

Sarah Lawrence College

DigitalCommons@SarahLawrence

Human Genetics Theses

The Joan H. Marks Graduate Program in
Human Genetics

5-2019

Disability Service Learning: A Study on the Potential Impact of an Educational Intervention on the Attitudes and Biases of Genetic Counseling Students Toward Disability

Michelle Bina
Sarah Lawrence College

Lucas Hollifield
Sarah Lawrence College

Follow this and additional works at: https://digitalcommons.sl.c.edu/genetics_etd



Part of the [Genetics Commons](#), and the [Other Genetics and Genomics Commons](#)

Recommended Citation

Bina, Michelle and Hollifield, Lucas, "Disability Service Learning: A Study on the Potential Impact of an Educational Intervention on the Attitudes and Biases of Genetic Counseling Students Toward Disability" (2019). *Human Genetics Theses*. 62.

https://digitalcommons.sl.c.edu/genetics_etd/62

This Thesis - Open Access is brought to you for free and open access by the The Joan H. Marks Graduate Program in Human Genetics at DigitalCommons@SarahLawrence. It has been accepted for inclusion in Human Genetics Theses by an authorized administrator of DigitalCommons@SarahLawrence. For more information, please contact alester@sarahlawrence.edu.

**Disability Service Learning: A Study on the Potential Impact of an Educational
Intervention on the Attitudes and Biases of Genetic Counseling Students Toward Disability**

Bina, Michelle¹; Hollifield, Lucas¹

Submitted in partial completion of the Master of Science Degree at Sarah Lawrence College, May 2019

¹ Joan H. Marks Graduate Program in Human Genetics, Sarah Lawrence College, Bronxville, New York

ABSTRACT

Disability and how it is perceived and discussed has deep relevance to the practice of genetic counseling. Disability communities have expressed concerns with genetic counseling and the dissemination of misinformation surrounding disability, leading to discrimination and intolerance of diversity (Parens & Asch, 2003). In 2015, the Joan H. Marks Graduate Program in Human Genetics (JHMGPHG) at Sarah Lawrence College implemented coursework and internships for students in order to address these concerns under the educational intervention titled Disability Service Learning (DSL).

This study aims to determine what impact this educational intervention has on the Sarah Lawrence genetic counseling students' attitudes and comfort level towards individuals with disabilities. Biases toward and comfort with individuals with disabilities can be assessed through the Attitudes to Disability Scale (ADS) (Power et al., 2010) and Interaction with Disabled Persons Scale (IDPS) (Gething & Wheeler, 1992). These scales, along with a short questionnaire designed to determine the students' level of knowledge and comfort with individuals with disabilities, were administered on the first and last day of the course to SLC students as well as in September and December of 2018 to students in other genetic counseling training programs.

Analysis of students' surveys showed that students who received the educational intervention experienced a significantly higher increase in comfort level with disabilities, and students who began DSL with little knowledge and comfort with disability showed the most increase in comfort level. Attitudes toward disability did not show a significant change as a result of DSL, warranting further study and honing of the educational intervention.

KEY WORDS: disability; service learning; educational intervention; genetic counseling; students

INTRODUCTION

Genetic counseling finds itself in the unusual position of advocating socially, economically, and emotionally for individuals with disabilities while at the same time offering access to information and services that help families avoid having future children with genetic conditions. This dichotomy between these two roles has caused friction between the disability community and the genetic counseling profession. The disability community has brought forward several concerns over the years, including the lack of a balanced portrayal of disability during preconception and prenatal genetic counseling sessions, increased support of reproductive rights, lack of recognition for disability organizations from large genetic counseling organizations, and the wide interpretations of nondirectiveness by genetic counselors (Madeo et al., 2010; Hodgson and Weil, 2011). Positively shifting attitudes and comfort level with the disability community is crucial to begin to bridge the rift between the two groups. Disability advocates contend that exposure to individuals with disabilities outside of a medical setting is an effective way to increase comfort during interactions and improve the understanding of life with a disability (Saxton, 1996; Patterson and Satz, 2002).

In a 2012 review of 22 studies examining the attitudes of medical students and health professionals toward physical disability, Snatchidanand et al. found that views were generally favorable, however they varied across gender of the provider, previous experience with individuals with disability, age and race/ethnicity of the provider, and the provider's rank. Female students and providers, after accounting for rank and profession, had significantly more positive attitudes towards people with disabilities. There was also a strong correlation between increased exposure to individuals with disabilities and increased positive attitudes. Additionally, the review identified several methods of exposure to individuals with disability provided to

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

healthcare students, including disability trainings, professional interactions, or casual interactions (Snatchidanand et al., 2012). By understanding the factors that shift attitudes more positively, educators are better able to target curriculum in order to change the mindset of future medical professionals as they move through healthcare training programs and forward into their profession.

In 2013, the Accreditation Council for Genetic Counseling (ACGC) training standards incorporated “disability awareness” into the genetic counseling training curriculum under the general area of psychosocial content. The Practice Based Competencies for Genetic Counselors directly references disability as an “aspect of culture” that may impact a genetic counseling encounter (ACGC, 2013). Disability is indirectly referenced as genetic counselors are expected to “recognize the importance of understanding the lived experiences of people with various genetic/genomic conditions” and to “present balanced descriptions of lived experiences of people with various conditions” (ACGC, 2015). ACGC does not define “disability awareness” or outline how the competencies should be achieved. The vagueness of this language has led to varied interpretations among genetic counseling training programs (Teicher et al., 1998; Brown et al., 2009; Sanborn and Patterson, 2013). This subsequent lack of standardization of disability training has led to disparate disability education and awareness within the genetic counseling community. Moreover, almost one third of genetic counselors have reported to find their disability training inadequate (Teicher et al., 1998; Brown et al., 2009; Hodgson and Weil, 2012; Qiao, 2015).

Disability advocates as well as current literature point to experiential knowledge of disability as a means of improving attitudes toward people with disabilities (Seccombe 2006; Brasington, 2007). Healthcare training programs have begun to implement service-learning

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

curricula and initial studies have suggested positive outcomes (Thompson et al., 2003; Cervasio and Hall, 2013). Service-learning is an educational strategy that has been shown to enhance academic and purposeful civic learning by using meaningful service within the community (Center for Community Engagement, 2015). Service-learning benefits both the student and the community in which they work. Educational programs utilizing service-learning curriculum with a focus on disability studies have been implemented in a variety of healthcare professional training programs, and showcase positive improvement in attitudes toward disability (Saxton, 1996; Patterson and Satz, 2002; Wells et al., 2002; Thompson et al., 2003; Adler et al., 2005; Seccombe, 2006; Brasington, 2007; Shakespear et al., 2009; Minihan et al., 2011; Scior, 2011; Cervasio and Hall, 2013).

Recommendations have been made for genetic counseling programs to offer experiences with individuals with disabilities to students outside of the clinical setting in order to foster comfort and understanding of life with a disability (Brasington, 1996; Teicher et al., 1998; Wertz and Gregg, 2000; Brown et al., 2009). Thus, implementation of service-learning programs within genetic counseling education may help improve attitudes toward individuals with disabilities.

In 2015, the Joan H. Marks Graduate Program in Human Genetics (JHMGPHG) at Sarah Lawrence College implemented new coursework and internships for students in order to address the aforementioned concerns. The goals of this course are to 1) Recognize the impact that disability has on the society as well as the personal lives of children and adults with disabilities and their families; 2) Develop communication skills with and about individuals, families and service providers; and 3) Assess their personal biases toward and about children and adults with disabilities and their families. Through the Disability Service Learning course, genetic counseling graduate students complete 80 hours of service in organizations that provides non-

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

medically related services to individuals with cognitive and/or physical disabilities. During these internships, students interact directly with individuals with disabilities. This experiential learning is complemented with a didactic curriculum combining lectures, readings, films, guest speakers, panels, and self-reflection to allow students to gain a well-rounded view of the lived experiences of individuals with disabilities outside of the medical setting. This study aims to determine what impact this educational intervention has on the Sarah Lawrence College genetic counseling students' attitudes and comfort level towards individuals with disabilities.

METHODS

Participants

Students enrolled in the Joan H. Marks Graduate Program in Human Genetics from 2015 to 2018 (n=115) comprised the experimental group, referred to as the "Sarah Lawrence cohort." These students are enrolled in the Disability Service Learning course during the Fall semester of their first year (September to December). The control group consisted of students entering into other genetic counseling training programs in North America in the Fall of 2018. In total, 24 student responses were collected, with an attrition rate of 41 students.

Instrumentation

The Attitudes to Disability Scale (ADS) (Power et al., 2010) and Interaction with Disabled Persons Scale (IDPS) (Gething & Wheeler, 1992) were used to assess students' attitudes towards disability and their comfort with people with a disability, respectively. The ADS is a "set of measures of attitudes to disability for use with individuals with physical disabilities and intellectual disabilities (the 'personal' forms of the scale) and for use with the general population about attitudes to disability in others (the 'general' form of the scale)" (Power

et al., 2010). The ADS score has a positive correlation with attitudes toward disability (i.e. a higher score indicates a more positive attitude toward disability).

The IDPS is used for “assessing general community attitudes, assessing attitudes of specific groups such as healthcare professionals ... and evaluating the effectiveness of interventions designed to promote positive attitude change” (Gething & Wheeler, 1992). This measure has a negative correlation with comfort with disability (i.e. a higher score indicates more discomfort with disability).

Procedures

Data was collected pre- and post-educational intervention from the first year of the course in 2015 through 2018. Each year, on the first day of the Disability Service Learning course, Sarah Lawrence genetic counseling students were asked to complete the Attitudes to Disability Scale (ADS) and the Interaction with Disabled Persons Scale (IDPS), along with the Attitudes Scale Introduction (a short questionnaire designed to determine the students’ level of exposure to and comfort with individuals with disabilities).

The students did not write their name on the surveys, but instead placed each set of surveys into a sealed envelope labelled with their name. These surveys remained sealed and were distributed back to the students on their final day of the Disability Service Learning course. Then the students completed the ADS and IDPS again as well as the Attitudes Scale Conclusion (a second questionnaire asking them to self-report any change in their views). In order to maintain anonymity but pair the September and December surveys, the students stapled the completed second survey to the first and returned them to the instructors without any identifying marks.

Students entering other genetic counseling training programs in North America in the Fall of 2018 were recruited via email and invited to complete the ADP, IDPS, and Attitude Scale

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

Introduction in September 2018 and the ADS and IDPS in December 2018. These surveys were administered via Survey Monkey, an online surveying system that allows for anonymous surveying. To pair the control students' September and December responses, the students were asked to create a unique identifier using the initials of their first and last name followed by the two-digit month and date of their birth (ex: John Smith DOB: 8/28; ID: JS0828).

Approval for this study was obtained from the Institutional Review Board of Sarah Lawrence College.

Data Analysis

The collection of de-identified quantitative data (IDPS, ADS, Attitudes Scales Intro, and Attitudes Scales Conclusion) was analyzed in a three-pronged approach using the Statistical Package for Social Sciences (SPSS):

(1) Descriptive statistics (means, SDs, etc.) were calculated for each sample's IDPS and ADS scores and change scores (the difference between each student's September and December scores for each scale) as well as answers from the Attitude Scales (Introduction and Conclusion) regarding knowledge of disability and comfort with disability.

(2) Independent t-tests compared the means of the Sarah Lawrence cohort scores and the control scores for both raw scores and change scores for the IDPS and ADS.

(3) To determine the significance in mean scores based on level of knowledge and comfort levels, twelve one-way analyses of variants (ANOVAs) were performed to analyze variance of ADS and IDPS scores and change scores for each variable (knowledge and comfort levels).

Post hoc Tukey HSD testing was performed when significant differences between categories were found.

RESULTS

The 115 genetic counseling students in the Joan H. Marks Graduate Program in Human Genetics at Sarah Lawrence College (Sarah Lawrence cohort) were found to have a mean score of 71.47 (SD = 9.27) on the Interaction with Disabled Persons Scale (IDPS) upon entering the program in September. These scores did not differ significantly ($p < 0.05$) from the IDPS scores of the control group (68.95 ± 8.61) (Table I), indicating that the Sarah Lawrence cohort held similar levels of comfort with disability as other incoming genetic counseling students before the educational intervention. The IDPS change scores (the difference between December and September scores for each student) differed significantly ($p = 0.005$) between the Sarah Lawrence cohort and the controls. Sarah Lawrence students exhibited a mean change in their IDPS scores of -12.73 ± 10.30 , while students in other programs experienced a mean change of -5.38 ± 16.16 (Table II).

The Attitudes to Disability Scale (ADS) scores in September differed significantly between the Sarah Lawrence cohort (48.5522 ± 4.98) and the control students (55.5833 ± 3.99) with a $p < 0.000$ (Table I); however, there was no significant difference in ADS change scores between the Sarah Lawrence cohort and students in other programs (Table II), but a $p = 0.061$ indicates a trend of the Sarah Lawrence cohort's attitudes becoming more negative.

At the conclusion of the Disability Service Learning educational intervention, the Sarah Lawrence cohort were asked if their view of disability changed over the course of the semester. Of the 115 SLC genetic counseling students, 74% reported that their view of disability became "more positive;" their scores decreased an average of 0.46 points on the ADS. 22% of students reported that their view did not change; their ADS scores decreased an average of 2.08 points.

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

4% students reported their views of disability became “more negative;” their ADS scores decreased by 3 points on average.

Knowledge

In September, participants were asked to self-report their level of knowledge of disability. Seven students (6%) within the Sarah Lawrence cohort reported no knowledge whereas none of the 67 initial control group participants (0%) reported no knowledge. 63% of students in both the Sarah Lawrence cohort and in the control group reported “a little” knowledge of disability, at 73 and 47, respectively. The Sarah Lawrence cohort included 29 students (25%) that perceived themselves as having “quite a bit” of knowledge of disability, while the control group had 12 (18%). Furthermore, 6 Sarah Lawrence students (5%) and 5 control group students (7%) reported they had a lot of knowledge on disability.

A one-way ANOVA was conducted to compare the effects of perceived knowledge of disability on the attitudes and comfort level with disability, as measured by the ADS and IDPS respectively. There was a significant effect of level of knowledge on IDPS September scores at the $p < .05$ level [$F(111,3) = 8.044, p = 0.000$]. Post hoc comparisons using the Tukey HSD indicated that the mean score for students with a little knowledge (74.1164 ± 8.09) was significantly different from the mean score for students reporting quite a bit of knowledge (65.8621 ± 8.88) as well as a lot of knowledge (64.3333 ± 8.87), but not for students with no reported knowledge of disability (73.2857 ± 11.16). Additionally, there was no significant difference found between scores of students with quite a bit of knowledge and a lot of knowledge. (Table III)

Additionally, the IDPS change scores showed a significant difference based on level of knowledge of disability at the $p < .05$ level [$F(111,3) = 4.893, p = 0.003$]. Similar to the

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

September IDPS scores, post hoc comparisons indicated that the mean change score for students with a little knowledge (-15.3219 ± 10.07) was significantly different from the mean change score for students reporting quite a bit of knowledge (-7.5517 ± 9.31). However, no significance was found when comparing the means of either of these groups to the IDPS change scores of students who reported no prior knowledge of disability or a lot of prior knowledge of disability. (Table III)

One-way ANOVA analysis did not find any significant differences in the means of either the September ADS scores or the ADS change scores between levels of perceived knowledge of disability (Table III).

After completing the Disability Service Learning educational intervention, 61% of the Sarah Lawrence cohort reported that their knowledge of disability changed “a lot”, 36% of students reported their knowledge changed “a little”, and two students reported no change to their knowledge of disability.

Comfort

In addition to knowledge on disability, students were asked to rate their level of comfort with both physical and intellectual disability. Of the 115 SLC genetic counseling students surveyed, 8 students reported they were very comfortable, 35 reported they were comfortable, 26 students answered they were uncomfortable, one student reported they were very uncomfortable, and 43 students reported they were neutral in their comfort level relating to physical disability. Four students selected “N/A” regarding their comfort level. In regards to intellectual disability, 12 students reported they were very comfortable, 18 students reported they were comfortable, 37 students were uncomfortable, 3 students answered they were very uncomfortable, and 39

students reported they were neutral in their comfort level. Seven students selected “N/A” when surveyed for comfort level with intellectual disability.

For the following analyses, the categories of very uncomfortable and uncomfortable as well as the categories of very comfortable and comfortable were combined to give three categories of comfort level: comfortable, uncomfortable, and neutral. Students who selected “N/A” were disregarded in the analysis due to the ambiguity behind this answer.

Physical Disability

A one-way ANOVA was conducted to compare the effects of comfort level with physical disability on both attitudes and comfort level with general disability as measured by the ADS and IDPS respectively. There was a significant effect of level of comfort with physical disability on IDPS September scores at the $p < .05$ level [$F(108,2) = 28.548, p = 0.000$]. Post hoc comparisons indicated that the mean scores for students of each comfort level differed significantly: uncomfortable (79.9200 ± 7.97), neutral (71.7386 ± 7.65), and comfortable (65.4762 ± 7.29). (Table IV)

Additionally, the IDPS change scores showed a significant difference based on level of comfort with physical disability at the $p < .05$ level [$F(108,2) = 8.336, p = 0.000$]. Similar to the September IDPS scores, post hoc comparisons indicated that the mean change score for students not comfortable with physical disability (-19.2400 ± 10.74) was significantly different from the mean change score for students reporting neutral (-10.8750 ± 8.98) as well as the mean change score for students comfortable with physical disability (-9.9048 ± 9.50). However, no significance was found when comparing the means of IDPS change scores of students who were neutral and students who were comfortable with physical disabilities. (Table IV)

One-way ANOVA analysis did not find any significant differences in means of the September ADS scores or the ADS change scores between levels of perceived comfort with disability (Table IV).

Intellectual Disability

A one-way ANOVA was conducted to compare the effects of comfort level with intellectual disability on the attitudes and comfort level with general disability as measured by the ADS and IDPS respectively. The level of comfort with intellectual disability has a significant effect on IDPS September scores at the $p < .05$ level [$F(105,2) = 24.859, p = 0.000$]. Post hoc comparisons indicated that the mean scores for students uncomfortable with intellectual disability (78.0385 ± 8.18) differed significantly from the mean IDPS scores of students with neutral comfort level (68.9744 ± 8.43) as well as students who were comfortable with intellectual disability (65.5000 ± 6.08). However, there was no significance detected between the mean scores of students with neutral comfort and students comfortable with intellectual disability. (Table V)

Additionally, the IDPS change scores showed a significant difference based on level of comfort with intellectual disability at the $p < .05$ level [$F(105,2) = 84.016, p = 0.021$]. Similar to the September IDPS scores, post hoc comparisons indicated that the mean change score for students not comfortable with intellectual disability (-16.1154 ± 9.53) was significantly different from the mean change score for students reporting neutral comfort (-10.0000 ± 10.03). However, no significance was found when comparing the means of IDPS change scores of students uncomfortable and students who were comfortable with intellectual disability nor when comparing students with neutral comfort and students who were comfortable with intellectual disabilities. (Table V)

One-way ANOVA analysis did not find any significant differences in means of the September ADS scores or the ADS change scores between levels of perceived comfort with intellectual disability (Table V).

At the conclusion of the Disability Service Learning educational intervention, Sarah Lawrence genetic counseling students were asked if their comfort level with disability changed. Of the 115 Sarah Lawrence students, 83% of students reported that they became “more comfortable,” 17% of students reported that their comfort level did not change, and no students reported that they became less comfortable.

DISCUSSION

Advocates for the disability community have called on the need for a more balanced presentation of disability by genetic counselors in their sessions (Madeo et al., 2011). Roadhouse et al. (2017) argues that the social model of disability plays an important role in an individual’s understanding of and decision-making process about disability. Continued exploration of one’s attitudes and biases are essential in order to enter into a meaningful dialogue about the impact of disability with patients (Patterson A, Satz M. 2002; Madeo et al., 2011; Roadhouse et al. 2017). This 4-year prospective study is one of the first to examine the comfort level with and attitudes towards individuals with a disability held by genetic counseling graduate students and to attempt to measure the impact a service-learning course has on those levels.

In a comprehensive review of the literature, Satchidanand et al (2012) identified previous contact to be a major contributing factor in positive attitudes towards individuals with disabilities among healthcare providers. In this study, 92% of the Sarah Lawrence cohort and 100% of the control group reported having some level of contact with individuals with a physical disability prior to entering a training program. Prior contact with individuals with an intellectual disability

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

was reported in 87% and 100% of participants respectively. Students in both groups were revealed to have similar levels of comfort with individuals with disabilities, as measured by the IDPS, at the start of the semester.

After completing the Disability Service Learning course, individuals in the Sarah Lawrence cohort experienced a significant increase in their comfort level with individuals with disabilities. Similar findings have been observed in other intensive disability education courses in healthcare education (Saxton, 1996; Patterson and Satz, 2002; Wells et al., 2002; Thompson et al., 2003; Adler et al., 2005; Seccombe, 2006; Brasington, 2007; Shakespear et al., 2009; Minihan et al., 2011; Scior, 2011; Morgan and Lo, 2012; Cervasio and Hall, 2013). This intervention was most successful in students who self-reported little prior knowledge of and comfort with members of the disability community.

Students show evidence of enhanced comfort through the Disability Service Learning intervention, which has implications for how they will interact with individuals with disabilities and operate within the genetic counseling community. Increased comfort with the disability community has been shown to lead to less biased and more nuanced conversations with patients (Roadhouse et al., 2017). While this study did not directly address whether comfort can equate to a more balanced presentation, studies like Roadhouse et al. point to the importance of exploring a patient's experience with disability within their social context.

Not all students experienced the same relative amount of change in comfort level with disability as a result of the Disability Service Learning course. Students who cited they began the course uncomfortable with disability experienced the most change in comfort level, while students who began the course comfortable with disability experienced slightly less change in comfort level by comparison. This phenomenon could highlight a maximum comfort level that

students are able to reach. Educational plateauing was described by Morgan and Lo (2012), who measured comfort levels of undergraduate physiotherapy students at the end of year 2, after a 12-week intensive unit working with individuals with neurological impairments and the end of year 4, after the completion of their clinical work. While a significant improvement in comfort level was seen after the semester long intervention, there was no significant difference noted between the end of year 2 and year 4.

Attitudes towards individuals with disabilities are influenced by implicit and explicit biases (Friedman, 2019). At the start of the 2018 semester, attitudes differed significantly between the Sarah Lawrence cohort and the control group, with the experimental cohort holding more negative attitudes, as measured by the ADS. One explanation for this is possible selection bias in the control sample. Students from outside programs were invited to participate voluntarily while students in the Sarah Lawrence cohort were required to complete the surveys as part of the Disability Service Learning course. Of 372 genetic counseling students matriculating in genetic counseling training programs throughout North America in September 2018 (AGCPD, 2018), only 6.45% responded to the survey. This self-selected group may have been inclined to participate in a survey measuring attitudes and biases toward disability due to their own experiences with disability. As 100% of this control group (n=24) cited previous contact with individuals with disability, contrasting the 92% of the Sarah Lawrence cohort (n=115), this group may not be fully representative of genetic counseling students' attitudes and biases toward disability.

Students in both cohorts did not display a significant change in attitudes, as measured by the ADS. The measurement did appear to trend towards a more negative view in the Sarah Lawrence cohort while it appeared to become slightly more positive in the control group.

Perceived attitudes, on the other hand, changed in the Sarah Lawrence cohort with 74% of students reporting that they had a more positive view towards individuals with disabilities at the conclusion of the intervention. One possible explanation of these observations is that the nature of the interactions experienced by the Sarah Lawrence cohort served to reinforce negatively held implicit biases shaped by societal views on disability. This phenomenon has been reported in family members of individuals with disabilities (Friedman, 2019).

The unequal effect the Disability Service Learning course had on measured student comfort compared with attitudes and biases toward disability highlights a more complex relationship between these qualities of healthcare professionals. While the Disability Service Learning course aims to promote balanced genetic counseling as a result from the concerns Madeo et al. voiced in 2011, further knowledge of the interplay between comfort level and attitudes and biases toward disability is necessary to hone this educational intervention.

Limitations

As this study gives a first look at the impact of the Disability Service Learning educational intervention, the sample was limited, especially when evaluating the sample in sub-groups. For example, a small sample size of students who self-identified as having no knowledge ($n = 7$) may limit the understanding of how lack of knowledge of disability upon entering a genetic counseling program affects comfort level with disability. Continued study of Sarah Lawrence students who enroll in the course, as well as control cohorts in other genetic counseling programs, will allow for a more robust sample and more power in statistical analysis.

The measures selected for this study offer their own limitations, as few publications have utilized the IDPS and ADS to analyze efficacy of disability education courses, which makes cross comparison to other healthcare fields difficult. The ADS used may have limited assessment

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

of changing attitudes, and implicit bias tests before and after completing the course may better gauge these changes (Wilson and Scior, 2014; Hein, Grumm, and Fingerle, 2011). Moving forward, collecting student demographics would also be insightful, as this study was not able to assess demographics appropriately.

ACKNOWLEDGEMENTS

The authors would like to thank their Research Mentor, Sara Gilvary, MS, LCGC, and Thesis Advisor, Radhika Sawh, MS, CGC, for their guidance throughout this study as well as their course instruction and data collection of the Disability Service Learning practicum. Additionally, the authors would like to thank Sara Gilvary, MS, LCGC and the late Erica Musen Sanborn, MS, CGC for their creation and implementation of the Disability Service Learning course at the Joan H. Marks Graduate Program in Human Genetics and the study design for this project.

CONFLICT OF INTEREST

Authors Michelle Bina and Lucas Hollifield declare they have no conflicts of interest.

HUMAN STUDIES AND INFORMED CONSENT

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2005 (5). Informed consent was obtained from all students for included in the study.

REFERENCES

Accreditation Council for Genetic Counseling (ACGC). 2013. *Practice based competencies for genetic counselors*. <http://gceducation.org/Pages/Standards>.

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

Accreditation Council for Genetic Counseling (ACGC). 2015. *Standards of accreditation for graduate programs in genetic counseling*. <http://gceducation.org/Pages/Standards>.

Accredited Genetic Counseling Program Director (AGCPD). 2018. Unpublished.

Adler P, Cregg M, Duignan A, Olett G, Woodhouse JM. 2005. *Effect of training on attitudes and expertise of optometrists towards people with intellectual disabilities*. *Ophthalmol Physiol Opt* 25:105-118.

Brasington CK. 2007. *What I wish I knew then. . . reflections from personal experiences in counseling about Down syndrome*. *J Genet Couns* 16:731-734.

Brown EK, Dies KA, Sanborn E, Peters H, Milunsky JM, Whalen Champion M. 2009. *Genetic counselors' perspectives on disability training and experience*. *J J Genet Couns* 18:659-660.

Cervasio K, Hall K. 2013. *Attitudes of Nurses Toward Children With Disabilities: The Attitudes of Nursing Students Toward Children With Disabilities: An Experimental Design*. *Intern J of Phys Med & Rehabil* 1:5.

Friedman C 2019. *Family members of people with disabilities' explicit and implicit disability attitudes*. Rehabil Psychol. 2019 May;64(2):203-211.

Gething L, Wheeler B. (1992) *The interaction with disabled persons scale: A new Australian instrument to measure attitudes towards people with disabilities*. *Australian Journal of Psychology*, 44(2), 75-82.

Hein S, Grumm M, Fingerle M. 2011. (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.

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

- Hodgson J, Weil J. 2012. *Talking about disability in prenatal genetic counseling: A report of two interactive workshops*. J Genet Couns 21:17-23.
- Madeo AC, Biesecker BB, Brasington C, Erby LH, Peters KF. 2011. *The relationship between the genetic counseling profession and the disability community: A commentary*. Am J Med Genet Part A 155:1777–1785.
- Minihan P, Robey K, Long-Belil L, Graham C, Hahn J, Woodard L, Eddey G. 2011. *Desired educational outcomes of disability-related training for the generalist physician: knowledge, attitudes, and skills*. Acad Med 86:1171-1178.
- Morgan E, Lo K. 2012. *Enhancing positive attitudes towards disability: Evaluation of an integrated physiotherapy program*. Disability and Rehabilitation 35(4):300-305.
- Parens E, Asch A. (1999). *The disability rights critique of prenatal genetic testing*. Hastings Center Report, 29, S1-S22.
- Patterson A, Satz M. 2002. *Genetic counseling and the disabled: Feminism examines the stance of those who stand at the gate*. Hypatia 17:118-142.
- Power MJ, Green AM; WHOQOL-DIS Group. (2010). *The Attitudes to Disability Scale (ADS): development and psychometric properties*. J Intellect Disabil Res, Sep;54(9):860-74.
- Qiao, X. 2015. *Evaluation of the Impact Program, a Disability Immersion Experience, in Genetic Counseling Education*. Sarah Lawrence College Digital Commons Human Genetics Theses:Paper 11.
- Roadhouse C, Shuman C, Anstey K, Sappleton K, Chitayat D, & Ignagni E. 2018. *Disability Experiences and Perspectives Regarding Reproductive Decisions, Parenting, and the Utility of Genetic Services: A Qualitative Study*. Journal of Genetic Counseling 27(6):1360-1373.

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

- Sanborn E, Patterson A. 2013. *Disability Training in the Genetic Counseling Curricula: Bridging the Gap Between Genetic Counselors and the Disability Community*. Am J Med Genet Part A 9999:1-7.
- Saxton M. 1996. *Disability feminism meets DNA: A study of and educational model for genetic counseling students on the social and ethical issues of selective abortion*. Ph.D. dissertation, Brandeis University, Waltham.
- Satchidanand N, Gunukula S, Lam W, McGuigan D, New I, Symons A, Withiam-Leitch M, Akl E. 2012. *Attitudes of Healthcare Students and Professionals Toward Patients with Physical Disability*. Am J of Phys Med & Rehabil 91:533-545.
- Scior K. 2011. *Public awareness, attitudes and beliefs regarding intellectual disability: A systematic review*. Research in Developmental Disabilities 32:2164-2182.
- Secombe J. 2006. *Attitudes towards disability in an undergraduate nursing curriculum: A literature review*. Nurse Edu Today 27:459-465.
- Shakespeare T, Iezzoni LI, Groce NE. 2009. *The art of the medicine: Disability and the training of health professionals*. Lancet 74:1815-1816.
- Teicher J, Tshipis J, Wertz DC, Lerner B. 1998. *Disability awareness training in the graduate genetic counseling training program: A survey of recent graduates*. J Genet Couns 7:498.
- Thompson T, Emrich K, Moore G. 2003. *The effect of curriculum on the attitudes of nursing students toward disability*. Rehabil Nursing 28:1.
- Wells T, Byron M, McMullen S, Birchall M. 2002. *Disability teaching for medical students: disabled people contribute to curriculum development*. Med Edu 36:788-792.
- Wertz DC, Gregg R. 2000. *Genetics services in a social, ethical, and policy context: A collaboration between consumers and providers*. J Med Ethics 26:261-265.

Wilson M, Scior K. 2014. *Attitudes towards individuals with disabilities as measured by the Implicit Association Test: A literature review*. *Research in Developmental Disabilities* 35:294–321.

TABLESTable I. *ADS and IDPS Scores in September*

Scale	Students	<i>Mean</i>	<i>SD</i>	<i>Sig.</i>
IDPS	Sarah Lawrence cohort (n=115)	71.4739	9.28	0.224 ^a
	Control (n=24)	68.9583	8.61	
ADS	Sarah Lawrence cohort (n=115)	48.5522	4.98	0.000 ^a
	Control (n=24)	55.5833	3.99	

^a Equal variances assumed due to Levene's Test for Equality of Variances revealing no significant unequal variance.

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

Table II. *ADS and IDPS Change Scores*

Scale	Students	Mean	SD	Sig.
IDPS Change Score (Dec-Sept)	Sarah Lawrence cohort (n=115)	-12.7261	10.30	0.005 ^a
	Control (n=24)	-5.3750	16.16	
ADS Change Score (Dec-Sept)	Sarah Lawrence cohort (n=115)	-0.9348	4.85	0.061 ^a
	Control (n=24)	1.1250	4.88	

^a Equal variances assumed due to Levene's Test for Equality of Variances revealing no significant unequal variance.

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

Table III. *Sarah Lawrence Cohort IDPS and ADS Mean Scores by Level of Knowledge*

Scale		Perceived Level of Knowledge in September			
		None n=7	A Little n=73	Quite A Bit n=29	A Lot n=6
IDPS	September	73.2857 ± 11.16	74.1164 ± 8.09 ^{a,b}	65.8621 ± 8.88 ^a	64.3333 ± 8.87 ^b
	Change Score	-11.0000 ± 11.58	-15.3219 ± 10.07 ^c	-7.5517 ± 9.31 ^c	-8.1667 ± 5.64
ADS	September	50.2857 ± 3.31	48.4384 ± 5.49	48.1724 ± 3.98	49.7500 ± 4.58
	Change Score	-2.5714 ± 4.47	-0.8014 ± 5.13	-1.1034 ± 4.61	0.1667 ± 2.93

*Means with the same superscript are significantly different from one another.

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

Table IV. *Sarah Lawrence Cohort IDPS and ADS Mean Scores by Level of Comfort with Physical Disability*

Scale		Perceived Level of Comfort with Physical Disability		
		Uncomfortable n=25	Neutral n=44	Comfortable n=42
IDPS	September	79.9200 ± 7.97 ^a	71.7386 ± 7.65 ^a	65.4762 ± 7.29 ^a
	Change Score	-19.2400 ± 10.74 ^{e,f}	-10.8750 ± 8.98 ^e	-9.9048 ± 9.50 ^f
ADS	September	48.2400 ± 5.47	47.4091 ± 4.19	49.4881 ± 5.32
	Change Score	-0.3000 ± 5.01	-0.5682 ± 4.94	-1.3333 ± 4.75

*Means with the same superscript are significantly different from one another.

GENETIC COUNSELING EDUCATIONAL INTERVENTION ON BIAS TOWARD DISABILITY

Table V. Sarah Lawrence Cohort IDPS and ADS Mean Scores by Level of Comfort with Intellectual Disability

Scale	Perceived Level of Comfort with Intellectual Disability		
	Uncomfortable n=39	Neutral n=39	Comfortable n=30
IDPS	September 78.0385 ± 8.18 ^{a,b}	68.9744 ± 8.43 ^a	65.5000 ± 6.08 ^b
	Change Score -16.1154 ± 9.53 ^c	-10.0000 ± 10.03 ^c	-10.9333 ± 11.05
ADS	September 48.2400 ± 5.47	47.4091 ± 4.19	49.4881 ± 5.32
	Change Score -0.3000 ± 5.01	-0.5682 ± 4.94	-1.3333 ± 4.75

*Means with the same superscript are significantly different from one another.