unique artistic talents [1, 78], leading the public to assign them positive stereotypes.

In summary, there are still inconsistent research results on the implicit attitudes of the public towards individuals with physical and mental disabilities, and further exploration is needed.

In previous research, the Implicit Association Test (IAT) has become the leading method for assessing implicit cognition, measuring implicit attitudes by quantifying the strength of associations between conceptual and attribute words [12]. However, the IAT measures the relative strength of the association between two concepts, rather than the absolute strength of a single attitude. Additionally, factors such as the test scenario and task order can influence the effect size [27]. Building on this foundation, investigators have developed an innovative implicit assessment tool rooted in relational structure theory, known as the Implicit Relationship Assessment Procedure (IRAP). The theory posits that human language is primarily composed of various patterns of relational responses, with the IRAP assessing the strength and probability of relational associations between stimuli formed through individuals' early experiences [22]. The IRAP is adept at reducing the impact of an individual's response latency, offering a more direct measure of their absolute implicit attitudes and revealing the specific vectors of bias [82]. Therefore, although both the IRAP and IAT assess an individual's implicit cognition based on response time differences, with faster responses signifying automated processing and slower responses indicating cognitive conflict, the IRAP offers distinct advantages. The IRAP, which more closely resembles natural language processing in its task design, also supports complex relational networks and multidimensional assessments, providing insight into the specific structure of implicit cognition [18, 21, 33]. This method is especially effective in identifying differences in implicit cognition within the general public toward various groups of individuals with disabilities.

In summary, this study employed the IRAP to investigate implicit stereotypes held by the public regarding individuals with physical and mental disabilities. Specifically, the study designed two distinct IRAP experiments based on the intergroup contact theory and the theory of intergroup discrimination and ingroup favoritism, with IRAP1 aiming to assess the presence of positive stereotypes toward individuals with physical disabilities and IRAP2 aiming to assess the presence of positive stereotypes toward individuals with mental disorders, and validating which theory is more strongly supported in real-world contexts through the two IRAP experiments. Meanwhile, developing a thorough understanding of these stereotypes is crucial for mitigating such biases [35], and by revealing the nuanced differences in public attitudes toward these distinct disabled groups, thereby fostering a proactive impact on the prevention and alleviation of prejudice, discrimination, and stigmatization. Furthermore, it aims to serve as a reference point for future targeted interventions aimed at challenging stereotypes about disabled populations.

This study suggests that the public frequently interacts with individuals with physical disabilities in daily life, and the media often portrays physical disabilities as the primary focus when promoting awareness and care for people with disabilities, which further supports the intergroup contact theory. The following hypotheses are proposed:

H1: The public's implicit stereotypes exhibit discernible variations between the physical and mental disabilities;

H2: The implicit stereotypes held by the public towards the physically disabled group are more favorable, whereas those directed at the group with mental disorder are more negative, indicating greater support for the intergroup contact theory.

Research methods

Participants

Utilizing G*power 3.1 for calculating the requisite participant sample size, with an anticipated effect size of 0.25 and a significance level (α) set at 0.05, the analysis determined that a minimum of 45 participants are needed to attain a statistical test power of 0.95. Given that the IRAP test necessitates computerized operation and response-time-based data processing, participants' age should not be excessively high. Accordingly, 63 participants were recruited from the general population via online channels, and three participants were excluded due to their data not meeting the relevant criteria, as outlined in the following processing section. In accordance with these specifications, this study recruited a total of 60 participants from the general populace via online channels. The participant demographic consisted of 22 males and 38 females, with ages ranging from 17 to 45 years (M = 23.50, SD = 4.32). Informed consent was obtained from each participant, and detailed demographic information is presented in Table 1.

Research tools

Consistent with prior research frameworks [24, 88], this study utilized E-prime 2.0 to construct an Implicit Relationship Assessment Program (IRAP). The label words were designated as "physically disabled group" and "group with mental disorder", while the target words were selected from the devised Disability Stereotype Semantic Differences Scale [41]. The scale was based on the widely recognized Stereotype Content Model (SCM) [23], which asserts that individuals may hold distinct stereotype content for various groups, typically categorized into two dimensions: warmth and competence. By varying the levels of these two dimensions, individuals can discern the structure of their stereotypes toward specific groups. Subsequently, following the process of collecting stereotype trait words for disability groups through the free association method, consulting dictionaries to generate antonym pairs, conducting expert reviews, and performing initial and retesting phases, the factor analysis of the validated scale indicated a good model fit, with a

Table 1 Basic information of participants

Variable	Level	Number	Percentage (%)
Gender	Male	22	36.67
	Female	38	63.33
Age	Under 18 years old	2	3.33
	18–35 years old	55	91.67
	Over 35 years old	3	5.00
Per capita	Below 3000 yuan	36	60.00
monthly income of households	3000-6000 yuan	22	36.67
	Over 6000 yuan	2	3.33
Home location	City	37	61.67
	Countryside	23	38.33
Contact	Yes	43	71.67
with disabled groups before	No	17	28.33

Cronbach's alpha coefficient of 0.90 for the total scale and 0.84 and 0.85 for the subscales.

Through expert consultation and review, the final selection comprised 12 positive and 12 negative antonymous words across two dimensions: warmth and competence (Positive warmth dimension: non-aggressive, strong, rational, lovely, brave, friendly; positive competence dimension: easy to move, wealthy, confident, talented, sharp, highly capable; negative warmth dimension: aggressive, fragile, crazy, terrifying, timid, indifferent; negative competence dimension: unable to move, poor, insecure, mediocre, sluggish, low ability). The relational words were "yes" and "no". Each participant conducted the experiment in an individual setting, utilizing identical personal computer equipment (15.6-inch screen size). During the practice phase, participants performed the exercises under the experimenter's supervision, while the formal experiment was carried out independently by the participants.

Research process

The study employed a 2*2 within-subjects factorial design, with the independent variables consisting of the type of association between the disabled population and attribute words (physical disability + positive words/ mental disability + negative words, or mental disability + positive words/physical disability + negative words) and the type of response (consistent/inconsistent). The dependent variable was the reaction time.

To more effectively identify the implicit stereotypes held by the public toward two groups, this study comprises two tests. The first test mainly examines whether the positive stereotype in the physically disabled group (negative for the mental disorder) exists at the implicit level, and the second test mainly examines whether the positive stereotype in the mental disorder (negative for the physically disabled group) exist at the implicit level. Participants were required to complete these tests on a computer. Each test comprised two practice blocks followed by four formal test blocks (see Table 2), which included both inconsistent and consistent tasks. Each task consisted of 24 trials, categorized into four task types: physically disabled group + positive words, group with mental disorder + negative words, group with mental disorder + positive words, and physically disabled group + negative words. In the IRAP test for the positive stereotype in the physically disabled group, consistent tasks involved responding "yes" to trials involving the physically disabled group with positive words and the mental disorder with negative words; inconsistent tasks required a "no" response to the same pairings. Similarly, in the IRAP test for the positive stereotype in the group with mental disorder, consistent tasks entailed

Table 2	Block design of	positive stereotypes	IRAP test for p	hysical/mental	disabilities
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Block	Task type	Function	Trial	Present stimuli	Reaction
1	Consensus task	Practice	24	physically disabled group + positive words	Yes/No
				group with mental disorder + negative words	Yes/No
				physically disabled group + negative words	No/Yes
				group with mental disorder + positive words	No/Yes
2	Inconsistent tasks	Practice	24	physically disabled group + positive words	No/Yes
				group with mental disorder + negative words	No/Yes
				physically disabled group + negative words	Yes/No
				group with mental disorder + positive words	Yes/No
3	Consensus task	Formal testing	24	Same as the first block	Same as the first block
4	Inconsistent tasks	Formal testing	24	Same as the second block	Same as the second block
5	Consensus task	Formal testing	24	Same as the first block	Same as the first block
6	Inconsistent tasks	Formal testing	24	Same as the second block	Same as the second block

In the IRAP test for positive stereotypes within the physically disabled group, the consistent task prompts participants to respond affirmatively (with a "yes" response) to pairings of physically disabled with positive words and mental disorder with negative words, and negatively (with a "no" response) to pairings of physically disabled with positive words. Conversely, in the inconsistent task, the response pattern is reversed. Similarly, in the IRAP test for positive stereotypes within the group with mental disorder, the consistent task necessitates participants to respond affirmatively to pairings of physically disabled with negative words and mental disorder, the consistent task necessitates participants to respond affirmatively to pairings of physically disabled with negative words and mental disorder with positive words, and negatively to pairings of physically disabled with negative words and mental disorder with negative words. Conversely, in the inconsistent task, the response pattern is reversed. Similarly, in the IRAP test for words. Conversely, in the inconsistent task, the response pattern is reversed. Similarly disabled with negative words and mental disorder with positive words, and negatively to pairings of physically disabled with positive words and mental disorder with negative words. Conversely, in the inconsistent task, the response pattern is reversed

responding "yes" to trials with the mental disorder with positive words and the physically disabled group with negative words; inconsistent tasks involved responding "no" to these pairings. The experimental protocol is illustrated in Fig. 1.

Data processing

During the data processing phase, the initial steps involved excluding data from trials with an accuracy rate below 80%. The primary measurement variable in this experiment was reaction time. Reaction times exceeding 3000 ms were capped at 3000 ms, and those below 300 ms were adjusted to 300 ms, in accordance with standard practices [82]. Only trials with correct responses were included in the analysis.

The D value, a standard metric for assessing the IRAP effect, was processed using the method outlined by Greenwald et al. [28] as follows:

- (1) Statistical analysis was limited to data from the formal test tasks only.
- (2) The data, in which trials with reaction times over 10000 ms or under 300 ms represented 10% or more of the total, were excluded.

- (3) The average reaction time for the four pairs within the two types of tasks (a total of 16 types of combination between disabled groups and attribute words) was calculated.
- (4) All tasks were grouped into two sets: "Task 1 and Task 2" and "Task 3 and Task 4". The standard deviation of reaction time for the four pairs (a total of 8 types of combination) within each group of tasks was then computed.
- (5) The D values for the four pairs (a total of 8 types of combination) in each test task were derived by dividing the difference between the mean reaction time from step 3 (inconsistent task minus consistent task) by the corresponding standard deviation from step 4.
- (6) The average D value for each pairing type from step 5 was calculated to obtain the overall D value for each pairing type.

Following the screening process, three participants who did not meet the criteria were excluded. Subsequently, the effect values of stereotypes related to both physical and mental disabilities were obtained from the IRAP test, and statistical analyses were conducted using SPSS version 25.0.



Fig. 1 Experimental procedure

 Table 3
 Overall effect values of two IRAP tests

	М	SD	t
IRAP1	0.30	0.45	5.25***
IRAP2	0.43	0.44	7.58***

IRAP 1 IRAP test for positive stereotypes in physically disabled group, *IRAP 2* IRAP test for positive stereotypes in group with mental disorder, the same below *** p < 0.001

Research results

Analysis of overall effect value

A single-sample t-test was performed to assess the presence of stereotypes in both IRAP tests, using zero as the test value and analyzing the total D effect values from each test. As shown in Table 3, the total effect value from the IRAP test for positive stereotypes in the physically disabled group (IRAP 1) was significantly greater than zero, t(59) = 5.25, p<0.001. Similarly, the total effect value from the IRAP test for positive stereotypes in the group with mental disorder (IRAP 2) substantially exceeded zero, t(59) = 7.58, p<0.001. These findings suggest that participants exhibited a significantly faster reaction speed in consistent tasks compared to inconsistent tasks, indicative of an underlying implicit bias in the cognitive associations made regarding disabled groups.

Table 4	Effect values	of four	task types	in two	IRAP tests
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	Task type	М	SD	t
IRAP 1	physically disabled group + positive words	0.35	0.54	5.04***
	group with mental disorder + negative words	0.40	0.71	4.33***
	physically disabled group + negative words	0.32	0.57	4.36***
	group with mental disorder + positive words	0.14	0.68	1.63
IRAP 2	physically disabled group + positive words	0.57	0.54	8.31***
	group with mental disorder + negative words	0.41	0.55	5.80***
	physically disabled group + negative words	0.34	0.63	4.14***
	group with mental disorder + positive words	0.40	0.69	4.48***

^{***} p<0.001

Analysis of effect values for four task types

To further examine the stereotypes held by participants across different tasks, a single-sample t-test was performed on the effect values of the four task types in both tests, using zero as the reference value. The results are shown in Table 4. Except for the negative effect value for the "group with mental disorder + positive words" in IRAP 1, which did not significantly differ from the reference value of zero (t(59) = 1.63, p > 0.05), the effect values for all other task types were significantly different from zero, with p < 0.001. This suggests that participants' reaction times in the consistency task

were significantly faster than in the inconsistency task, providing further evidence of the influence of implicit stereotypes on cognitive processing. Specifically, in IRAP1, participants affirmed the physically disabled group + positive words and group with mental disorder + negative words, while negating the physically disabled group + negative words, but not negating the group with mental disorder + positive words. In IRAP2, participants affirmed the physically disabled group + negative words and the group with mental disorder + positive words, while negating the physically disabled group + positive words and the group with mental disorder + positive words, while negating the physically disabled group + positive words and the group with mental disorder + negative words.

According to the widely accepted definition of effect sizes in prior research, an effect size between 0.15 and 0.35 is classified as small, 0.35 to 0.65 as medium, and values of 0.65 or higher as large [61, 67]. To further assess the intensity of stereotypes among participants in various task types within IRAP 1, a one-way repeated measures Analysis of Variance (ANOVA) was conducted on the effect values associated with these tasks. The findings indicated a significant variance in the effect values across different task types, with F(3,56)=2.77, p<0.05, $\eta_p^2=0.05$. Post hoc comparisons using Tukey's HSD test showed that the effect value for affirming the "physically disabled group + positive words" (M = 0.35, SD = 0.54) was significantly higher than that for negating the "group with mental disorder + positive words" (M = 0.14, SD = 0.68), p < 0.05. Similarly, the effect value for affirming the "group with mental disorder + negative words" (M = 0.40, SD =0.71) was significantly higher than that for negating the "group with mental disorder + positive words" (M =0.14, SD = 0.68), p < 0.05 (Fig. 2).

To further assess the intensity of stereotypes among participants across different task types within IRAP 2, a one-way repeated measures ANOVA was conducted to examine the effect sizes for each task type. The results revealed a marginally significant difference, with F(3,56)=2.66, p=0.05, $\eta_p^2=0.04$. Post hoc comparisons using Tukey's HSD test revealed that the effect size for negating the "physically disabled group + positive words" (M = 0.57, SD = 0.54) was significantly higher than that for negating the "group with mental disorder + negative words" (M = 0.41, SD = 0.55), p < 0.05. Furthermore, the negative effect size for the "physically disabled group + positive words" (M = 0.57, SD = 0.54) was significantly larger than the positive effect size for the "physically disabled group + negative words" (M = 0.34, SD = 0.63), *p*<0.05 (Fig. 3).

Discussion

The present study utilized the Implicit Relationship Assessment Procedure (IRAP) to compare the implicit stereotypes held by the public towards individuals with physical and mental disabilities. The findings indicate that the public holds implicit stereotypes towards both groups, encompassing both positive and negative connotations.

In the IRAP test designed to assess positive stereotypes related to the physically disabled group, the results show a stronger tendency among the public to affirm the positive attributes of the physically disabled group and the negative attributes of individuals with mental disorders, with the intensity of these stereotypes reaching a moderate level. This pattern reflects the public's negative stereotypes associated with mental disability, characterized by descriptors such as "aggressive," "fragile," "crazy,"



Fig. 2 Effect values of different types of tasks in IRAP 1



Fig. 3 Effect values of different types of tasks in IRAP 2

"scary," "timid," and "indifferent," while also reflecting positive stereotypes of physical disability, including traits like "non-aggressive," "strong," "rational," "cute," "brave," and "friendly." These findings validate the hypothesis proposed by the study and are consistent with previous findings [15, 34, 51], indicating that people tend to believe that the group with mental disorder have more negative characteristics, which directly supports the intergroup contact theory [42]. First, this difference indicates that frequent contact improves stereotyping of specific groups [26]. Physically disabled individuals are more readily identifiable due to the obvious visibility of their disability status, such as the use of wheelchairs or guide canes, and the public's direct, everyday contact with these groups fosters a deeper understanding, reducing perceived differences and promoting more positive stereotypes [77]. In contrast, individuals with mental disorders are less recognizable, and the public has less frequent contact with them. As the saying goes, "fear comes from the unknown," and the unknown is often characterized by a lack of information. Due to this, the public's limited understanding of this group fosters more negative stereotypes [59]. Second, this difference may stem from the frequent media coverage of physically disabled individuals. In efforts to promote disability awareness, the media often portray physically disabled individuals as examples, contributing to the creation of a positive social climate and public expectations. As a result, the public is more likely to attribute positive traits, such as "strong" and "brave," to physically disabled individuals in their evaluations [56, 64]. Furthermore, the behaviors of physically disabled individuals often align with those of the general public, demonstrating clear awareness and understanding. In contrast, individuals with mental disorders may exhibit behaviors considered unacceptable or alien by societal norms [19]. These behaviors can be unpredictable, inducing personal anxiety and fear in the public [5, 68], leading to the attribution of negative stereotypes such as "scary," "aggressive," and "crazy."

The study found that the difference between the effect value of participants negating the group with a mental disorder and positive words, and the test value of 0, was not significant. This suggests that although the public may perceive individuals with mental disorders as having negative characteristics, this perception does not negate the existence of positive traits within this group. Moreover, from a cultural perspective, Confucianism in China has consistently advocated the principles of "collectivism" and "benevolence," which emphasize acting in the collective interest and offering universal respect and compassion to all individuals, regardless of their social roles [44, 58]. Influenced by this culture, the public may be reluctant to compromise the collective good or weaken collective solidarity, instead extending 'benevolence' to individuals with mental disorders and promoting the inclusion of diverse groups, thereby recognizing the positive attributes they possess [20].

In the IRAP test concerning positive stereotypes within the group with mental disorder, the public demonstrated a greater tendency to negate the positive traits of the physically disabled group, as opposed to negating the negative traits of the group with mental disorder or affirming the negative traits of the physically disabled group. The intensity of these stereotypes was also found to be at a moderate level, reflecting a public belief that the physically disabled group lacks characteristics such

as "convenient mobility," "wealth," "confidence," "talent," "sensitivity," and "high ability." Although it does not directly confirm the public's positive affirmation of individuals with mental disorders, the public's tendency to associate negative words with the physical disability group also indirectly supports the theory of intergroup discrimination and ingroup favoritism, that is, individuals tend to evaluate members within the group more favorably than those outside the group and actively enhance similarities with other members of the group [6]. Individuals with more severe disabilities may attract greater attention and provoke a "deterrent" response, which can result in the public overlooking their positive characteristics [70]. From the appearance, the physically disabled group appears to be more "deterrent" than the mental disorder. Simultaneously, when individuals with physical disabilities exhibit their positive traits, the general public may perceive a threat [74]. To mitigate this perceived threat and uphold the perceived superiority of their own group, they may attribute, for instance, the success of individuals with physical disabilities to policy favoritism or social privilege rather than to individual abilities, thereby negating the positive traits of this group [11, 69]. Furthermore, the innuendo effect in social cognition suggests that when individuals are exposed to descriptions of positive traits associated with a group, they may infer compensatory negative attributes [36, 75]. While media portrayals of individuals with physical disabilities are generally positive, they inadvertently emphasize their perceived disadvantages, such as being characterized as "strong" and "brave" due to the lack of qualities like "mobility" and "ability," which require the public to help them. These portrayals may reinforce the notion that "disability itself is a disadvantage," making it challenging for the public to view them beyond the "less capable" framework, thus denying their positive attributes [8, 43].

Moreover, additional factors could influence the public's implicit positive and negative stereotypes toward the two groups under consideration. First, the selection of trait terms from the Semantic Differential Scale for Stereotypes of Disabled Groups introduces a degree of subjectivity into the experimental materials. Secondly, historical differences may have played a role [5, 31, 46]. The contemporary public's perceptions of disabled groups are likely multifaceted, rather than strictly positive or negative. Consequently, the study's findings support the notion that a divergence exists in implicit stereotypes between physical and mental disabilities in public consciousness.

Research limitations and prospects

The current study acknowledges several limitations that present opportunities for enhancement in subsequent research endeavors.

First, the cognitive and computer operation requirements of the IRAP limited the age range of participants, thus failing to encompass all demographic groups within the general population. Additionally, participants were recruited online, which may have attracted individuals who are particularly interested in psychological research, more open-minded, or those who identify with the study's topic, such as individuals concerned with the disability. This recruitment strategy may have led to results that are more open-ended, thereby reducing the generalizability of the findings. In this study, the fact that over 70% of participants have had contact with individuals with disabilities may also account for this, potentially influencing the research outcomes. Moreover, the cognitive processing speed of participants, as well as whether they have a medical background, may also impact the study's results [2, 53]. Therefore, future studies should involve larger sample sizes and encompass a broader range of groups, thereby enhancing the representativeness of the sample and ensuring more accurate and reliable results.

Secondly, regarding the research instrument, as all participants were Chinese, the instrument was also in Chinese, which may raise concerns about cultural applicability and relevance. Future research could aim to conduct cross-cultural studies to explore the heterogeneity of participants from diverse cultural backgrounds on a global scale.

Third, concerning the research content, this study focused solely on the general public's implicit stereotypes of disability groups and did not address the implicit stereotypes held by individuals with disabilities about themselves. Future studies could compare the differences in implicit stereotypes between the two groups and incorporate them into the comparative analysis of explicit stereotypes. Furthermore, individuals with mental disorders encompass different subgroups with unique characteristics. In future, in-depth studies on stereotypes associated with various subgroups of mental disabilities (e.g., individuals with depression, schizophrenia, and obsessive-compulsive disorder) could be conducted, contributing to a more nuanced understanding of the public's perceptions.

Finally, due to the default bias of constructing events and objects in a positive way (positive framing bias; PFB), this may lead to faster correct responses from participants to positive vocabulary, resulting in overestimation of positive attitudes [52]. By addressing these limitations and expanding the research scope, future studies can contribute to a more comprehensive and nuanced understanding of the complex interplay between public attitudes, stereotypes, and the experiences of individuals with physical and mental disabilities.

Practical inspirations

The study is of significant importance in enhancing our understanding of the implicit stereotypes held by the public towards various groups of individuals with disabilities and in informing efforts aimed at improving these biases. The findings reveal that in the IRAP test for positive stereotypes within the physically disabled group, the public tends to affirm the positive traits of the physically disabled and the negative traits of the mental disorder, suggesting an implicitly more favorable attitude towards the physically disabled and a more adverse stance towards the mental disorder. This phenomenon is widespread and shares cross-cultural commonalities [48, 60], which reminds us to address and transform tpublic attitudes towards individuals with mental disorders.

To achieve this, several practical measures can be implemented: First, public education should be promoted to disseminate mental health knowledge through various channels, such as school curricula and media campaigns, allowing the public to gain a more objective and equitable understanding of the scope of individuals with mental disorders and their overall situation. Second, increasing opportunities for interaction with individuals with mental disorders is essential. The intergroup contact theory suggests that such interactions can offer both groups new perspectives, dispel misconceptions [42], and promote better intergroup relations. Therefore, additional opportunities should be provided for the public to engage with individuals with mental disorders. For example, in community settings, activities can be organized for both individuals with mental disorders and the general public to participate in together. Furthermore, individuals with mental disorders and their families should be encouraged to share their experiences, using real stories to reduce social stigma [73] and challenge stereotypes through these interactions. Third, the exemplification model also indicates that by presenting new examples, stereotypes can be modified [54]. The media should engage in positive publicity, showcasing favorable portrayals and exemplary cases of individuals with mental disorders to improve negative stereotypes.

Additionally, the study discovered that in the IRAP test for positive stereotypes within the group with mental disorder, the public is more inclined to negate the positive traits of the physically disabled group. This finding suggests that the public's understanding of the physically disabled group also contains negative elements. This insight highlights the need for careful consideration of both the approach and content when advocating for disability care. By emphasizing the strengths and capabilities of individuals with disabilities, we can assist the public in recognizing their potential [10], foster a shift from an "impairment perspective" to an "ability perspective," and move beyond patronizing notions such as "pity," ultimately working towards the establishment of an equitable social standing for all. Furthermore, when providing social welfare support for physically disabled groups, the focus should shift from "assistance" to "empowerment." For instance, when offering employment opportunities to physically disabled groups, we should consider innovative employment models, such as telecommuting and AI-assisted work, rather than restricting ourselves to the simpler jobs of the past [39, 55]. In community activities, individuals with physical disabilities can be transformed from service recipients into volunteers, and more dedicated workspaces can be created for them, allowing them to share social responsibility with the public [13].

Finally, considering that this study was conducted in China, efforts to improve stereotypes can be framed within the context of traditional Chinese culture. For instance, society could actively promote values such as "harmony in diversity," "benevolence," and "restrain yourself and follow social norms," encouraging the public to respect and tolerate differences while seeking harmony through diversity [40]. Through cultural inculcation, a social atmosphere of tolerance and fraternity is cultivated, fostering the advancement of civilization.

Conclusion

The findings of this study lead to the conclusion that, at an implicit level, the public holds both positive and negative stereotypes about individuals with physical and mental disabilities. Notably, although all of these stereotypes are of moderate intensity, their specific values still vary. In the context of the IRAP test for positive stereotypes within the physically disabled group, the public exhibits a pronounced tendency to affirm the positive attributes associated with the physically disabled and to negate the positive attributes of the mental disorder, which directly validates intergroup contact theory. In the IRAP test concerning positive stereotypes within the group with mental disorder, there is a discernible inclination among the public to negate the positive traits of the physically disabled group, which indirectly supports the theory of intergroup discrimination and ingroup favoritism. These results underscore the nuanced and complex nature of implicit biases held by the public towards individuals with disabilities, highlighting the need for continued research and intervention efforts aimed at fostering greater understanding and inclusivity.

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Authors' contributions

YX is the main author of the manuscript and analyzed the relevant data; LY wrote some manuscripts and drew graphs and tables; SY has improved the manuscript and validated the data analysis; XY reviewed the manuscript and provided financial support; Y reviewed and revised the manuscript, analyzed the data, and provided financial support.

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Data availability

Our custom data are available in the Open Science Framework repository at: https://osf.io/jvz64/.

Declarations

Ethics approval and consent to participate

According to the American Psychological Association's (APA) Ethical Principles of Psychologists and Code of Conduct, the conduct of this study followed the relevant ethical requirements for human research and was approved by the Human Study Ethics Committee of Beijing Forestry University. All participants signed informed consent forms.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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