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ARTICLE

Attitudes toward disabilities among students in college settings: A multidimensional scaling analysis with biplot

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Abstract

We investigated attitudes toward 10 specific groups of individuals with disabilities among students in college settings. These groups comprised major depression, substance use disorder (SUD), anxiety disorder, autism spectrum disorder (ASD), cerebral palsy, hearing impairment, learning disability, visual impairment, spinal cord injury, and cancer survivor. The multidimensional scaling (MDS) analysis revealed a two-dimension space representing participants' attitudes toward those disabilities. The MDS biplot further indicated higher levels of perceived dangerousness from the groups with SUD, major depression, anxiety disorder, and ASD. The hierarchical cluster analysis revealed that cluster A (SUD and major depression) was rated as having the highest level of social distance (i.e., negative attitudes). The implications for research and practice in rehabilitation counseling were discussed.

Keywords: Attitudes; inclusion; multidimensional scaling analysis; postsecondary education; students with disabilities

The report from the National Longitudinal Transition Study-2 in 2005 has indicated that approximately 25% of students with disabilities who received special education services during grade school have entered postsecondary education (Wagner, Newman, Cameto, Garza & Levine, 2005). This percentage increased to 67% in 2011, indicating that the number of students with disabilities who received special education services during grade school pursuing postsecondary education has increased dramatically over the past years (Newman et al., 2011). In addition, a large number of college students without disabilities meet the criteria for mental health disorders (Hunt & Eisenberg, 2010; Rodgers & Tennison, 2009). In many cases, students with disabilities and mental health disorders experience increased stress, as they are faced with navigating the typical stressors of postsecondary attendance in addition to the added stressors of coping with disabilities. As a result, promoting quality participation in and successful completion of postsecondary education for these students is critical since completion of postsecondary education plays an essential role in achieving positive postgraduation employment outcomes and economic success (Engle, 2007; O'Neill et al., 2015).

College life is often considered stressful for students with disabilities due to high academic pressure and potential social isolation when transitioning to new college life (Archer & Cooper, 1998; Kadison & DiGeronimo, 2004; Tansey et al., 2018). While students with disabilities have emphasized the benefit of social support from peers in promoting positive college adjustment and academic success (Cardoso et al., 2016; Sanders & Dubois, 1996; Wegner, 2017), developing meaningful support network in college settings is frequently challenging for students with disabilities

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due to negative attitudes toward disabilities among their peers without disabilities (Green, 2007; Perlick et al., 2001; Vyavaharkar et al., 2010).

Attitudes are defined as global evaluations of an individual, an object, or an event that can be favorable or unfavorable (Chan, Livneh, Pruett, Wang & Zheng, 2009). Attitudes are generally assumed to consist of cognitive, affective, and behavioral components (Eagly, Mladinic & Otto, 1994). For example, some college students without disabilities may believe individuals with serious mental illness (SMI), including past alcohol or drug history, depression, and anxiety, are dangerous, as these groups have frequently been associated with harming or self-harming behaviors (Chartrand, Sareen, Toews & Bolton, 2012; Heerde & Hemphill, 2015; Mannarini & Boffo, 2015; Peluso & Blay, 2009; Raza, Abbasi, Khurshid & Ansari, 2018). While there is little scientific evidence supporting the cause of harming and self-harming behaviors among these groups (Van Dorn, Volavka & Johnson, 2012), this belief may encourage students to feel apprehensive around peers from these groups and, in turn, avoid contact with them.

While attitudes toward disabilities among students in college settings have gained attention from researchers, a majority of studies have focused on individuals with SMI (Amarasuriya, Jorm, Reavley & Mackinnon, 2015; Anderson, Jeon, Blenner, Wiener & Hope, 2015; Botha, Shamblaw & Dozois, 2017; Vankar, Prabhakaran & Sharma, 2014). Research on this topic focusing on other types of disabilities is scarce. For example, while few studies have shown mixed findings regarding attitudes toward individuals with cerebral palsy (Martin, Rowell, Reid, Marks & Reddihough, 2005; Sarno & Colpoys, 1967), individuals with hearing impairment (Emerton & Rothman, 1978), and individuals with autism spectrum disorder (ASD; Gillespie-Lynch et al., 2015; Obeid et al., 2015), there is still a significant dearth of studies in this area focusing on individuals with other types of disabilities, such as visual impairment, spinal cord injury (SCI), and cancer survivor. Moreover, while several studies (Banks, in press; Dodd, Hermanson, Landstrom, Nelson & Rose, 1991; Matthews, Anderson & Skolnick, 1987; Vogel, Leyser, Wyland & Brulle, 1999) investigating attitudes toward individuals with learning disability in college settings revealed positive attitudes toward this group, the major emphasis in those studies is mostly on the faculty's perspectives about their willingness to provide academic accommodations instead of on students' attitudes toward their peers with disabilities. As a result, it can be difficult to gain a comprehensive understanding of attitudes toward disabilities in college settings due to the limited number of empirical studies in this area.

Negative attitudes toward disabilities are likely to create a negative climate, decrease campus involvement, and contribute to a diminished sense of belonging for college students with disabilities. Each of these factors is considered key element for success and persistence in postsecondary education for students with disabilities (Fleming, Oertle, Plotner & Hakun, 2017; Vaccaro, Daly-Cano & Newman, 2015). Therefore, it is crucial to gain a comprehensive understanding of attitudes toward college students with different types of disabilities among those without disabilities in college settings.

Research on attitudes toward disabilities specifically among students in college settings can be traced back to the 1960s (Freed, 1964). While research on attitudes toward disabilities among students in college settings has been documented in the literature (e.g., Culp, Rojas-Guyler, Vidourek & King, 2017; Leyser & Romi, 2008; Palmer, Redinius & Tervo, 2000; Seo & Chen, 2009; Wagner & Stewart, 2001), a majority of the extant studies display two critical methodological limitations: (a) problems in contextualizing attitude measurement and (b) treating all disability categories as a homogeneous group. These issues may potentially bias findings and the interpretations of the results.

1. Problems in Contextualizing Attitude Measurement

It has been emphasized that an attitude is context dependent (Kowalska & Winnicka, 2013; Ouellette-Kuntz et al., 2010). Wright (1988) has accentuated the importance of social context

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related to disability. Hence, the result might not reflect the truth if attitudes toward disabilities among college students are investigated using measures assessing attitudes in a generic context (i.e., decontextualizing attitude measurement) instead of a specific context (i.e., contextualizing attitude measurement). For example, several studies utilized the *Attitudes Towards Disabled Persons Scale* (ATDP; Yuker & Block, 1986; Yuker, Block & Young, 1970) to measure attitudes toward disabilities among college students (Fichten, Tagalakis & Amsel, 1989; Martin et al., 2005; Palmer et al., 2000; Seo & Chen, 2009; Suthakaran, Wright, Simpson, Marra & Sonner, 2011); example items in the ATDP include "Disabled people are the same as anyone" and "Most disabled people feel sorry for themselves." However, while the psychometric properties of the ATDP have been questioned (Breen, 2018), this instrument measures attitudes toward disabilities in a generic context as opposed to a specific context (e.g., a context that is closely related to college settings). The studies (Gupta & Bonnell, 1993; Ionta & Scherman, 2007) using the *Opinions of Mental Illness* Questionnaire (Struening & Cohen, 1963), which is a commonly used instrument measuring attitudes toward mental illness, also share a similar issue.

However, student attitudes toward individuals with disabilities in college settings (e.g., in the classroom or dorm) may be very different from the student attitudes toward individuals with disabilities in other life settings (i.e., employment or marriage). In other words, college student attitudes toward individuals with disabilities in a generic context may not generalize to other specific contexts because the levels of intimacy may differ when college students interact with individuals with disabilities in different life settings (Hergenrather & Rhodes, 2007; Huskin, Reiser-Robbins & Kwon, 2018).

Another critical issue concerning contextualizing attitude measurement is that an attitude measurement may be contextualizing but involve distinctly different contexts (Bogardus, 1933; Hergenrather & Rhodes, 2007). For example, despite the critiques to its psychometric properties (Ethington, 1997), the *Social Distance Scale* (SDS; Bogardus, 1933) has been a popular instrument measuring attitudes toward disabilities. Some studies (Gillespie-Lynch et al., 2015; Obeid et al., 2015) used the adapted version of the SDS to measure attitudes toward ASD among college students. The SDS consists of a series of questions to determine an individual's willingness to engage with a specific group at varying levels of intimacy ranging from "starting a collaborative project" to "marrying a person" for instance. In such a case, when college students express willingness to work with peers with ASD on a collaborative project in the classroom, they may score low on a question under this context (i.e., low scores in this context represent a high level of willingness [low social distance] to work together on a collaborative project). However, the same respondents may not be willing to marry someone with ASD and therefore score high on a question under this context (i.e., high scores in this context represent a low level of willingness [high social distance] to marry someone with ASD). As a result, a scale score calculated with raw scores derived from these two distinctly different questions in terms of contexts may inaccurately reflect respondents' attitudes toward individuals with ASD because scores derived from these two questions may offset one another. Such a case was also found in a study (Bean & Hedgpeth, 2014) using the *Disability Social Relations Generalized (DSRGD) Scale* (Hergenrather & Rhodes, 2007) to investigate student attitudes toward people with disabilities.

The DSRGD is composed of three subscales measuring attitudes in three distinctly different contexts (i.e., dating, marriage, and work). The issue noted in the previous paragraph might be addressed by examining attitudes toward disabilities at the subscale level, since examining attitudes at the subscale level in this case would provide more accurate insights than examining attitudes at the full-scale level.

In brief, investigating attitudes toward disabilities with a decontextualizing attitude measurement (i.e., a generic context) may reflect respondents' attitudes toward disabilities, but this type of measurement may provide little specific information related to attitudes in a specific context. Likewise, investigating attitudes toward individuals with disabilities with measurement consisting

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of different contexts and scores focusing on full-scale level may inaccurately reflect respondents' broad attitudes toward disabilities, as scores from different contexts may offset one another.

2. Treating Disabilities as a Homogeneous Group

Many studies investigating attitudes toward individuals with disabilities frequently consolidate all disabilities into one homogeneous group and fail to address differences in attitudes toward specific groups with disabilities (Bean & Hedgpeth, 2014; Bogart, Logan, Hospodar & Woekel, 2019; Culp et al., 2017; Hergenrather & Rhodes, 2007; Leyser & Romi, 2008; Palmer et al., 2000; Polo Saánchez, Fernaández-Jimeánez & Fernaández-Cabezas, 2018; Seo & Chen, 2009; Suthakaran et al., 2011; Wagner & Stewart, 2001). However, research has indicated that most individuals exhibit hierarchical preferences for specific groups of individuals with disabilities. For example, people generally harbor more positive attitudes toward individuals with physical disability than do individuals with psychiatric disability and more positive attitudes toward individuals with intellectual disability than individuals with psychiatric disability (Chan et al., 2009). Therefore, treating different disabilities as one homogeneous group is likely to provide little information specific to individuals' attitudes and experiences of different types of disabilities.

A number of studies investigating attitudes toward disabilities among college students have focused on a specific group of individuals with disabilities (Ahlborn, Panel & Jungers, 2008; Gibbons, Cihak, Mynatt & Wilhoit, 2015; Granello & Granello, 2000; Griffin, Summer, McMillan, Day & Hodapp, 2012; Haney & Fisher, 2017; Li, Tsoi & Wang, 2012; Matthews, Ly & Goldberg, 2015; Nevill & White, 2011; Sun et al., 2013; Youssef et al., 2014). Focusing on one specific group of individuals with disabilities may pose limitations regarding insights into attitudes across different groups of individuals with disabilities. This narrow focus may also limit the development of efficient and innovative strategies for increasing disability awareness for disability groups who require higher levels of awareness from their peers without disabilities.

3. Purpose of the Study

Little research to date has focused on multiple groups of individuals with disabilities simultaneously (Schmelkin, 1984; Tringo, 1970; Upton, Harper & Wadsworth, 2005); few studies have taken into consideration the aforementioned methodological limitations. In order to fill this gap and expand the understanding of attitudes toward individuals with disabilities among students in college settings, the purpose of this study was to expand the understanding of attitudes toward 10 specific groups of individuals with disabilities among students in college settings while taking into consideration methodological limitations from the previous studies.

4. Method

4.1 Design and procedures

A quantitative descriptive design utilizing a convenience sample was used in this study. We recruited participants from a public university in the southern United States. Participants who were eligible to participate in the study were at least 18 years old and enrolled in a course in which the instructors agreed to participate in this study. Upon receiving approval from the Institutional Review Board at the hosting university, we, based on personal network, sent out an email to the instructors in an academic program preparing professionals at the hosting university for inquiring their willingness to help disseminate an online survey link for this study. The instructors who agreed to participate in this study helped to send out a survey link to students in their classes. The instructors offered extra credit to students for their participation in the online survey.

We purposely selected 10 types of disabilities to be involved in this study since the recipients of supports for academic accommodations at the hosting university had involved these groups. These

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groups comprised major depression, substance use disorder (SUD), anxiety disorder, ASD, cerebral palsy, hearing impairment, learning disability, visual impairment, SCI, and cancer survivor. This study also purposely involved two groups of individuals who were from a single-parent family and who were transfer students. The involvement of these two groups aims at serving as an anchor representing individuals without disabilities.

A list containing the selected 12 groups (i.e., 10 types of disabilities and 2 anchor groups) was presented in each question of the measures used in the survey. For example, the participants were asked "how willing would you be to start a collaborative project with someone from the given group of individuals?" and then provided their responses to this question by checking the response based on a Likert-type scale presented with each of the 12 groups. These 12 groups were presented in a random order in the list for the first question, with the first group being individuals who are cancer survivors, followed by individuals with SCI, individuals with visual impairment, individuals from a single-parent family, individuals with past alcohol/drug history, individuals with ASD, individuals with major depression, individuals with learning disability, individuals who are transfer student, individuals with anxiety disorder, individuals with hearing impairment, and individuals with cerebral palsy. This order remained the same throughout the remaining questions.

4.2 Participants

One hundred eighty-nine participants completed the online survey. Five cases were removed since more than 80% of values were missing, resulting in a final count of $N = 184$. Descriptive statistics for the sample are presented in Table 1.

A majority of the sample were female (76%), while 24% were male. Participants ranged in age from 18 to 62 years ($M = 28.35$, $SD = 10.36$). Eighty-five participants reported as European American (46.20%), followed by Hispanic/Latino American (21.74%), African American (20.65%), Asian American, native Hawaiian, or other Pacific Islander (5.98%), Native American/American Indian (0.54%), and other (4.89%). Participants reported that they were college seniors (40.22%), master's students (22.28%), juniors (19.02%), sophomores (11.41%), and freshmen (7.07%). One hundred thirteen participants (61.41%) reported that a member of their immediate family or a close friend was living with disability, and 131 participants (71.20%) reported that a member of their extended family, co-worker, or acquaintance was living with disability. Sixty-five participants (35.33%) reported that topics concerning disability were not the major focus of their academic training but were addressed in classes, seminars, or workshops. Fifty-five participants (29.89%) reported that disability was the major focus of all or most of their academic training, and the remaining 64 participants (34.78%) reported that had received almost no training in topics concerning disability.

4.3 Measures

4.3.1 Social distance

An adapted version of the 4-item SDS (Bogardus, 1933) was used to measure attitudes toward students with disabilities among students in college settings. The SDS measures attitudes by assessing participants' willingness to engage with a given type of person (i.e., someone with specific type of disability) at various levels of intimacy. The original 6-item SDS asks participants how willing they would be (a) "to move next door to someone from the given group of individuals"; (b) "to spend an evening socializing with someone from the given group of individuals"; (c) "to start a collaborative project with someone from the given group of individuals"; (d) "to make friends with a person from the given group of individuals"; (e) "to have a person from the given group of individuals marry into the family"; and (f) "to marry or date a person from the given group of individuals." In order to ensure the measurement's context was more specifically relevant to college life, the last two items from the original 6-item SDS were excluded because the context concerning "marriage" was less directly relevant to college life. Each item was rated on a 7-point Likert-type scale ranging from 1 (*definitely willing*) to 7 (*definitely unwilling*). A mean

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Table 1. Participant demographic characteristics ($N = 184$)

Characteristics	*N* (%)	*M* (*SD*)
Age		28.35 (10.36)
Gender		
Male	44 (23.91)	
Female	140 (76.09)	
Ethnicity		
European American	85 (46.20)	
Hispanic/Latino American	40 (21.74)	
African American	38 (20.65)	
Asian American, native Hawaiian, or other Pacific Islanders	11 (5.98)	
Native American/American Indian	1 (0.54)	
Others	9 (4.89)	
Class level		
Freshman	13 (7.07)	
Sophomore	21 (11.41)	
Junior	35 (19.02)	
Senior	74 (40.22)	
Master's degree	41 (22.28)	
Immediate family or a close friend living with disabilities		
Yes	113 (61.41)	
No	71 (38.59)	
Extended family, a co-worker, or an acquaintance living with disabilities		
Yes	131 (71.20)	
No	53 (28.80)	
Receiving training in topics concerning disability		
Receiving major training in this topic	55 (29.89)	
Receiving partial training in this topic	65 (35.33)	
Receiving no training in this topic	64 (34.78)	

score was computed, with higher scores indicating higher level of social distance. Cronbach's alpha for the adapted 4-item SDS in this study was $\alpha = .92$.

4.3.2 Perceived dangerousness

The *Perceived Dangerousness Scale* (*PDS*; Martin, Pescosolido & Tuch, 2000; Phelan & Basow, 2007; Schnittker, 2000) was utilized to assess participants' perceived dangerousness of their peers with disabilities. The PDS comprises three items: (a) "How likely is it that the given group of individuals would do something violent toward other people?" (b) "How likely is it that the given group of individuals would do something violent toward themselves?" and (c) "How dangerous this group of individuals appears?" The first two items were rated on a 7-point Likert-type scale ranging from 1 (*very unlikely*) to 7 (*very likely*), and the third item was rated on a 7-point Likert-

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type scale ranging from 1 (*not at all dangerous*) to 7 (*extremely dangerous*). A mean score was computed, with higher scores indicating higher levels of perceived dangerousness of students with disabilities. Cronbach's alpha for PDS in this study was $\alpha = .83$.

4.4 Data analysis

Descriptive statistics, missing data analysis, multidimensional scaling (MDS) analysis, and hierarchical cluster analysis (HCA) were computed using statistical programming language R version 3.5.0 with RStudio version 1.1.453. An analysis for missing data revealed a missing pattern ranging from a low of 1% for SDS measuring stigma to a high of 4% for PDS measuring perceived dangerousness. Because missing values were not extreme in this sample, a single imputation using predictive mean matching for continuous variables and logistic regression for categorical variables (van Buuren, 2012) was utilized to replace missing values. This method is preferred over listwise deletion when less than 5% of items are missing to ensure that sample size and representativeness are intact (Fox-Wasylyshyn & El-Masri, 2005; Schafer & Graham, 2002).

A nonmetric MDS analysis was used to determine the degree to which objects (i.e., different groups of students with disabilities in this study) are dissimilar to each other based on the participants' ratings on social distance (Borg & Groenen, 2005; Cox & Cox, 2001). The dimensional structure underlying this set of objects was graphically presented in a perceptual space. In other words, the more distant two groups of students with disabilities are, the more dissimilar the two groups will be. Given the use of Likert-type scale, which is considered an indirect proximity measure in the MDS literature, the indirect proximity data were converted to a *Euclidean* distance matrix prior to model configuration (Ding, 2018). The Euclidean distance matrix was then utilized for configuration using classical scaling solution (Torgerson 1958). In order to determine an optimal dimensionality for MDS, we examined the *Kruskal's Stress-1* index (Kruskal, 1964) and a *scree plot* (Cox & Cox, 2001; Hout, Papesh & Goldinger, 2013) for the optimal MDS model selection. A *Kruskal's stress-1* index less than .10 represents a fair model fit, less than .05 represents a good fit, and less than .025 represents an excellent fit (Borg & Groenen, 2005; Kruskal, 1964). Despite the fact that lower stress index indicates a better fit for an MDS model, the decreased stress index would lead to an increased number of dimensions (Borg & Groenen, 2005; Cox & Cox, 2001; Ding, 2018), which decreases the readability and interpretability of the MDS model (Jaworska & Chupetlovska-Anastasova, 2009). Therefore, a scree plot, also known as "elbow method," was further examined for addressing this limitation. The scree plot was generated by plotting stress function value against the number of dimensions (Jaworska & Chupetlovska-Anastasova, 2009). An obvious "elbow" within the scree plot indicates an optimal number of dimensions since increasing dimensions does not affect stress index in any significant way (Hout et al., 2013).

We further applied a *biplot* for MDS. A biplot for MDS is a plot in two or more dimensions that illustrate objects on MDS perceptual space and external variables of a data matrix simultaneously (Cox & Cox, 2001). Thus, a biplot is a representation of two modes (e.g., the objects on MDS space and external variables) in one plot but not to the dimensionality (Borg & Groenen, 2005). We generated an MDS biplot by adding an external variable (i.e., perceived dangerousness) to the MDS perceptual space. The projection of this external variable on the perceptual space was determined based on the linear regression coefficient of the external variable on the objects in the MDS perceptual space (Greenacre, 2010).

An HCA also was conducted based on the participants' ratings on social distance in order to further clarify the different groups of students with disabilities perceived by the participants. The number of clusters was determined by examination of the *scree plot*. The scree plot was generated by plotting *Dindex* value against the number of clusters (Charrad, Ghazzali, Boiteau, Niknafs &

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Table 2. Descriptive statistics for social distance and perceived dangerousness; results of hierarchical cluster analysis and standardized regression coefficients resulting from MDS biplot

	Social distance	Dangerousness	
	M (SD)	*M (SD)*	*β*
Cluster A	2.17 (0.07)	3.52 (0.05)	
Substance use disorder	2.22 (1.40)	3.55 (1.56)	2.23
Major depression	2.12 (1.36)	3.48 (1.36)	1.50
Cluster B	1.84 (0.10)	2.31 (0.33)	
Autism spectrum disorder	1.99 (1.26)	2.59 (1.29)	0.11
Anxiety disorder	1.90 (1.23)	2.92 (1.34)	0.46
Cerebral palsy	1.86 (1.27)	2.16 (1.22)	−0.52
Hearing impairment	1.83 (1.25)	2.08 (1.18)	−0.25
Learning disability	1.82 (1.17)	2.27 (1.23)	−0.09
Visual impairment	1.77 (1.14)	2.10 (1.15)	−0.50
Spinal cord injury	1.68 (1.11)	2.06 (1.08)	−0.75
Cluster C	1.57 (0.02)	2.11 (0.13)	
Transfer student	1.59 (1.12)	2.05 (1.16)	−0.61
Cancer survivor	1.57 (1.11)	2.03 (1.13)	−0.81
Single-parent family	1.56 (1.08)	2.26 (1.27)	−0.76

Charrad, 2014). The *Dindex* is based on clustering gain on intra-cluster inertia, which measures the level of homogeneity between the data (e.g., groups of disabilities) associated with a cluster (Lebart, Morineau & Piron, 2000). An obvious "elbow" within the scree plot indicates an optimal number of clusters.

5. Results

5.1 Descriptive analysis

Descriptive statistics for social distance and perceived dangerousness across disability groups are presented in Table 2.

The descriptive statistics revealed mean scores for social distance ranging from a low on the group of single-parent family ($M = 1.56$, $SD = 1.08$) to a high on the group of SUD ($M = 2.22$, $SD = 1.40$). This result indicated that participants mostly held positive attitudes toward their peers from these groups in college settings, but more favored those who were from a single-parent family and least favored those living with SUD. In other words, participants were mostly or definitely willing to move to next door to those from a single-parent family, spend an evening socializing with those from a single-parent family, start a collaborative project with those from a single-parent family, and make friends with those from a single-parent family, but participants were only somewhat or mostly willing to move to next door to those living SUD, spend an evening socializing with those living with SUD, start a collaborative project with those living with SUD, and make friends with those living with SUD.

Mean scores for perceived dangerousness ranged from a low on the group of cancer survivors ($M = 2.03$, $SD = 1.13$) to a high on the group of SUD ($M = 3.55$, $SD = 1.56$). This result indicated that participants perceived a low level of dangerousness from a majority of the disability groups. In other words, participants considered that a majority of their peers from these disability groups

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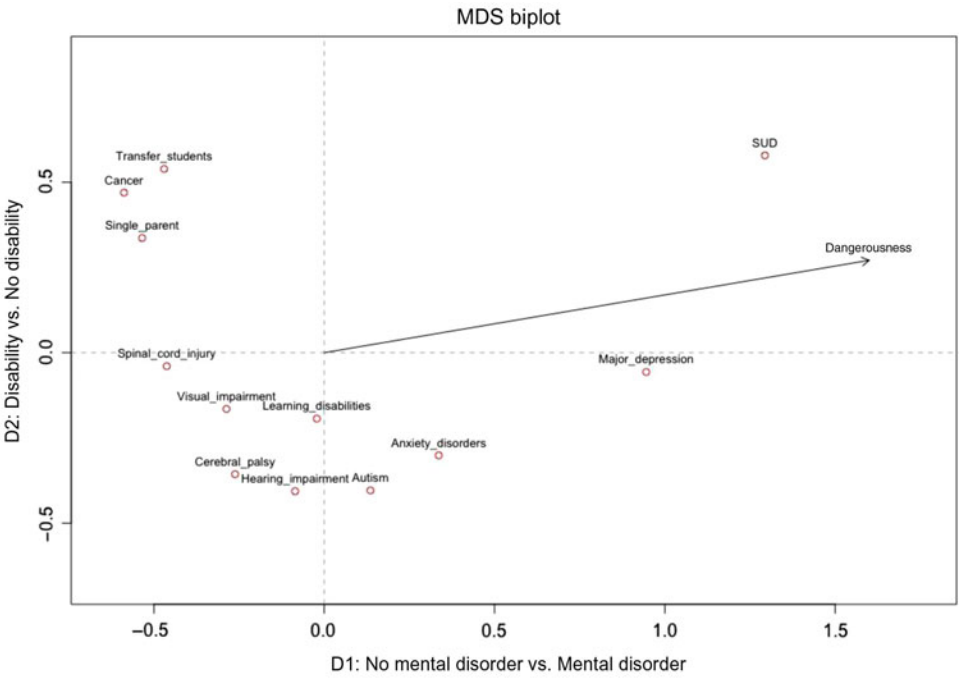


Figure 1. A two-dimension solution for attitudes toward students with disabilities in college settings and biplot for the dangerousness vector.

were not dangerous and were unlikely to do something violent toward other people and themselves. However, participants held nearly neutral opinions about their peers living with SUD in terms of dangerousness, indicating that participants perceived low to moderate level of dangerousness from their peers living with SUD and that their peers living with SUD might be *somewhat* unlikely to do something violent toward other people and themselves.

5.2 Multidimensional scaling and biplot

The MDS result indicated participants' attitudes toward their peers from given groups of disabilities can be graphically represented in a two-dimension space based on the scree plot for MDS and *Kruskal's stress-1* index. The *Kruskal's stress-1* index was found to be .016 (< .025), indicating an excellent fit. Dimension one is represented by *no mental disorder* versus *mental disorder*, and dimension two is represented by *disability* versus *no disability*. The MDS perceptual space is presented in Fig. 1. It should be noted that MDS defines clusters of objects in terms of continuous dimensions instead of in an *either–or* fashion (Ding, 2018); therefore, the groups of students with disabilities in this perceptual space are viewed as being likely to possess more of one attribute than the other (i.e., more likely to experience mental health disorders), rather than having that attribute or not (Ding, 2018). As a result, participants were likely to perceive the groups locating more toward right side on this space as being more likely to experience a mental health disorder compared to the groups locating more toward left side on this space. Likewise, participants were more likely to perceive groups positioned toward the lower side on this space as living with a disability compared to the groups locating more toward upper side on this space.

The perceived dangerousness was added to generate an MDS biplot. This added external variable was represented by the projection of the vector as shown in Fig. 1. It should be noted that in the MDS biplot we only interpret the direction of the projected vector (i.e., the added external variable) pointing toward and the objects (i.e., the groups of disabilities) on the vector's direction,

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not the distance between an object on the space and the vector (Borg & Groenen, 2005). In other words, while the groups of disabilities were positioned on the MDS perceptual space according to the participants' ratings on social distance, the vector indicates how the ratings on perceived dangerousness relate to the ratings on social distance.

Building on this guideline, the vector on the right side on the space represents *perceived dangerousness* and points slightly toward upper-right direction ($R^2 = .93$), indicating that participants perceived higher level of dangerousness from the groups who were positioned in this direction, including those living with SUD ($\beta = 2.23$), major depression ($\beta = 1.50$), anxiety disorder ($\beta = 0.46$), and ASD ($\beta = 0.11$), as compared to the groups who were positioned at the opposite direction of dangerousness vector.

5.3 Hierarchical cluster analysis

The HCA was conducted to clarify the clustering of the different groups of disabilities. Based on the scree plot for HCA, the result indicated that the groups of disabilities can be clustered into three clusters: (a) cluster A is composed of groups living with SUD and depression; (b) cluster B is composed of groups living with ASD, anxiety disorder, cerebral palsy, hearing impairment, learning disability, visual impairment, and SCI; (c) cluster C is composed of groups who were transfer student, cancer survivor, and from a single-parent family. Participants rated cluster A as having the highest level of social distance, followed by clusters B and C (see Table 2). This pattern is similar to the result from the ratings on perceived dangerousness, in which cluster A received the highest ratings on perceived dangerousness, followed by clusters B and C.

6. Discussion

This study aimed at expanding the understanding of attitudes toward 10 specific groups of individuals with disabilities among students in college settings while taking into consideration methodological limitations from the previous studies. Our findings, as shown on the MDS perceptual space, indicated that the participants were likely to perceive the groups living with SCI, visual impairment, learning disability, cerebral palsy, hearing impairment, ASD, anxiety disorder, and depression as living with disabilities. These groups of individuals typically were considered living with disabilities by general public. However, it was surprising that the participants were less likely to perceive individuals who were cancer survivors or individuals who were living with SUD as living with disabilities.

Research has indicated that individuals living with SUD often are viewed to be dangerous and treated as a moral and criminal issue instead of a health concern and that this population also has been considered to have personal control over their behaviors (Livingston, Milne, Fang & Amari, 2012; Phelan & Basow, 2007; Radcliffe & Stevens, 2008; Room, 2005). This may help explain why our participants were less likely to perceive individuals living with SUD as living with disabilities. In addition, our participants were less likely to view individuals who were cancer survivors as living with disabilities. One possible explanation is that since the term "cancer survivor" was used in the survey, participants might assume that those who were cancer survivors already recovered from cancer due to the term "survivor." This assumption might further imply that individuals who were cancer survivors might have less functional limitations within the context of college settings (i.e., making friends or starting a collaborative project) because they already recovered from cancer. Further, mobility and communication were essential components for participating in academic-related activities. As compared to groups who were cancer survivors, those living with SCI, visual impairment, learning disability, cerebral palsy, hearing impairment, ASD, anxiety disorder, and depression were more likely to experience issues concerning communication, mobility, or other functional limitations. Participants might, therefore, consider that cancer survivors have less functional limitations within the context of college settings and were less likely to perceive this group as living with disabilities.

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Participants, on the other hand, were more likely to perceive the groups living with SUD, depression, and anxiety disorder as being likely to experience a mental health disorder, while the remaining groups were perceived as being less likely to experience a mental health disorder. Noteworthily, the group living with ASD was positioned slightly toward to the right side. This may imply that our participants considered that their peers living with ASD were somewhat likely to experience mental health concerns. This explanation is plausible since experiences in anxiety and depression have been frequently reported by individuals living with ASD in college settings (Gelbar, Smith & Reichow, 2014).

6.1 Perceived dangerousness in the MDS biplot

The MDS biplot provided additional insights into the relationship between the MDS perceptual space and perceived dangerousness. The findings indicated that participants were likely to perceive dangerousness from the groups living with SUD, depression, anxiety disorder, and ASD.

Criminal issues among individuals living with SUD have been one of the major contributors to negative attitudes toward this population (Ahern, Stuber & Galea, 2007). Research has shown that substance misuse is associated with increased perpetration of physically violent behaviors, property offences, and increased family violence (Choenni, Hammink & van de Mheen, 2017; Heerde & Hemphill, 2015; Margolin, Ramos, Baucom, Bennett & Guran, 2013). Although our findings provide additional support for previous studies (Mannarini & Boffo, 2015; Schomerus et al., 2010) suggesting a relationship between perceived dangerousness and SUD, research has shown that substance abuse might not causally lead to violence but might be due to involvement of other mental health issues (Choenni et al., 2017; Van Dorn et al., 2012). Besides, depression and anxiety disorder have been found to be associated with self-harming behavior (Chartrand et al., 2012; Raza et al., 2018). Our findings are also consistent with previous findings (Peluso & Blay, 2009). This may help explain why the groups living with depression or anxiety disorder were positioned in the direction of dangerousness vector.

It is important to note that the group living with ASD also was positioned on the dangerousness vector despite the fact that this group was positioned very close to the opposite direction of the dangerousness vector. This finding also provides additional support for the previous study indicating that college students exhibited high level of social distance (i.e., negative attitudes) toward individuals living with ASD (Huskin et al., 2018). However, the literature (White, Meloy, Mohandie & Kienlen, 2017) has shown that popular media have generated a concern regarding violent behaviors in individuals living with ASD even though no empirical studies support the causality between ASD and violent behaviors; instead the violent behaviors might result from undetected or untreated mental health issues (Del Pozzo, Roche & Silverstein, 2018). These findings may also suggest that participants may possess insufficient or inaccurate knowledge of ASD and in turn leads to perception of dangerousness.

6.2 The clusters resulted from HCA

The patterns grouping the individuals with disabilities into three clusters were consistent with the positions where all the groups of individuals with disabilities located on the MDS perceptual space. The result from HCA also indicated that participants rated cluster A as having the highest level of social distance, followed by clusters B and C. It should be noted that cluster B is composed of groups living with ASD, anxiety disorder, cerebral palsy, hearing impairment, learning disability, visual impairment, and SCI. These groups are likely to exhibit functional limitations in terms of communication and mobility as compared to cluster A (individuals living with SUD and individuals with depressions) and C (individuals who were transfer student, individuals who were cancer survivors, and individuals who were from a single-parent family).

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The MDS perceptual space was configured based on the SDS, and the behaviors (or activities) described in the SDS involve a certain level of communication and mobility, such as spending an evening socializing with peers from these groups, starting a collaborative project with peers from these groups, and making friends with peers from these groups. Communication and mobility are essential abilities needed in college life. Those groups in cluster B may have higher likelihood requesting academic accommodations (Berk, 2013; Mash & Wolfe, 2016; Wicks-Nelson & Israel, 2013), and therefore, our participants may perceive those groups in cluster B share more similarity with each other as compared to those groups in cluster A and C. Further, while participants exhibited positive attitudes toward cluster B, the group living with ASD in cluster B was rated as having the highest level of social distance compared to other groups in cluster B, supporting the finding from the previous study (Huskin et al., 2018) indicating that college students expressed negative attitudes toward ASD relative to other disability groups.

6.3 Implications

The findings from this study have significant implications for educators involved in training individuals who will likely work with clients with disabilities. Approximately two-thirds (65.22%) of our participants reported receiving disability-related training; however, it was unclear to what extent topics concerning mental health disorders (e.g., SUD, depression, and anxiety) as well as ASD were addressed in disability-related training. It is relevant for rehabilitation counselor educators to review disability-related educational programming for providing sufficient accurate information related to these specific groups of individuals with disabilities. On the other hand, findings from this study also suggest the need for educational programs at the university level to increase awareness and understanding for the group of individuals with disabilities who require higher levels of awareness from their peers without disabilities due to misunderstanding of the disabilities. Increased disability awareness may enhance students' accurate understanding of their peers with disabilities and promote inclusion in college settings. Research has shown that inclusion is beneficial to students academically and socially, including those with disabilities, and that inclusive practices enable students without disabilities to develop empathy and skills necessary to support their peers with disabilities (Causton-Theoharis & Theoharis, 2008; Peck, Staub, Gallucci & Schwartz, 2004).

Our findings also highlight the need for future research in this area. Future research should consider examining academic training programs at the university level to determine how the concept of disability awareness is addressed. We also encourage researchers to consider probing attitudes toward disabilities among faculties and administrative staffs with contextualizing attitude measurement and involvement of multiple types of disability groups.

6.4 Limitations

Several limitations should be considered when interpreting the results of the study. First, the generalizability of the findings is restricted due to the use of an online survey format and a non-random convenience sample, which was made up with a majority of female participants. Second, the use of self-report measurements might have negative impact on data quality as self-report measurements could be vulnerable to social desirability bias (Krumpal, 2013). Third, a descriptive design was utilized in this study; therefore, no statistical inference could be made. Fourth, despite the fact that our participants reported prior contact experiences in interacting with individuals with disabilities, the quality of contact experiences remains unclear and this could potentially exert impact on attitudes toward disabilities. In addition, individuals may exhibit attitudes toward disabilities differently because of different causes of disabilities (Chan et al., 2009). For example, individuals may exhibit fewer negative attitudes toward congenital disabilities (e.g., cerebral palsy) than acquired disabilities (e.g., alcohol or drug misuse). This study

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did not control for the potentially confounding impact of perception of disability causes on attitudes toward disabilities; therefore, the results should be interpreted with caution. Lastly, since this study did not adopt a counterbalance approach to present disability groups in the survey, the presentation of disability groups in the survey and the length of the survey may potentially influence the results due to rank-order effects (McFarland, 1981) and fatigue effects (Bradley & Daly, 1994).

7. Conclusion

Negative attitudes toward disabilities among students in college settings have led to challenges to college adjustment and participation for students with disabilities. While research in this area has been documented in the literature, a majority of the extant studies either have failed to contextualize attitude measurements or have failed to take into account the hierarchy of attitudes toward disabilities. This study was to fill this gap by investigating attitudes toward 10 specific groups of individuals with disabilities specifically among students in college settings. This study revealed that participants perceived the groups locating more toward right side on the MDS space as being more likely to experience mental health concerns compared to the groups locating more toward left side on this space and that participants were more likely to perceive the groups locating more toward lower side on this space as living with disabilities compared to the groups locating more toward upper side on this space. The MDS biplot further indicated that participants perceived higher levels of dangerousness from the groups living with SUD, major depression, anxiety disorder, and ASD. The HCA also clarified that the participants grouped the disabilities into three clusters. In brief, participants were "mostly" willing to move to next door to, spend an evening socializing with, start a collaborative project with, and make friends with those in cluster C (individuals who were transfer student, individuals who were cancer survivors, and individuals who were from a single-parent family) but were "somewhat" willing to perform the same behaviors with those in cluster A (SUD and depression). This study enhances our understanding of attitudes toward disabilities specifically among students in college settings. It is recommended that rehabilitation researchers need to take into account the hierarchy of attitudes toward specific groups of individuals with disabilities and contextualize attitude measurements when investigating attitudes toward disabilities. It is also urged to develop strategies that target on specific groups of individuals with disabilities (i.e., SUD, depression, anxiety disorder, and ASD) to increase disability awareness in college settings.

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References

Ahern, J., Stuber, J., & Galea, S. (2007). Stigma, discrimination and the health of illicit drug users. *Drug & Alcohol Dependence*, **88**(2), 188–196.

Ahlborn, L. J., Panek, P. E., & Jungers, M. K. (2008). College students' perceptions of persons with intellectual disability at three different ages. *Research in Developmental Disabilities*, **29**(1), 61–69.

Amarasuriya, S. D., Jorm, A. F., Reavley, N. J., & Mackinnon, A. J. (2015). Stigmatising attitudes of undergraduates towards their peers with depression: a cross-sectional study in Sri Lanka. *BMC Psychiatry*, **15**:129. 1–13.

Anderson, K. N., Jeon, A. B., Blenner, J. A., Wiener, R. L., & Hope, D. A. (2015). How people evaluate others with social anxiety disorder: A comparison to depression and general mental illness stigma. *American Journal of Orthopsychiatry*, **85**(2), 131–138.

https://doi.org/10.1017/jrc.2019.10 Published online by Cambridge University Press

Archer, J. Jr., & Cooper, S. (1998). *Counseling and mental health services on campus: A handbook of contemporary practices and challenges*. San Francisco, CA: Jossey-Bass.

Banks, J. (in press). Are we ready: Faculty perceptions of postsecondary students with learning disabilities at a historically Black University. *Journal of Diversity in Higher Education*. Advance online publication. doi: 10.1037/dhe0000100

Bean, K. F., & Hedgpeth, J. (2014). The effect of social work education and self-esteem on students' social discrimination of people with disabilities. *Social Work Education*, **33**(1), 49–60.

Berk, L. (2013). *Child development* (9th ed.). Boston, MA: Allyn & Bacon.

Bogardus, E. S. (1933). A social distance scale. *Sociology & Social Research*, **17**, 265–271.

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.

Borg, I., & Groenen, P. J. F. (2005). *Modern multidimensional scaling: Theory and applications* (2nd ed.). New York, NY: Springer Science.

Botha, F. B., Shamblaw, A. L., & Dozois, D. J. (2017). Reducing the stigma of depression among Asian students: A social norm approach. *Journal of Cross-Cultural Psychology*, **48**(1), 113–131.

Bradley, M., & Daly, A. (1994). Use of the logit scaling approach to test for rank-order and fatigue effects in stated preference data. *Transportation*, **21**(2), 167–184.

Breen, J. S. (2018). Attitudes toward employees with disabilities: A systematic review of self-report measures. *The Australian Journal of Rehabilitation Counselling*, **24**(2), 67–87.

Cardoso, E., Phillips, B. N., Thompson, K., Ruiz, D., Tansey, T. N., & Chan, F. (2016). Experiences of minority college students with disabilities in STEM. *Journal of Postsecondary Education and Disability*, **29**(4), 375–388.

Causton-Theoharis, J., & Theoharis, G. (2008). Creating inclusive schools for all students. *School Administrator*, **65**(8), 24–25.

Chan, F., Livneh, H., Pruett, S., Wang, C. C., & Zheng, L. X. (2009). Societal attitudes toward disability: Concepts, measurements, and interventions. In F. Chan, E. Da Silva Cardoso, & J. A. Chronister (Eds.), *Understanding psychosocial adjustment to chronic illness and disability: A handbook for evidence-based practitioners in rehabilitation* (pp. 333–367). New York, NY: Springer.

Charrad, M., Ghazzali, N., Boiteau, V., Niknafs, A., & Charrad, M. M. (2014). Package 'NbClust'. *Journal of Statistical Software*, **61**, 1–36.

Chartrand, H., Sareen, J., Toews, M., & Bolton, J. M. (2012). Suicide attempts versus nonsuicidal self-injury among individuals with anxiety disorders in a nationally representative sample. *Depress Anxiety*, **29**(3), 172–179. doi: 10.1002/da.20882

Choenni, V., Hammink, A., & van de Mheen, D. (2017). Association between substance use and the perpetration of family violence in industrialized countries: A systematic review. *Trauma, Violence, & Abuse*, **18**(1), 37–50.

Cox, T. F., & Cox, M. A. A. (2001). *Multidimensional scaling* (2nd ed.). Boca Raton, Florida: Chapman & Hall/CRC.

Culp, A. G., Rojas-Guyler, L., Vidourek, R. A., & King, K. A. (2017). College students' self-efficacy, knowledge, and attitudes about disability. *American Journal of Health Studies*, **32**(1), 48–59.

Del Pozzo, J., Roché, M. W., & Silverstein, S. M. (2018). Violent behavior in autism spectrum disorders: Who's at risk? *Aggression and Violent Behavior*, **39**, 53–60.

Ding, C. S. (2018). *Fundamentals of applied multidimensional scaling for educational and psychological research* (1st ed.). Cham, Switzerland: Springer.

Dodd, J. M., Hermanson, M., Landstrom, B., Nelson, J. R., & Rose, P. M. (1991). Tribal college student attitudes toward accommodations for students with learning Disabilities. *Tribal College*, **3**(1), 22–26.

Eagly, A. H., Mladinic, A., & Otto, S. (1994). Cognitive and affective bases of attitudes toward social groups and social policies. *Journal of Experimental Social Psychology*, **30**(2), 113–137.

Emerton, R. G., & Rothman, G. (1978). Attitudes towards deafness: Hearing students at a hearing and deaf college. *American Annals of the Deaf*, **123**(5), 588–593.

Engle, J. (2007). Postsecondary access and success for first-generation college students. *American Academic*, **3**, 25–48.

Ethington, P. J. (1997). *The intellectual construction of "Social Distance": Toward a recovery of Georg Simmel's social geometry*. Cybergeo: European Journal of Geography.

Fichten, C. S., Tagalakis, V., & Amsel, R. (1989). Effects of cognitive modeling, affect, and contact on attitudes, thoughts, and feelings toward college students with physical disabilities. *Journal of the Multihandicapped Person*, **2**(2), 119–137.

Fleming, A. R., Oertle, K. M., Plotner, A. J., & Hakun, J. G. (2017). Influence of social factors on student satisfaction among college students with disabilities. *Journal of College Student Development*, **58**(2), 215–228.

Fox-Wasylyshyn, S. M., & El-Masri, M. M. (2005). Handling missing data in self-report measures. *Research in Nursing & Health*, **28**, 488–495.

Freed, E. X. (1964). Opinions of psychiatric hospital personnel and college students toward alcoholism, mental illness, and physical disability: An exploratory study. *Psychological Reports*, **15**(2), 615–618.

Gelbar, N. W., Smith, I., & Reichow, B. (2014). Systematic review of articles describing experience and supports of individuals with autism enrolled in college and university programs. *Journal of Autism and Developmental Disorders*, **44**(10), 2593–2601.

https://doi.org/10.1017/jrc.2019.10 Published online by Cambridge University Press

Gibbons, M. M., Cihak, D. F., Mynatt, B., & Wilhoit, B. E. (2015). Faculty and student attitudes toward postsecondary education for students with intellectual disabilities and autism. *Journal of Postsecondary Education and Disability*, **28**(2), 149–162.

Gillespie-Lynch, K., Brooks, P. J., Someki, F., Obeid, R., Shane-Simpson, C., Kapp, S. K., … Smith, D. S. (2015). Changing college students' conceptions of autism: An online training to increase knowledge and decrease stigma. *Journal of Autism and Developmental Disorders*, **45**(8), 2553–2566

Granello, D. H., & Granello, P. F. (2000). Defining mental illness: The relationship between college students' beliefs about the definition of mental illness and tolerance. *Journal of College Counseling*, **3**(2), 100–112.

Green, S. E. (2007). Components of perceived stigma and perceptions of well-being among university students with and without disability experience. *Health Sociology Review*, **16**(3–4), 328–340.

Greenacre, M. (2010). *Biplots in practice*. Bilbao, Spain: Fundacion BBVA.

Griffin, M. M., Summer, A. H., McMillan, E. D., Day, T. L., & Hodapp, R. M. (2012). Attitudes toward including students with intellectual disabilities at college. *Journal of Policy and Practice in Intellectual Disabilities*, **9**(4), 234–239.

Gupta, A., & Bonnell, P. (1993). Opinions about mental illness among college students. *Journal of Personality and Clinical Studies*, **9**(1–2), 63–68.

Haney, M. R., & Fisher, K. (2017). Student attitudes and perceptions about postsecondary education for people with intellectual disabilities (practice brief). *Journal of Postsecondary Education and Disability*, **30**(1), 97–104.

Heerde, J. A., & Hemphill, S. A. (2015). Is substance use associated with perpetration and victimization of physically violent behavior and property offences among homeless youth? A systematic review of international studies. *Child Youth Care Forum*, **44**(2), 277–307.

Hergenrather, K., & Rhodes, S. (2007). Exploring undergraduate student attitudes toward persons with disabilities: Application of the disability social relationship scale. *Rehabilitation Counseling Bulletin*, **50**(2), 66–75.

Hout, M. C., Papesh, M. H., & Goldinger, S. D. (2013). Multidimensional scaling. *Wiley Interdisciplinary Reviews: Cognitive Science*, **4**(1), 93–103.

Hunt, J., & Eisenberg, D. (2010). Mental health problems and help-seeking behavior among college students. *Journal of Adolescent Health*, **46**(1), 3–10.

Huskin, P. R., Reiser-Robbins, C., & Kwon, S. (2018). Attitudes of undergraduate students toward persons with disabilities: Exploring effects of contact experience on social distance across ten disability types. *Rehabilitation Counseling Bulletin*, **62**(1), 53–63.

Ionta, J. R., & Scherman, C. D. (2007). An examination of college students' perceptions of people diagnosed with mental illness. *College of St. Elizabeth Journal of the Behavioral Sciences*, **1**, 1–10.

Jaworska, N., & Chupetlovska-Anastasova, A. (2009). A review of multidimensional scaling (MDS) and its utility in various psychological domains. *Tutorials in Quantitative Methods for Psychology*, **5**(1), 1–10.

Kadison, R., & DiGeronimo, T. F. (2004). *College of the overwhelmed: The campus mental health crisis and what to do about it*. San Francisco, CA: Jossey-Bass.

Kowalska, J., & Winnicka, J. (2013). Attitudes of undergraduate students towards persons with disabilities: The role of the need for social approval. *Polish Psychological Bulletin*, **44**, 40–49.

Krumpal, I. (2013). Determinants of social desirability bias in sensitive survey: A literature review. *Quality & Quantity*, **47**(4), 2025–2047.

Kruskal, J. B. (1964). Multidimensional scaling by optimizing goodness of fit to a nonmetric hypothesis. *Psychometrika*, **29**(1), 1–27.

Lebart, L., Morineau, A., & Piron, M. (2000). *Statistique exploratoire multidimensionnelle*. Paris: Dunod.

Leyser, Y., & Romi, S. (2008). Religion and attitudes of college preservice teachers toward students with disabilities: Implications for higher education. *Higher Education*, **55**(6), 703–717.

Li, C., Tsoi, E. W., & Wang, J. C. (2012). Chinese college students' attitudes toward people with intellectual disabilities: Differences by study major, gender, contact, and knowledge. *International Journal of Developmental Disabilities*, **58**(3), 137–144.

Livingston, J. D., Milne, T., Fang, M. L., & Amari, E. (2012). The effectiveness of interventions for reducing stigma related to substance use disorders: A systematic review. *Addiction*, **107**(1), 39–50.

Mannarini, S., & Boffo, M. (2015). Anxiety, bulimia, drug and alcohol addiction, depression, and schizophrenia: what do you think about their aetiology, dangerousness, social distance, and treatment? A latent class analysis approach. *Social Psychiatry and Psychiatric Epidemiology*, **50**(1), 27–37.

Margolin, G., Ramos, M. C., Baucom, B. R., Bennett, D. C., & Guran, E. L. (2013). Substance use, aggression perpetration, and victimization: Temporal co-occurrence in college males and females. *Journal of Interpersonal Violence*, **28**(14), 2849–2872.

Martin, H. L., Rowell, M. M., Reid, S. M., Marks, M. K., & Reddihough, D. S. (2005). Cerebral palsy: what do medical students know and believe? *Journal of Paediatrics and Child Health*, **41**(1–2), 43–47.

Martin, J. K., Pescosolido, B. A., & Tuch, S. A. (2000). Of fear and loathing: The role of "disturbing behavior", labels, and causal attributions in shaping public attitudes toward people with mental illness. *Journal of Health and Social Behavior*, **41**, 208–223.

https://doi.org/10.1017/jrc.2019.10 Published online by Cambridge University Press

Mash, E., & Wolfe, D. (2016). *Abnormal child psychology*. Boston, MA: Cengage Learning.

Matthews, N. L., Ly, A. R., & Goldberg, W. A. (2015). College students' perceptions of peers with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, **45**(1), 90–99.

Matthews, P. R., Anderson, D. W., & Skolnick, B. D. (1987). Faculty attitude toward accommodations for college students with learning disabilities. *Learning Disabilities Focus*, **3**(1), 46–52.

McFarland, S. G. (1981). Effects of question order on survey responses. *Public Opinion Quarterly*, **45**(2), 208–215.

Nevill, R. E., & White, S. W. (2011). College students' openness toward autism spectrum disorders: Improving peer acceptance. *Journal of Autism and Developmental Disorders*, **41**(12), 1619–1628.

Newman, L., Wagner, M., Knokey, A. M., Marder, C., Nagle, K., Shaver, D., ... **Schwarting, M.** (2011). *The post-high school outcomes of young adults with disabilities up to 8 years after high school: A report from the National Longitudinal Transition Study-2 (NLTS-2)* (NCSER 2011-3005). Menlo Park, CA: SRI International.

Obeid, R., Daou, N., DeNigris, D., Shane-Simpson, C., Brooks, P. J., & Gillespie-Lynch, K. (2015). A cross-cultural comparison of knowledge and stigma associated with autism spectrum disorder among college students in Lebanon and the United States. *Journal of Autism and Developmental Disorders*, **45**(11), 3520–3536.

O'Neill, J., Kang, H.-J., Aldrich, H., Pfaller, J., Chan, F., Saánchez, J., & Muller, V. (2015). Effect of college or university training on earnings of people with disabilities: A case control study. *Journal of Vocational Rehabilitation*, **43**, 93–102.

Ouellette-Kuntz, H., Burge, P., Brown, H. K., & Arsenault, E. (2010). Public attitudes towards individuals with intellectual disabilities as measured by the concept of social distance. *Journal of Applied Research in Intellectual Disabilities*, **23**, 132–142.

Palmer, G. A., Redinius, P. L., & Tervo, R. C. (2000). An examination of attitudes toward disabilities among college students: Rural and urban differences. *Journal of Rural Community Psychology*, **E3**(1), 2000.

Peck, C. A., Staub, D., Gallucci, C., & Schwartz, I. (2004). Parent perception of the impacts of inclusion on their nondisabled child. *Research and Practice for Persons with Severe Disabilities*, **29**(2), 135–143. doi: 10.2511/rpsd.29.2.135

Peluso, É. D. T. P., & Blay, S. L. (2009). Public stigma in relation to individuals with depression. *Journal of Affective Disorders*, **115**(1–2), 201–206.

Perlick, D. A., Rosenheck, R. A., Clarkin, J. F., Sirey, J. A., Salahi, J., Struening, E. L., & Link, B. G. (2001). Stigma as a barrier to recovery: Adverse effects of perceived stigma on social adaptation of persons diagnosed with bipolar affective disorder. *Psychiatric Services*, **52**(12), 1627–1632.

Phelan, J. E., & Basow, S. A. (2007). College students' attitudes toward mental illness: An examination of the stigma process. *Journal of Applied Social Psychology*, **37**(12), 2877–2902.

Polo Sánchez, M. T., Fernández-Jiménez, C., & Fernández-Cabezas, M. (2018). The attitudes of different partners involved in higher education towards students with disabilities. *International Journal of Disability, Development and Education*, **65**(4), 442–458.

Radcliffe, P., & Stevens, A. (2008). Are drug treatment services only for 'thieving junkie scumbags'? Drug users and the management of stigmatised identities. *Social Science & Medicine*, **67**(7), 1065–1073.

Raza, A., Abbasi, N., Khurshid, M., Ansari, M. (2018). The relationship between depression, anxiety, stress and self harm among college students: A cross-sectional survey. *Pakistan Armed Forces Medical Journal*, **68**(1), 137–142.

Rodgers, L. S., & Tennison, L. R. (2009). A preliminary assessment of adjustment disorder among first-year college students. *Archives of Psychiatric Nursing*, **23**(3), 220–230.

Room, R. (2005). Stigma, social inequality and alcohol and drug use. *Drug and Alcohol Review*, **24**(2), 143–155.

Sanders, K. S., & DuBois, D. L. (1996). Individual and socio-environmental predictors of adjustment to college among students with disabilities. *Journal of Postsecondary Education and Disability*, **12**(2), 28–43.

Sarno, J. F., Jr., & Colpoys, B. P. (1967). Attitudes of college students toward selected children's handicaps. *Child Study Center Bulletin*, **3**(3), 74–77.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, **7**(2), 147–177.

Schmelkin, L. P. (1984). Hierarchy of preferences toward disabled groups: A reanalysis. *Perceptual and Motor Skills*, **59**(1), 151–157.

Schnittker, J. (2000). Gender and reactions to psychological problems: An examination of social tolerance and perceived dangerousness. *Journal of Health and Social Behavior*, **41**, 224–240.

Schomerus, G., Lucht, M., Holzinger, A., Matschinger, H., Carta, M. G., & Angermeyer, M. C. (2010). The stigma of alcohol dependence compared with other mental disorders: a review of population studies. *Alcohol and Alcoholism*, **46**(2), 105–112.

Seo, W. S., & Chen, R. K. (2009). Attitudes of college students toward people with. *Journal of Applied Rehabilitation Counseling*, **40**(4), 3–8.

Struening, E., & Cohen, J. (1963). Factorial invariance and other psychometric characteristics of five opinions about mental illness factors. *Educational and Psychological Measurement*, **23**, 209–290.

Sun, M., Pu, W., Wang, Z., Hu, A., Yang, J., Chen, X., ... **Rosenheck, R.** (2013). Investigation on the influence of a didactic course in psychiatry on attitudes of mental illness in Chinese college students. *Asia-Pacific Psychiatry*, **5**(3), 147–151.

https://doi.org/10.1017/jrc.2019.10 Published online by Cambridge University Press

Suthakaran, V., Wright, S., Simpson, E., Marra, M., & Sonner, D. (2011). The impact of information-processing styles on college students' attitudes toward people with disabilities. *Journal of Applied Rehabilitation Counseling*, **42**(4), 19–26.

Tansey, T. N., Smedema, S., Umucu, E., Iwanaga, K., Wu, J. R., Cardoso, E. D. S., & Strauser, D. (2018). Assessing college life adjustment of students with disabilities: application of the PERMA framework. *Rehabilitation Counseling Bulletin*, **61**(3), 131–142.

Torgerson, W. S. (1958). *Theory and methods of scaling*. New York, NY: John Wiley & Sons.

Tringo, J. L. (1970). The hierarchy of preference toward disability groups. *The Journal of Special Education*, **4**(3), 295–306.

Upton, T. D., Harper, D. C., & Wadsworth, J. (2005). Postsecondary attitudes toward persons with disabilities: A comparison of college students with and without disabilities. *Journal of Applied Rehabilitation Counseling*, **36**(3), 24–31.

Vaccaro, A., Daly-Cano, M., & Newman, B. M. (2015). A sense of belonging among college students with disabilities: An emergent theoretical model. *Journal of College Student Development*, **56**(7), 670–686.

Van Buuren, S. (2012). *Flexible imputation of missing data*. London, UK: Chapman and Hall/CRC.

Van Dorn, R., Volavka, J., & Johnson, N. (2012). Mental disorder and violence: Is there a relationship beyond substance use? *Social Psychiatry and Psychiatric Epidemiology*, **47**(3), 487–503.

Vankar, J. R., Prabhakaran, A., & Sharma, H. (2014). Depression and stigma in medical students at a private medical college. *Indian Journal of Psychological Medicine*, **36**(3), 246–254.

Vogel, S. A., Leyser, Y., Wyland, S., & Brulle, A. (1999). Students with learning disabilities in higher education: Faculty attitude and practices. *Learning Disabilities Research & Practice*, **14**(3), 173–186.

Vyavaharkar, M., Moneyham, L., Corwin, S., Saunders, R., Annang, L., & Tavakoli, A. (2010). Relationships between stigma, social support, and depression in HIV-infected African American women living in the rural Southeastern United States. *Journal of the Association of Nurses in AIDS Care*, **21**(2), 144–152.

Wagner, A. K., & Stewart, P. J. (2001). An internship for college students in physical medicine and rehabilitation: Effects on awareness, career choice, and disability perceptions. *American Journal of Physical Medicine & Rehabilitation*, **80**(6), 459–465.

Wagner, M., Newman, L., Cameto, R., Garza, N., & Levine, P. (2005). *After high school: A first look at the postschool experiences of youth with disabilities. A report from the National Longitudinal Transition Study-2 (NLTS-2)*. Menlo Park, CA: SRI International.

Wegner, T. M. (2017). Students with learning disabilities' perceptions of self-determining factors contributing to college success. *International Journal of Adult Vocational Education and Technology (IJAVET)*, **8**(3), 1–13.

White, S. G., Meloy, J. R., Mohandie, K., & Kienlen, K. (2017). Autism spectrum disorder and violence: Threat assessment issues. *Journal of Threat Assessment and Management*, **4**(3), 144–163.

Wicks-Nelson, R., & Israel, A. (2013). *Abnormal child and adolescent psychology* (8th ed.). Upper Saddle River, NJ: Pearson Education.

Wright, B. A. (1988). Attitudes and the fundamental negative bias: Conditions and corrections. In H. E. Yuker (Ed.), *Attitudes toward people with disabilities* (pp. 3–21). New York, NY: Springer.

Youssef, F. F., Bachew, R., Bodie, D., Leach, R., Morris, K., & Sherma, G. (2014). Knowledge and attitudes towards mental illness among college students: Insights into the wider English-speaking Caribbean population. *International Journal of Social Psychiatry*, **60**(1), 47–54.

Yuker, H. E., & Block, J. R. (1986). *Research with the Attitudes Toward Disabled People Scale (ATDP)*. Hempstead, NY: Center for the Study of Attitudes Toward Person with Disabilities, Hofstra University.

Yuker, H. E., Block, J., & Young, J. (1970). *The measurement of attitudes toward disabled persons*. Albertson, NY: Human Resources Center.

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