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Improvement of Attitudes Towards People with Disabilities Through Education and Contact

Samuel L. Ash
Macalester College, samuellash11@gmail.com

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Improvement of Attitudes Towards People with Disabilities

Through Education and Contact

Samuel Ash

Cari Gillen-O'Neel, Macalester College Psychology Department

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Abstract

Two studies were conducted to investigate the impact of educational interventions and contact with individuals with disabilities on explicit and implicit attitudes towards people with disabilities. In study 1, 63 participants watched one of two videos, one on the social model of disability (experimental condition) and the other about wheelchair soccer (control condition). Participants also completed measures of contact, explicit, and implicit attitudes toward people with disabilities. Results from regression analyses indicated no significant effects of the videos or reported contact on either explicit or implicit attitudes, challenging previous findings that suggested positive effects of contact and education on explicit attitudes. To address potential issues, study 2 included 42 participants, and employed a more substantial educational intervention. Rather than a video, the intervention in this study consisted of four intermediate and advanced psychology courses, with a course specifically on disability acting as the experimental condition. Results from repeated measure ANOVAs indicated no significant changes in explicit or implicit attitudes by condition over time. Importantly, due to the severely underpowered nature of this study extreme caution should be taken when attempting to examine and interpret the data provided. If replicated and validated, however, both studies may raise questions about the efficacy of educational interventions in altering deeply rooted societal attitudes, emphasizing the need for even more substantial and intentional approaches. In conclusion, the research underscores the challenges in shifting societal attitudes, and future research may explore longer and more tailored interventions to foster meaningful changes in attitudes towards disability.

Improvement of Attitudes Towards People with Disabilities Through Education and

Contact

Ableism, the belief that people with disabilities are inferior to able-bodied individuals, is deeply rooted in the current societal systems and structures that must be navigated by people with disabilities (Barnard Center for Research on Women, 2017; Lewis, 2022; Nario-Redmond, 2020; Wexler, 2021). Negative attitudes towards disability, both implicit and explicit, shape the ways in which people with disabilities interact with the world around them, and have played a significant role in why these inherently ableist systems continue to remain largely unchanged (Antonopoulos et al., 2023; Bogart et al., 2019; Dovidio et al., 2019; Friedman, 2019; Hunt & Hunt, 2004; Nario-Redmond, 2020; Szumski et al., 2020; Wexler, 2021). Simultaneously, people with disabilities both live and thrive in these systems, and work to reimagine these structures in order to improve access, and remove societal barriers that limit access as a result of disability (Bennett & Hannah, 2022; Schnellert et al., 2023; *Sins Invalid*, 2023).

Previous research has explored implicit and explicit attitudes towards marginalized groups (Brown et al., 2007; Greenwald & Krieger, 2006; Hein et al., 2011; Rudman, 2004). Explicit attitudes are conscious and self-expressed, while implicit attitudes are unconscious and cannot be self-expressed (Dovidio et al., 2019; Friedman, 2019; Rudman, 2004). Explicit attitudes tend to be easier to measure, as a self-report item can determine someone's explicit attitudes regarding a particular group (Friedman, 2019). Additionally, explicit attitudes tend to be more affected by social desirability, revealing themselves through conscious behaviors and can be prone to misrepresentation when self-reported, especially when asking about attitudes towards historically marginalized groups (Greenwald & Banaji, 1995). Implicit attitudes, on the other hand, are less susceptible to participant manipulation due to its measurement procedure, and

better predicts spontaneous behaviors (Greenwald & Krieger, 2006, 2006). This may reveal

insight into discriminatory behavior, which relates more to implicit attitudes (FitzGerald &

Hurst, 2017). Two things that may improve both explicit and implicit attitudes toward disability

are educational interventions and interpersonal contact. However, to effectively influence

attitudes towards disability, certain conditions of both educational intervention and interpersonal

contact must meet.

Specific to disability, people's perspectives on various models of disability have been

shown to relate to attitudes towards disability (Bogart et al., 2019). Although there are variations,

there are two primary models of disability: the medical model and the social model. The medical

model frames disability as an individual problem to be treated and cured, and is extremely

prevalent within Western contexts (Bogart et al., 2019). For example, someone who uses a

wheelchair is considered disabled, and this "deficit" is seen as needing to be "fixed" through

medical means. However, the social model, pioneered by those in disability rights and critical

disability studies, views society, and the inaccessible structures within it, as the issue (Bogart et

al., 2019). According to the social model, rather than a focus on individual treatment, it is society

that needs to reevaluate the current systems in place that are disabling individuals. (Bogart et al.,

2019). Although these models may seem to be antithetical, it is likely most people have personal

beliefs that share characteristics of both models (Bogart et al., 2019).

Previous research has demonstrated that weaker beliefs in the medical model and stronger beliefs

in the social model predict improved attitudes towards people with disabilities over time (Bogart

et al., 2019).

Additionally, educational interventions that address stereotypes about disability

(Cecchetti et al., 2021; Corrigan et al., 2012; Lindgren & Oermann, 1993) have been shown to

improve attitudes towards people with disabilities. Education alone, such as school programs addressing acceptance of students with disabilities, have shown positive signs in improving explicit disability attitudes and addressing negative stigma (Salinger, 2020). Therefore, education on the social model of disability may predict an improvement in both explicit attitudes, as shown previously, while implicit attitudes may improve slightly, or stay the same. Although education may address and refute previously held beliefs that shape implicit attitudes, the impact of an educational intervention alone may not be enough to greatly shift implicit attitudes.

Along with educational interventions, contact with people with disabilities (Allport, 1954; Corrigan et al., 2012; Hein et al., 2011) has also been shown to improve attitudes. Contact, as defined by Allport (1954), is facilitated when the following four conditions are met: equal group status within the situation (e.g., student/student, not student/teacher); common goals; intergroup cooperation; and the support for positive contact by authorities, law, or custom. Contact that meets these criteria outlined by Allport correlates with improved explicit attitudes (Hein et al., 2011). Contact alone, however, has not been shown to improve implicit attitudes (Hein et al., 2011). So, it would not be expected that, on its own, contact with people with disabilities would predict more positive explicit or implicit attitudes.

Finally, an intervention utilizing both education *and* contact demonstrated increases in positive *explicit* attitudes (Bogart et al., 2022). The interaction between an educational intervention and contact may intensify the attitude-improving qualities of each aspect alone. A person with more contact with someone with a disability may be more impacted by an educational intervention on disability, as compared to someone without a significant amount of contact. Importantly, the impact of education and contact on *implicit* attitudes has yet to be

explored. Two studies were conducted to determine how both *explicit* and *implicit* attitudes may

be affected by educational interventions and contact with people with disabilities.

Study 1

This study examined whether contact *and* education improve both explicit and implicit

attitudes towards people with disabilities. A brief educational video was utilized as the

educational intervention. The experimental condition focused on the social model of disability, in

order to maximize improvement in attitudes towards people with disabilities, while the control

video discussed the intersection of disability, sports, and disability community.

Participants watched one of two educational videos, and completed a variety of measures

on contact with people with disabilities, explicit attitudes, and implicit attitudes. It was predicted

that those with higher levels of contact and in the experimental condition (a video on the social

model of disability) would have more positive explicit and implicit attitudes, as compared to

those in the control condition and those with lower levels of contact.

Method

Participants

This study was open to those who were 18 years old and older. It was open to anyone

regardless of gender identity, race, disability identity, etc. Participants were recruited through

social media, email, word-of-mouth, and participants were encouraged to recruit additional

participants. It was limited to those who speak English, as materials provided to participants

were in English. In addition, this study was implicitly restricted based on access to technology,

due to its online nature and distribution.

Of the 161 participants who opened the study, 98 were excluded due to not having

adequate implicit and explicit attitude data, or failing the attention check, leaving 63 participants

for data analysis. Of those 63, 41 identified as White; 7 as Hispanic, Latinx, or Spanish Origins; 4 as Black or African American; 6 as Asian/Asian American; and 5 as Multiracial. Forty-one participants identified as female, 15 as male, 5 as non-binary, and 2 as gender non-conforming/genderqueer. Ages ranged from 18 to 79 ($M = 26.27$, $SD = 15.19$). Sixteen participants identified as disabled.

Design

This study employed an experimental design. There were two independent variables: education (manipulated) and contact (measured, quasi-experimental). The dependent variables were explicit and implicit attitudes toward people with disabilities.

Materials

Conceptual Definition of Disability

For most of this study, the definition of disability was kept as broad as possible, to include all forms of disability, both visible and invisible. However, due to inherent constraints within the implicit attitude measure, disability is portrayed solely through physical disabilities with the use of pictograms.

Education

Participants were randomly assigned to one of two educational conditions. Both conditions were YouTube videos produced by Scope, an England- and Wales-based disability equality organization, and were approximately three minutes in length. For the experimental group, the video interviewed disabled individuals from the disability community about what the social model of disability is (*What Is the Social Model of Disability? - Scope Video*, 2014). For the control group, the video was about the sport of powerchair soccer (*Powerchair Football Is Your New Favourite #WorldCup Sport*, 2018). Although they both relate to disability, the

experimental condition video focuses specifically on the social model of disability, while the control video revolves more around inclusion and disability community.

Attention check/Video Questions

To avoid demand characteristics, the video was framed as being pilot-tested for a course on disability. To support this cover story, participants were asked questions about whether the videos were clear, engaging, and informative. Additionally, this allowed for a manipulation check to be included, in which participants answered a question about the content of the video.

Contact

Contact was measured via a modified series of questions, originally modified by Hein et al. (2011) from Brown et al. (2007). These questions included "Did or do you have contact with a person with a disability/disabilities?" (with answers being yes or no), "How much contact did or do you have?" (with answers ranging from *less than once a month* to *daily* using a five-point scale, with 1 = "less than a month" and 5 = "daily"). To assess quality of contact, three questions on the perceived quality of contact were asked. These questions assessed the participants' closeness, equity and cooperativeness during contact ($\alpha = 0.72$). Responses were on a six-point scale ranging from 1 = *not at all* to 6 = *very much*. Contact quality was then determined by averaging the scores from these three responses. Additionally, to clarify contact for those who identified as disabled, participants were prompted with "Contact does not include yourself, if you are a person with a disability or disabilities/disabled person."

Fifty-four participants had contact with a person with a disability, and 9 responded they had not. For the 54 participants who responded yes, the amount of contact was recorded on a self-report scale from 1 ("less than a month") to 5 ("daily") scale ($M = 3.63$, $SD = 1.46$). In addition, the 3-item measure of contact quality demonstrated adequate reliability ($\alpha = .760$), and

therefore was averaged to form an individual contact quality score, including those who had not had contact with a score of zero ($M = 4.15$, $SD = 2.00$).

Explicit Attitudes: Attitudes To Disability Scale (ADS)

The Attitudes To Disability Scale (ADS) was originally developed to assess explicit, personal attitudes towards people with intellectual and physical disabilities (Power et al., 2014). However, a slightly modified version was used in this study to assess more general explicit attitudes towards disability, and people with disabilities. There were a total of 16 items, placed into four subgroups (*inclusion*, e.g. "People with a disability find it harder than others to make new friends"; *discrimination*, e.g. "People often make fun of disabilities"; *gains*, e.g. "Having a disability can make someone a stronger person"; and *prospects*, e.g. "People with a disability have less to look forward to than others"). Items were rated on a five-point scale, from 1 = *completely disagree* to 5 = *completely agree* (Yanes et al., 2023). A score for each subscale was calculated by adding each item within the particular subscale together, where higher scores indicated lower inclusion, more discrimination, more perceived gains, and fewer prospects (reverse scored) (Yanes et al., 2023). Acceptable internal consistency was found in all four subgroups ($\alpha = .775$), and a single explicit score was created by averaging the four subscales ($M = 2.40$, $SD = 0.44$). One participant did not complete the *discrimination* subscale, but due to the adequate reliability, and completion of the remaining three subscales, their data was included in analyses.

Implicit Attitudes: Implicit Association Test (IAT)

This study utilized the DA-IAT, an implicit association test, specifically designed to measure implicit attitudes towards people with disabilities (Pruett & Chan, 2006). The DA-IAT utilizes symbols to represent the two target categories of "disabled" and "non-disabled". An

example of this would be a pictogram of someone in a wheelchair (disabled) and someone

running (non-disabled), along with positive or negative words such as *evil*, *good*, *bad*, and

happy. Participants, using keys on their computer, categorize the given pictograms with the

positive or negative words, depending on the task. For example, the first block requires the

participant to press the 'E' key when they see a pictogram representing disability, and the 'I' key

when it represents able-bodiedness. However, the most important blocks are when participants

are asked to match disability with good and nondisabled with bad (incongruent), as well as

matching disability with bad and nondisabled with good (congruent; Pruett & Chan, 2006).

Reaction times for those two blocks are then measured, and used to determine participants'

implicit attitudes, with slower reaction times indicating greater negative implicit attitudes (Pruett

& Chan, 2006). Reliability is between $\alpha \cong .70$ to .80 (Greenwald & Lai, 2020; Thomas et al.,

2014). The DA-IAT was embedded into Qualtrics utilizing a software program called *Minno.js*

(Zlotnick et al., 2015), and code for specifically running the DA-IAT (Bar-Anan, 2020). IAT

data was aggregated to produce a D-score for each participant, ranging from -2 (*preference*

towards disabled) to 2 (*preference towards abled*; $M = 0.61$, $SD = 0.51$).

Demographics

        The demographics survey included questions about race/ethnicity, gender identity, age,

political affiliation, and disability identity (*The 15 Best Demographic Examples & Questions to*

Use in Your Next Survey, n.d.).

Procedure

        Participants began by providing informed consent via an e-signature on Qualtrics before

continuing. If they did not sign the informed consent page they were redirected to the end of the

Qualtrics survey. Next, some participants completed the contact measure, while others viewed

one of the two educational videos, counterbalanced to reduce order effects. Following the completion of one of these measures, the participant then completed the remaining task. In addition, immediately following the video participants answered an attention check, to ensure they understood the video content. Participants then completed either the explicit or implicit attitude measure, counterbalanced to avoid order effects, followed by the remaining measure. Participants then provided demographic information. Lastly, participants received the debriefing form.

Results

Regression was used to determine if the educational intervention and contact quality predicted differences in both explicit (via ADS) and implicit (via IAT) attitudes. Prior to analysis, the contact quality score was mean-centered, condition assignment was effect coded (experimental = 1 and control = -1), and an interaction variable between contact quality and condition assignment was calculated. For explicit attitudes, educational intervention, contact quality, and their interactions did not predict a significant amount of variance ($F(3,59) = 1.32$, $p = .278$, $R^2 = .25$). Although not significant, the association between experimental condition and explicit attitudes was in the positive direction (see Table 1). The main effect of contact quality was not a significant predictor of explicit attitudes toward people with disabilities (see Table 1). Additionally, the interaction was not significant. For implicit attitudes, experimental condition, contact quality, and their interaction did not predict a significant amount of variance ($F = (3, 59) = .29$, $p = .836$, $R^2 = .12$). Main effects of both condition and contact quality were not significant (see Table 2). Their interaction was also not significant.

Discussion

Utilizing an experimental design, the effects of a brief educational intervention and contact with a person with a disability on both explicit and implicit attitudes towards people with a disability was explored. It was hypothesized that contact and education would improve explicit attitudes, as directly supported by previous research, while simultaneously improving implicit attitudes. However, following regression analyses, results indicated that the hypothesis was not supported. Neither the educational intervention, contact, nor interaction predicted significant variance in explicit or implicit attitude scores.

Contact with people with disabilities showed no relation to explicit or implicit attitudes. This is unsurprising for implicit attitudes in particular, as previous research has demonstrated the inability for contact alone to predict implicit attitudes (Hein et al., 2011). However, numerous studies have found a correlation between contact and explicit attitudes (Brown et al., 2007; Hein et al., 2011), which was not found in this study. It is possible that the measure of contact lacked specificity or clarity in what was considered "closeness", "equity", and "cooperativeness" in relation to contact. This confusion in question wording may have played a role in the absence of a correlation between contact and explicit attitudes. Similarly, the specifics of a particular contact may be important in determining its impact on explicit attitudes. For example, the contact measure did not specify a time frame the contact must have occurred in, such as in the past month, 6 months, or year. Time may play a role in the impact of contact on attitudes, and this measure does not differentiate between contact at different times (other than tangentially through contact quality). To address potential issues with the contact measure used in the original study, another measure for contact was employed for the subsequent study.

While non-significant, the experimental video condition was approaching significance for improvement in explicit attitudes, exhibiting promise for future use of video interventions to

improve explicit attitudes, as has been supported previously (Amsalem et al., 2023; Begolli & Richland, 2017; Ha et al., 2022). Future research may look to explore the necessary components (content, length, etc.) of video interventions, and how changes in these components may impact explicit attitudes. Whereas implicit attitudes seem extremely resistant to change via a brief intervention, as discussed further next, explicit attitudes may be more susceptible to change through video interventions, albeit via a stronger intervention than the one utilized in this study. Additionally, if the number of participants for this study were higher, a third video, unrelated to disability, may have been included as an additional condition. It is possible that both the experimental and control videos could have improved attitudes towards people with disabilities, as they both relate to the topic of disability. Although previous research has demonstrated the importance of disability model beliefs in predicting attitudes (Bogart et al., 2019), if both videos were to have improved attitudes it would be challenging to detect, due to the lack of a pretest-posttest procedure. A future study may look to include an additional control condition, unrelated to disability, to determine if the mere discussion of disability, regardless of its relation to disability models, improves attitudes.

In regard to differences between explicit and implicit attitudes, this study may help illuminate the possibilities, and difficulties, in shaping attitudes. Implicit attitudes are decidedly more challenging to positively shift as they, compared to explicit attitudes, require "repeated pairings between an attitude object and related evaluations" (Rydell & McConnell, 2006). This notable difference in how implicit attitudes are impacted by a potential intervention, as opposed to explicit attitudes, is important to recognize in context of the brief intervention utilized in this study.

Limitations

There were a few limitations that may have influenced the results of this study. First, the lack of sufficient statistical power may have impacted the results, in particular the effect of the educational video on explicit attitudes. In addition, as opposed to previous research that used more intensive education interventions, this study employed a 3-minute video for each condition. A brief intervention may improve, or begin to shift explicit attitudes in the positive direction, but may be less successful in changing deep-rooted implicit attitudes, due to their resistance to change, as discussed before. This limitation in particular was the focus of changes made in study 2.

Study 2

Study 2 looked to address a number of issues apparent in study 1. Although previous research had supported the usage of brief interventions as a form of education, a brief, 3-minute video was not a significant enough intervention to change long-held attitudes. Therefore, a more substantial intervention was needed to further test the hypothesis that explicit and implicit attitudes towards people with a disability can, in fact, be impacted by an educational intervention and contact with a person with a disability.

Rather than a video, the intervention in this study consisted of four intermediate and advanced psychology courses, with a course on disability as the experimental condition. While a brief, video intervention may lack components to significantly impact attitudes (Bar-Tal & Hameiri, 2020), a semester-long course on disability, with topics such as the social model of disability and disability identity, may be more promising. Bogart et al. (2022), in a similarly designed study, demonstrated the role education and contact can have on improving explicit attitudes. Bogart et al. examined disability attitudes (and model beliefs) of students in three psychology courses, with three conditions: education and contact, a class taught by a professor

with a visible disability (contact) on the social model of disability, and challenging the medical

model; contact only, a class taught by a professor with a visible disability but did not include any

disability-related material; and a control, a class taught by a professor without a disability and

without any disability-related material. Looking at explicit attitudes specifically, they found that

students in the education and contact group showed greater attitude change, supporting their

proposed hypothesis. If similar findings can be found in relation to implicit attitudes, it would

provide insight into ways in which systematic improvement in attitudes, in particular attitudes

towards people with disabilities, is both a possibility, and provides a gateway towards a more

just society.

As mentioned, the experimental condition in this study was a course that specifically

focused on disability. This course, an upper-level psychology course, was discussion-based, and

incorporated psychological research along with first-person narratives from individuals who

identified as disabled (through writing, guest visits, etc.). In addition to the format of the course,

content played a key role in its intervention on attitudes towards disability. This material

included, in particular, information on the social model (vs. medical model) of disability, as

emphasized as principal in changing disability-related attitudes (Bogart et al., 2019, 2022). A

course specifically on disability has the potential to act as a powerful educational intervention,

providing participants with significant education about the social construction of disability. A

semester-long course, solely about the intersection of society and disability would be more likely

to improve attitudes, both explicit and implicit, as compared to a brief, 3-minute video.

In addition to an alteration in intervention, survey items were refined. A more extensive

disability attitude scale was utilized, and changes were made to wording on particular items that

were, based on participant feedback, found to be confusing and may have impacted participants'

answers.

Method

Participants

Students in four courses at a small, liberal arts college were eligible to complete the

study, with the option to opt-out at any time. From that pool of potential participants,

participation was open to those who were 18 years old and older. It was open to anyone

regardless of gender identity, race, etc. It was limited to those who speak English, as materials

provided to participants were in English. In addition, this study was implicitly restricted based on

access to technology, due to its online nature and proliferation.

Data for this study were collected in two waves. Some participants completed both the

pre- and posttest measures, while others only completed the survey at one time-point. Time 1

participants were recruited between the second and third week of the semester, via email from

the professor of each course. Provided with an introduction to the given study, participants were

directed to the survey. Data from 25 participants were included in the pretest (N_{Exp}=5, N_{Con1}=9,

N_{Con2}=3, N_{Con3}=8). Of those 25, 11 identified as White, 3 as Hispanic, Latinx, or Spanish Origins,

2 as Asian/Asian American, and 4 as Multiracial, with 5 participants preferring not to answer.

Fourteen participants identified as female, 4 as male, 3 as non-binary, and 4 participants

preferred not to answer. Ages ranged from 18 to 22 ($M = 20.20$, $SD = 1.12$). Four participants

identified as disabled. At the end, 12 additional participants opened the survey but were excluded

from any data analysis due to inadequate data.

Originally, the plan was to use a pretest-posttest design and collect data from the same

participants at Time 2. However, because the sample size for the pretest was relatively small,

additional participants were recruited for Time 2, along with those who completed the survey at

Time 1. Time 2 participants were recruited through email, from each class's professor, to all

potential participants, along with personalized emails to participants from Time 1.

Posttest data included 25 participants (N_{Exp}=5, N_{Con1}=11, N_{Con2}=2, N_{Con3}=7), of whom 13

identified as White, 5 as Hispanic, Latinx, or Spanish Origins, 1 as Black or African American, 2

as Asian/Asian American, and 3 as Multiracial, and 1 did not respond. Nineteen participants

identified as female, 3 as male, and 2 as non-binary. Ages ranged from 18 to 23 ($M = 20.58$, SD

$= 1.14$). Seven participants identified as disabled. Additionally, 14 participants opened the

survey, but were excluded from data analysis due to inadequate data.

Finally, 8 participants completed surveys at both pre- and posttest. Of those participants,

3 identified as White, 1 as Hispanic, Latinx, or Spanish Origins, 3 as Asian/Asian American, and

1 as Multiracial. Five participants identified as female, 1 as male, and 2 as non-binary. Ages

ranged from 18 to 21 ($M = 20.12$, $SD = 1.05$). One participant identified as disabled.

Design

This study employed an experimental design. There were two independent variables:

education (manipulated, not randomly assigned) and contact (measured, quasi-experimental).

The dependent variables were explicit and implicit attitudes toward people with disabilities.

Materials

Education

Educational interventions consisted of four intermediate and advanced psychology

courses. Two of these courses were intermediate (200) level classes: a developmental

psychology course, and a course on mental disorders specifically. Two were advanced (300)

level courses: one being a course on the role of race in youth development. As for the fourth

course, this was the experimental condition: a course specifically on disability, incorporating

topics such as the social model of disability and disability identity. Most class sizes ranged from

15-25, except for the course on mental disorders which was a larger, lecture-style class with

around 70 students.

As for choosing these control conditions, they provided an overlap of topics. A course on

development is primarily unrelated to disability attitudes, while a class on race in youth

development touches on the impact of identity on development (which could include attitude

development). As for the course on mental disorders, it discusses topics related to disability, but

in a more specific, applied context, and does not directly mention models of disability or

disability identity. Previous research has explored key factors in changing "well-anchored

attitudes", specifically in the context of intergroup conflict (Bar-Tal & Hameiri, 2020). These

components include: providing contradictory information; paradoxical thinking (pushing

attitudes to a seemingly absurd extreme, in order to refute them); enlightening individual

shortcoming (or implicit bias); teaching skills (for attitude change); and the informative process

model (to understand how attitudes are formed). Although there is no previous research

specifically on whether particular courses may differentially impact changes in attitudes, this

collection of courses may potentially employ all, some, or none of these components within a

disability-specific context.

Contact: Contact with Disabled Persons (CDP) Scale

Contact was measured via a modified series of 20 items developed by Yuker & Hurley

(1987). Some questions measured the amount and type of contact (e.g., "How often have you had

a long talk with a person who is disabled?"), while others included an affective aspect (e.g.,

"How often have you met a disabled person that you admire?"). Responses were on a five-point

scale ranging from 1 = *never* to 5 = *very often*. Composite scores could range from 20 (no contact) to 100 (maximum contact). Additionally, to clarify contact for those who identified as disabled, participants were prompted with, "Contact does not include yourself, if you are a person with a disability or disabilities/disabled person."

At Time 1, 25 participants completed the measure. The 20-item measure of contact demonstrated strong reliability (α = .95), and therefore was averaged to form an individual contact score (M = 2.83, SD = 0.78). At Time 2, 24 participants completed the measure. Again, the measure demonstrated strong reliability (α = .96), and therefore was averaged to form an individual contact score (M = 2.84, SD = 0.85).

Explicit Attitudes: Attitudes Towards Disabled Persons Scale (ATDP) Form A

The Attitudes Towards Disabled Persons Scale (ATDP) Form A (Yuker & Others, 1970), is a widely used measure for assessing explicit attitudes towards people with disabilities. This study utilized a version modified by Bogart et al. (2022), in which item wording was modified from "disabled people" to "people with disabilities", to better align with more current language. Thirty statements were proposed to participants in which attitudes are assessed based on responses ranging from 1 = *I disagree very much* to 6 = *I agree very much* (e.g., "People with disabilities are often unfriendly"). Some items, such as "People with disabilities are usually sociable" would be reversed scored. Scores were added together (after reverse scoring appropriate items) to produce a single score, with higher scores indicating greater negative attitudes (α_{T1} = .84; α_{T2} = .80). Due to adequate reliability, the ATDP items were averaged to form an individual attitude score (M_{T1} = 2.40, SD_{T1} = 0.43; M_{T2} = 2.50, SD_{T2} = 0.42)

Implicit Attitudes: Implicit Association Test (IAT)

See study 1 for description. IAT data was aggregated to produce a D-score for each participant, ranging from -2 (*preference towards disabled*) to 2 (*preference towards abled*; M_{T1} = 0.31, SD_{T1} = 0.58; M_{T2} = 0.34, SD_{T2} = 0.65).

Procedure

Procedure for both pre- and post-intervention surveys were the same. Participants began by providing informed consent via an e-signature on Qualtrics before continuing. If they did not sign the informed consent page they were redirected to the end of the Qualtrics survey. Next, participants were presented with either the contact, explicit, or implicit attitude measure, counterbalancing to avoid order effects. Following the completion of one of these measures, the participant then moved to the second, followed by the last measure. Participants then provided demographic information. Lastly, participants received the debriefing form.

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Results

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Prior to presenting the results it's important to recognize that due to this study being severely underpowered (*N*=8 for primary hypothesis), particular care should be taken when interpreting these results. Previous research suggests that attitude interventions result in an effect size of .125 to .262 (Cecchetti et al., 2021; Ha et al., 2022). A power analyses (Statistical Kingdom) with the given effects sizes indicated that to have an 80% chance of detecting a significant effect within this range would require 118 to 506 total participants. Additionally, due to participants' ability to skip questions, as well as cease participation in the study at any point, *N* was slightly different for certain measures, and are not consistent across measure nor time. Due to the underpowered nature of this study, extreme caution should be taken when attempting to examine and interpret the data provided. Relatedly, because of these challenges in meaningfully interpreting the data, and low confidence in its validity, these findings should not be generalized,

as they may not be indicative of the true impact contact and an educational intervention have on attitudes towards people with disabilities. However, the Discussion section attempts to both recognize the restrictions described here, while also taking the results as "truth" which, as argued here, may not be the case.

First, as the same implicit attitudes measure (IAT) was used in both study 1 and study 2, a t-test was run to determine any differences in implicit attitudes between those in study 1 and those in the pretest of study 2. Interestingly, there was a significant difference between study 1 and study 2 pretest participants (see Table 3 for means and standard deviations) in implicit attitude scores ($t(84) = 2.327$, $p = .022$). This indicates that those in the study 2 pretest had less negative implicit attitudes towards people with disabilities, as compared to those in study 1.

Initial analyses on study 2 examined whether there were differences among the three control groups. Given that all results were not significant for either explicit or implicit attitudes at both Time 1 and 2 (all p's > .62), they were combined into a single "control group".

Tests were conducted to determine any potential pre-existing differences in contact, as well as explicit and implicit attitudes between the experimental and combined control groups. For contact, participants in the control and experimental groups did not show any pre-existing differences ($t(23) = -.067$, $p = .947$). Similarly, participants in the control and experimental groups showed no pre-existing differences for explicit attitudes ($t(22) = .390$, $p = .700$). Lastly, implicit attitudes for the control and experimental groups did not demonstrate pre-existing differences ($t(21) = .420$, $p = .679$).

Longitudinal tests, including participants who completed both waves of data collection (*N=8)*, exploring differences in explicit and implicit attitudes over time, as well as by condition and contact were then conducted. Using repeated measures ANOVA, the effect of time,

condition, and contact on explicit and implicit attitudes was determined (see Table 4 for means

and standard deviations). For explicit attitudes, no significant effect was found for time ($F(1,5)$ =

0.56, p = .488), suggesting that, overall, explicit attitudes did not shift from T1 to T2. There were

also no significant effects of contact ($F(1,5)$ = 0.14, p = .723) or condition ($F(1,5)$ = 0.00, p =

.991). The critical test of this study's hypothesis was the interaction between time and condition,

which examines whether there was a different level of change in explicit attitudes from T1 to T2

in the experimental condition than there was in the control conditions. This test was not

significant, indicating that the lack of attitude change was consistent across conditions ($F(1,5)$ =

2.14, p = .203). There was also no two-way interaction between time and contact ($F(1,5)$ = .22, p

= .659).

For implicit attitudes, no significant effect was found for time ($F(1,5)$ = 2.07, p = .209),

indicating that explicit attitudes, overall, did not change from T1 to T2. Additionally, there were

no significant effects of contact ($F(1,5)$ = 0.52, p = .503) or condition ($F(1,5)$ = 0.73, p = .433).

As was the case for explicit attitudes, the critical test of the interaction between time and

condition on implicit attitudes was not significant, demonstrating an absence of attitude change

across conditions ($F(1,5)$ = .35, p = .580). No two-way interaction was found between time and

contact as well ($F(1, 5)$ = 1.76, p = .242).

Lastly, because of the relatively small sample size of participants who completed the

study at T1 and T2, additional analyses were run examining the effects of contact and condition

on both explicit and implicit attitudes at posttest only ($N=24$-25). Employing a univariate

ANOVA, neither contact ($F(1,21)$ = .76, p = .395) nor condition ($F(1,21)$ = 2.71, p = .114) were

significant predictors of explicit attitudes. The interaction between contact and condition for

explicit attitudes, although not significant, demonstrated a trend towards significance ($F(1,21)$ =

3.31, p = .083). To examine the trend of this interaction, I ran two separate correlations between contact and explicit attitudes for each educational condition. The association between contact and explicit attitudes was not significant for those in control groups ($r(20)$ = .298, p = .203) or those in the experimental group ($r(5)$ = -.532, p = .356).

For implicit attitudes, there was no significant effect of contact ($F(1,20)$ = .05, p = .825), condition ($F(1,20)$ = 1.03, p = .323), or their interaction ($F(1,20)$ = .93, p = .346).

Discussion

Modeled after the experimental design of Bogart et al. (2022), a college course on disability acted as an educational intervention that, along with contact with people with disabilities, was hypothesized to improve both explicit and implicit attitudes towards people with a disability. Results, however, do not align with this proposed hypothesis. There were no significant effects of time, condition, or contact, as well as any interaction, on explicit or implicit attitude scores.

A number of improvements in study design were introduced in study 2. However, the primary change in intervention approach did not present any immediate improvement in effectiveness at changing attitudes. Neither explicit nor implicit attitudes were significantly impacted by condition and contact over time. This result could be due to a variety of factors. At its core, this result indicates this particular intervention was ineffective for *this particular group of participants*. As was mentioned previously, there are particular components of importance in an intervention designed to change attitudes (Bar-Tal & Hameiri, 2020). These results indicate that those key components may not have been present in *any* of the courses to a significant enough extent. Due to the inability to alter course content, control over ensuring these components were present was not possible. Future research may look to compose course material

that directly addresses these components of attitude-changing interventions. While these results push against the notion of educational interventions having any impact, the theoretical basis of education having an impact on attitudes still holds.

Additionally, exploration may be needed to determine if the length of intervention played a role in its ineffectiveness; for how long, whether a semester, full year, or more, must a participant be exposed to an educational intervention for it to become effective in changing their attitudes? Previous research supports that change in attitudes is possible (Bogart et al., 2019; Cecchetti et al., 2021; Hein et al., 2011; Salinger, 2020), but further research may be needed within the particular area of disability-related attitudes.

It is also important to recognize the low power of this study, making it challenging to make broad conclusions without a more significantly sized, and more equally distributed, participant pool. Relatedly, the number of participants that completed surveys at both time-points was small, making it difficult to determine directly the impact of condition over time. Lastly, due to restraints, data collection did not start at the very beginning of the semester, and ceased before the end of the semester. There is potential that any improvement in attitudes may occur in the first few weeks of an educational intervention, and would therefore not be captured in these analyses. Future expansion of this work may look to refine the educational intervention, both by starting data collection at the beginning of the course, increasing the amount of time for the intervention (e.g., a full year course), and modifying the course content to more directly incorporate key components of attitude-changing interventions.

In addition to the intervention, potential issues with reliability on measures of contact and explicit attitudes were resolved in study 2, allowing for improved measurement. Even so, contact was not associated with either explicit or implicit attitudes. Due to this improved reliability,

slightly more importance can be placed on these results. However, as discussed surrounding the intervention, the low power and small, and unequally distributed, participant pool makes it difficult to have strong confidence in, and therefore generalize, these findings.

General Discussion

Many of the results presented run counter to previous literature, which has demonstrated the positive impact both contact and educational interventions can have on explicit attitudes (Bogart et al., 2019; Cecchetti et al., 2021; Hein et al., 2011; Salinger, 2020). It is clear that explicit and implicit attitudes can be difficult to change (Eagly & Chaiken, 1995), and that widespread ableism reproduces negative perceptions of people with disabilities (Lewis, 2022; Nario-Redmond, 2020), further feeding into those negative attitudes.

For explicit attitudes, specifically, it has been found that thinking about oneself impacts explicit, but not implicit attitudes (Grumm et al., 2009; Hein et al., 2011). Hein et al. (2011) primed participants to think consciously about their own personal attributes, prior to completing any attitude measures, via a "self-activation" activity. This procedure was not employed in either study, decreasing the impact of contact on explicit and implicit attitudes. In order to maximize the potential impact of contact (and possibly the intervention), this "self-activation" procedure would be beneficial for future studies, as without it contact had no relation to attitudes.

In regards to implicit attitudes, both studies elucidate the challenging nature of changing these long-held beliefs. Both a brief video intervention and a semester-long college course were unable to significantly improve participants' attitudes towards people with disabilities. Although discouraging, it may not be unsurprising. Interestingly, recent research has argued that individual implicit attitudes tend to reflect *societal* biases, rather than *individual* biases (Vuletich & Payne, 2019). They propose that social environments, and the biases they produce, are difficult to

change, rather than the individual biases themselves. This framework seems reasonable, especially in relation to attitudes towards people with disabilities. Ableism has shaped, and continues to shape, the ways in which individuals think about disability, and people with disabilities. These societal attitudes therefore shape individual attitudes, and it's the societal environment that must be targeted to improve individual attitudes, rather than individuals themselves. This framework is, in a way, an application of the social model of disability; the "problem" lies with society itself, rather than the individual.

Conclusion

In summary, study 1 revealed a brief, 3-minute video intervention on disability, along with contact, does not significantly predict an improvement in explicit or implicit attitudes towards disability. Although not significant, study 2 explored whether a slightly longer and more intentionally-designed intervention would improve explicit and implicit attitudes towards disability and people with disabilities.

Important, however, is the role of attitudes in behavior. While explicit attitudes may be more susceptible to change, implicit attitudes tend to have a greater role in discriminatory behavior, and therefore sustaining and reinforcing current systems of oppression. Thus, determining how to significantly and substantially improve implicit attitudes is of the utmost importance in making system-wide change.

Although these studies reinforced the difficulties in producing change in deeply ingrained and societally-reinforced attitudes, it simultaneously demonstrated that there are those who *already* hold positive attitudes towards people with disabilities. In particular, those in study 2 (pretest), all of whom were college students, had significantly better (although still not positive) attitudes towards people with disabilities than those in study 1 (wider age range). This may

indicate college students already hold less negative attitudes towards people with disabilities than the general population. All the more necessary, then, to continue leveraging the perspectives of those with disabilities along with those with tools to enact positive change on both individual attitudes *and* the societal structures in which those attitudes are formed.

Appendix

Table 1: *Regression of educational intervention and contact quality on explicit attitudes*

Variable	B	SE	*p*
Contact Quality	-0.01	0.03	.862
Condition	0.11	0.07	.086
Contact Quality*Condition Interaction	-0.02	0.03	.553

Table 2: *Regression of educational intervention and contact quality on implicit attitudes*

Variable	B	SE	*p*
Contact Quality	-0.01	0.04	.820
Condition	0.03	0.08	.690
Contact Quality*Condition Interaction	0.25	0.04	.480

Table 3: *Means and SDs for contact, explicit and implicit attitudes at Time 1 and Time 2 (all participants)*

| | Time 1 | | Time 2 | |
Group	N	M(SD)	N	M(SD)
Contact				
Control	20	2.82(0.72)	20	2.68(0.86)
Experimental	5	2.85(1.11)	5	3.26(0.78)
Explicit Attitudes				
Control	19	2.42(0.43)	20	2.52(0.39)
Experimental	5	2.33(0.46)	5	2.44(0.56)
Implicit Attitudes				
Control	18	0.33(0.59)	19	0.38(0.65)
Experimental	5	0.21(0.60)	5	0.21(0.70)

Table 4: *Means and SDs for contact, explicit and implicit attitudes at Time 1 and Time 2, for participants who completed both waves*

Group (N)	Time 1 M(SD)	Time 2 M(SD)
<u>Contact</u>		
Control (6)	2.28(0.74)	2.23(0.50)
Experimental (2)	3.28(1.52)	3.58(1.17)
<u>Explicit Attitudes</u>		
Control (6)	2.38(0.46)	2.41(0.36)
Experimental (2)	1.88(0.02)	2.35(0.78)
<u>Implicit Attitudes</u>		
Control (6)	0.56(0.29)	0.35(0.62)
Experimental (2)	0.16(1.15)	-0.30(0.32)

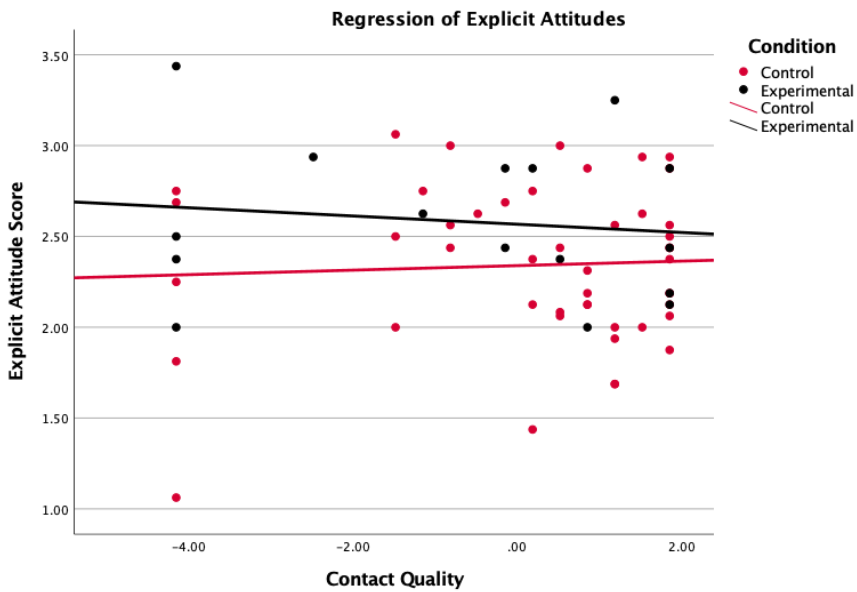Figure 1: Relationship between contact quality and explicit attitude scores.

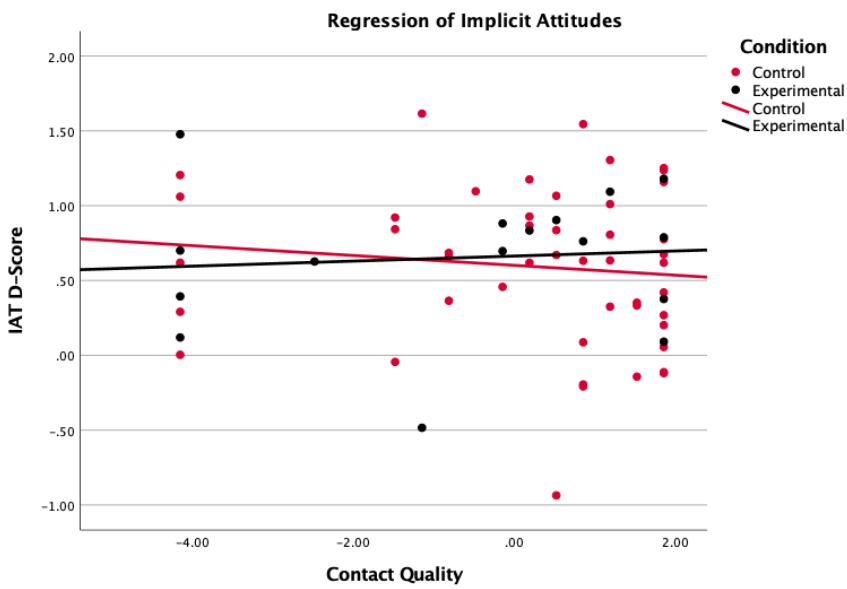Figure 2: Relationship between contact quality and implicit attitude D-score.

References

Allport, G. W. (1954). *The nature of prejudice* (pp. xviii, 537). Addison-Wesley.

Amsalem, D., Wall, M., Lazarov, A., Markowitz, J. C., Fisch, C. T., LeBeau, M., Hinds, M., Liu,
J., Fisher, P. W., Smith, T. E., Hankerson, S., Lewis-Fernández, R., Dixon, L. B., &
Neria, Y. (2023). Brief video intervention to increase treatment-seeking intention among
US health care workers: A randomized controlled trial. *Psychiatric Services*, *74*(2), 119–
126.

Antonopoulos, C. R., Sugden, N., & Saliba, A. (2023). Implicit bias toward people with
disability: A systematic review and meta-analysis. *Rehabilitation Psychology*, *68*(2),
121–134. https://doi.org/10.1037/rep0000493

Bar-Anan, Y. (2020, March 3). *Running Project Implicit's IAT from Qualtrics*. Retrieved from
https://minnojs.github.io/minnojs-blog/qualtrics-iat/

Barnard Center for Research on Women (Director). (2017, May 9). *Ableism is The Bane of My
Motherfuckin' Existence*. https://www.youtube.com/watch?v=IelmZUxBIq0

Bar-Tal, D., & Hameiri, B. (2020). Interventions to change well-anchored attitudes in the context
of intergroup conflict. *Social and Personality Psychology Compass*, *14*(7), e12534.
https://doi.org/10.1111/spc3.12534

Begolli, K., & Richland, L. (2017). Bridging cognitive science and real classrooms: A video
methodology for experimental research. *The Journal of Experimental Education*, *86*.
https://doi.org/10.1080/00220973.2017.1347775

Bennett, K. C., & Hannah, M. A. (2022). Transforming the rights-based encounter: Disability
rights, disability justice, and the ethics of access. *Journal of Business and Technical
Communication*, *36*(3), 326–354. https://doi.org/10.1177/10506519221087960

Bogart, K. R., Bonnett, A. K., Logan, S. W., & Kallem, C. (2022). Intervening on disability attitudes through disability models and contact in psychology education. *Scholarship of Teaching and Learning in Psychology*, *8*(1), 15–26. https://doi.org/10.1037/stl0000194

Bogart, K. R., Logan, S. W., Hospodar, C., & Woekel, E. (2019). Disability models and attitudes among college students with and without disabilities. *Stigma and Health*, *4*(3), 260–263. https://doi.org/10.1037/sah0000142

Brown, R., Eller, A., Leeds, S., & Stace, K. (2007). Intergroup contact and intergroup attitudes: A longitudinal study. *European Journal of Social Psychology*, *37*(4), 692–703. https://doi.org/10.1002/ejsp.384

Cecchetti, M., Last, J., Lynch, J., & Linehan, C. (2021). Evaluating the longitudinal impact of a disability education intervention on medical students' attitudes towards persons with a disability. *Disability and Health Journal*, *14*(3), 101092. https://doi.org/10.1016/j.dhjo.2021.101092

Corrigan, P. W., Morris, S. B., Michaels, P. J., Rafacz, J. D., & Rüsch, N. (2012). Challenging the public stigma of mental illness: A meta-analysis of outcome studies. *Psychiatric Services*, *63*(10), 963–973. https://doi.org/10.1176/appi.ps.201100529

Dovidio, J. F., Casados, A. T., & Roussos, G. (2019). Implicit attitudes and behavior toward people with disabilities. In D. S. Dunn (Ed.), *Understanding the experience of disability: Perspectives from social and rehabilitation psychology.* (2019-54246-014; pp. 239–251). Oxford University Press.

Eagly, A. H., & Chaiken, S. (1995). Attitude strength, attitude structure, and resistance to change. In *Attitude strength: Antecedents and consequences* (pp. 413–432). Lawrence Erlbaum Associates, Inc.

FitzGerald, C., & Hurst, S. (2017). Implicit bias in healthcare professionals: A systematic review. *BMC Medical Ethics*, *18*(1), 19. https://doi.org/10.1186/s12910-017-0179-8

Friedman, C. (2019). Family members of people with disabilities' explicit and implicit disability attitudes. *Rehabilitation Psychology*, *64*(2), 203–211. https://doi.org/10.1037/rep0000265

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, *102*(1), 4–27. https://doi.org/10.1037/0033-295X.102.1.4

Greenwald, A. G., & Krieger, L. H. (2006). Implicit bias: Scientific foundations. *California Law Review*, *94*(4), 945–967. https://doi.org/10.2307/20439056

Greenwald, A. G., & Lai, C. K. (2020). Implicit social cognition. *Annual Review of Psychology*, *71*, 419–445. https://doi.org/10.1146/annurev-psych-010419-050837

Grumm, M., Nestler, S., & Collani, G. von. (2009). Changing explicit and implicit attitudes: The case of self-esteem. *Journal of Experimental Social Psychology*, *45*(2), 327–335. https://doi.org/10.1016/j.jesp.2008.10.006

Ha, J., McClain, M. B., Covington, B., & Golson, M. E. (2022). Brief report: A brief video intervention for increasing autism knowledge in a general population sample. *Journal of Autism and Developmental Disorders*, *52*(11), 5058–5063. https://doi.org/10.1007/s10803-021-05341-w

Hein, S., Grumm, M., & Fingerle, M. (2011). Is contact with people with disabilities a guarantee for positive implicit and explicit attitudes? *European Journal of Special Needs Education*, *26*(4), 509–522. https://doi.org/10.1080/08856257.2011.597192

Hunt, C. S., & Hunt, B. (2004). Changing attitudes toward people with disabilities:

    Experimenting with an educational intervention. *Journal of Managerial Issues*, *16*(2),

    266–280.

Lewis, T. A. (2022, January). *Working Definition of Ableism—January 2022 Update* [Blog].

    Talila A. Lewis. https://www.talilalewis.com/blog

Lindgren, C. L., & Oermann, M. H. (1993). Effects of an educational intervention on students'

    attitudes toward the disabled. *Journal of Nursing Education*, *32*(3), 121–126.

    https://doi.org/10.3928/0148-4834-19930301-07

Nario-Redmond, M. R. (2020). *Ableism: The causes and consequence of disability prejudice*.

    Wiley Blackwell.

Power, M. J., Green, A. M., & WHOQOL-DIS Group. (2014). *Attitudes to Disability Scale*

    [dataset]. https://doi.org/10.1037/t33332-000

Powerchair Football is your new favourite #WorldCup sport. (2018, June 22).

    https://www.youtube.com/watch?v=X27gacWEdmI

Pruett, S. R., & Chan, F. (2006). The development and psychometric validation of the Disability

    Attitude Implicit Association Test. *Rehabilitation Psychology*, *51*(3), 202–213.

    https://doi.org/10.1037/0090-5550.51.3.202

Rudman, L. A. (2004). Sources of implicit attitudes. *Current Directions in Psychological

    Science*, *13*(2), 79–82. https://doi.org/10.1111/j.0963-7214.2004.00279.x

Rydell, R. J., & McConnell, A. R. (2006). Understanding implicit and explicit attitude change: A

    systems of reasoning analysis. *Journal of Personality and Social Psychology*, *91*(6), 995–

    1008. https://doi.org/10.1037/0022-3514.91.6.995

Salinger, R. (2020). Empirically based practices to address disability stigma in the classroom.

    Journal of Applied School Psychology, *36*(3), 324–345.

    https://doi.org/10.1080/15377903.2020.1749203

Schnellert, L., Tidey, L., & Hole, R. (2023). "You have the right to love and be loved":

    Participatory theatre for disability justice with self-advocates. *Qualitative Research*,

    23(2), 467–485. https://doi.org/10.1177/14687941211034963

Sins Invalid. (2023, December 1). Sins Invalid. https://www.sinsinvalid.org

Statistics Kingdom. (n.d.). Regression and ANOVA - Sample size calculator. Retrieved April 26,

    2024, from https://www.statskingdom.com/sample_size_regression.html

Szumski, G., Smogorzewska, J., & Grygiel, P. (2020). Attitudes of students toward people with

    disabilities, moral identity and inclusive education—A two-level analysis. *Research in

    Developmental Disabilities*, *102*, 103685. https://doi.org/10.1016/j.ridd.2020.103685

The 15 Best Demographic Examples & Questions to Use in Your Next Survey. (n.d.). Retrieved

    October 23, 2023, from https://blog.hubspot.com/service/survey-demographic-questions

Thomas, A., Vaughn, E. D., Doyle, A., & Bubb, R. (2014). Implicit Association Tests of

    attitudes toward persons with disabilities. *The Journal of Experimental Education*, *82*(2),

    184–204.

Vuletich, H. A., & Payne, B. K. (2019). Stability and change in implicit bias. *Psychological

    Science*, *30*(6), 854–862. https://doi.org/10.1177/0956797619844270

Wexler, A. (2021). *Review of Ableism: The Causes and Consequences of Disability Prejudice by

    Michelle R. Nario-Redmond*. *41*(1). https://doi.org/10.18061/dsq.v41i1.7839

What is the social model of disability? - Scope video. (2014, August 21).

    https://www.youtube.com/watch?v=0e24rfTZ2CQ

Yanes, T., Nathan, V., Wallingford, C., Faragher, R., Nankervis, K., Jacobs, C., Vassos, M.,

    Boyle, F., Carroll, A., Smith, S., & McInerney-Leo, A. (2023). Australasian genetic

    counselors' attitudes toward disability and prenatal testing: Findings from a cross-

    sectional survey. *Journal of Genetic Counseling*, *n/a*(n/a).

    https://doi.org/10.1002/jgc4.1788

Yuker, H. E., & Hurley, M. K. (1987). Contact with and attitudes toward persons with

    disabilities: The measurement of intergroup contact. *Rehabilitation Psychology*, *32*(3),

    145–154. https://doi.org/10.1037//0090-5550.32.3.145

Yuker, H. E., & Others, A. (1970). *The Measurement of Attitudes Toward Disabled Persons*.

    https://eric.ed.gov/?id=ED044853

Zlotnick, E., Dzikiewicz, A. J., & Bar-Anan, Y. (2015). *Minno.js* (0.3) [Computer software].