Diving Our Way to Empathy:

Evaluating Standardized Empathy Training in the Handicapped Scuba Association's Adaptive Dive Buddy Training Course

Joseph Anthony Hoyle

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Mentor: Erin Nelson, PsyD

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Abstract

Background, Significance and Rationale:

SCUBA (Self-Contained Underwater Breathing Appartatus), a sport popularized in the mid-twentieth century by French inventor and explorer Jacques Cousteau, has historically been considered an extreme sport reserved only for risk-takers and physical specimens. The Handicapped Scuba Association (HSA) has challenged this narrative since its founding by Jim Gatacre in 1981. The HSA brings the sport of scuba to those of all abilities with training programs for people with disabilities and their able-bodied buddies. The adaptive buddy training, standardized on an international scale, consists of four days of intensive above- and below-water training. Beyond the technical skill of assisting disabled divers, the training is renowned for its approach to empathy. HSA empathy training includes OSHA and international accessibility standards, wheelchair-bound and blind exercises, and paraplegic and quadriplegic underwater maneuvers. Through these experiential simulation scenarios buddies learn to dive and solve problems differently, developing new skills that are needed to safely scuba dive with divers with disabilities. HSA simulation drills are a cornerstone of HSA training and are required to achieve certification.

Empathy, and the ability to teach and improve this skill, is a core tenet of the Anne Burnett Marion School of Medicine at Texas Christian University. Empathy training is becoming mainstream in medical education, and insights into practices that objectively increase empathy could help further develop and inform these curricula in medical education.

Research Question:

Our research question is centered around this challenging training. We aim to explore the effectiveness of HSA empathy training on raising participants' objective empathy.

Materials and Methods:

We explored our primary research question with a standardized, validated empathy measure. We partnered with a local branch of the HSA, a non-profit in the metroplex called Adaptable Scuba. Adaptable Scuba trains several groups of adaptive buddies every year according to HSA's international standards. We used the validated Perth Empathy Scale (PES) to objectively measure empathy scores over the course of training.

We expected that the data would demonstrate a statistically significant, objective increase in empathy measures as measured by the Perth Empathy Scale. We also expected the baseline empathy of those pursuing Adaptive Dive Buddy training to be higher than the mean as reported by the creators of the Perth Empathy Scale.

Results:

After one cohort of adaptive dive buddy candidates, we found no significant difference in baseline empathy and no significant changes in empathy as measured by the PES in any category, sub-category, or aggregate after the intervention.

Discussion and Conclusions:

After debrief, we believe subjective empathy increased, especially with this specific and vulnerable population. Upon further discussion, we surmise there may be a need for more cohorts, use of a different scale, or creation of a scale especially for caregivers and colleagues of those with disabilities.

Research Questions

In certified scuba divers who obtain standardized, intensive empathy training in July 2023 through Adaptable Scuba, is there an objective increase in empathy as measured by the Perth Empathy Scale?

In certified scuba divers who are enrolled in the HSA Adaptive Dive Buddy training course, is there a statistically significant difference in baseline empathy compared to the general population, as reported by the Perth Empathy Scale?

Hypothesis: We hypothesize that empathy, as measured by the PES, a self-reported measure, will increase pre- to post- HSA empathy training. We expect this increase to be statistically significant. We also hypothesize that our cohort will have higher baseline empathy scores.

Introduction

Empathy has many definitions that all center around the ability to identify and interpret the feelings of others. Over the years, researchers have come up with many scales that measure different facets of empathy. The Hogan Empathy Scale may be the earliest, developed in the late 1960s.[1] Several scales followed, including the Jefferson Scale of Empathy that focuses on empathy in the medical field. Today, more empathy measures are being created to assess empathy in specific fields, such as social workers or counselors.[2] Clearly, assessing empathy in healthcare professionals and validating interventions aiming to improve empathy is an important endeavor.

One such intervention is the cornerstone of the HSA's Adaptive Dive Buddy training course. In this course, certified scuba divers become licensed to assist divers with disabilities to safely and comfortably dive. This training is standardized on an international scale. A major component of the course is exercises in empathy, including an emphasis on disability simulation. On the first day, each able-bodied candidate will move to the different stations while using a wheelchair. Later, candidates will guide each other around an obstacle course with verbal and tactile commands while one wears a blindfold. Buddies will don and doff each others' wetsuit while the "disabled diver" cannot move their extremities. In the water, one buddy will place a black plastic bag inside their mask to simulate visual impairment, and the seeing buddy will "guide" the visually impaired buddy, communicating through tactile signs such as squeezes and shakes. Able-bodied buddies will assist paraplegic or quadriplegic divers with critical dive skills such as descent to depth, buoyancy, sinus and ear equalization, finning, and ascent.

These exercises build trust between buddies and, more importantly, simulate certain disabilities for the trainees. The ultimate goal is to ensure safety by understanding the limitations of divers with a wide variety of disabilities. This training also aims to increase empathy and communication.

Significance

Through our literature review, no evaluation of the impact of the HSA empathy training has been done. With such a significant time and energy investment into the training of the adaptive dive buddies, it is prudent to assess this standardized, international training course. A result in line with our hypothesis would suggest that the training is useful and adequate; an unclear result might suggest the process may need to be reworked.

The significance of this research is to not only evaluate the HSA training, but to estimate the impact it may have on other areas. If the results show a measurable increase in empathy through this explicit and interactive style, it may guide future curricula development in other fields. For example, empathy training in medical education is a growing area of interest. Lack or loss of empathy in medical staff has been associated with high burnout rates and patient and provider dissatisfaction.[3] Without early intervention to increase empathy, empathy reserves can decrease.[4] We anticipate this research will add to the literature suggesting that empathy can be increased through experiences or through motivation.[5] For example, a UK nursing program had students wear an aged simulation suit that simulated visual impairment, hearing impairment, and musculoskeletal and dexterity changes. The study, published in 2020, reported an statistically significant increase in student empathy for older paitents in the experimental group as measured by the Basic Empathy Scale.[6]

The current study aims to evaluate if empathy can be increased in the short term with exercises that are simple and cost-effective. Implementing these into medical school curricula, residency training programs, and continuing education may improve patient and provider satisfaction and long-term patient outcomes.

Materials and Methods

Subject Identification

Participants will be adults who are certified scuba divers that voluntarily elect to undergo Handicap Scuba Association (HSA) Adaptive Buddy training. This training is a mix of didactic lecture, confined water practice, open-water assessment dives, and a cumulative exam over course material. The training consists of basic skills required to be a facilitator of a handicapped divers as well as extensive empathy training including disability simulation. To be included in the study, subjects must successfully complete the minimum requirements to achieve HSA Adaptive Buddy Certification.

Inclusion criteria include certified scuba divers who are enrolled in the HSA Adaptive Buddy Course through Adaptable Scuba and who agree to participate in the study. To be included in the data analysis, divers must successfully complete all requirements as determined by the HSA Instructor.

Exclusion criteria include those who do not successfully complete the course as well as those who opt out of the study either at the baseline or post-intervention stage.

Procedure

Participants beginning the HSA Adaptive Buddy course facilitated by Adaptable Scuba will be recruited to participate in the proposed empathy study. The Co-Investigator will explain the current study and the empathy measure to be used. After explaining the details of informed consent, participants who consent to be included in the study will be given the survey to measure baseline empathy. This data will be collected via a physical copy of the Perth Empathy Scale.

After the surveys have been collected, the participants will undergo training per HSA and Adaptable as outlined above.

Once training has been completed, participants will be reminded of the voluntary nature of this survey, be reoriented to the aims, and those who consent to be included in the study will complete a post-intervention empathy scale. This scale will be indentical to the baseline scale.

The data from baseline and post-intervention will be marked appropriately. The subjects will be thanked for their participation and given the contact information of the investigators.

The Survey

There are many empathy scales that vary in their construction and utilization. Of these scales, we choose to use one that can measure different facets of empathy. The Perth Empathy Scale (PES) is a measure developed in 2022 by researchers at the University of Western Australia. The PES aims to objectively assess both cognitive and affective empathy.[7] Cognitive empathy is defined as the ability to infer and recognize the emotions of others, while affective empathy is the ability to share in the emotion of another. These two branches are distinct and contain subdivisions for both positive and negative emotions.

The Perth Empathy Scale is a twenty item self-report survey, ranging from 1 (almost never) to 5 (almost always). The scale key also identifies which five items test the author's four categories: positive and negative cognitive empathy(P-CE, N-CE), and positive and negative affective empathy (P-AE, N-AE). These subcategories can be summed to evaluate total cognitive empathy (CE) and affective empathy (AE), as well as total empathy using the entire twenty items.

Survey Analysis

Baseline and post-intervention scores from all subjects will be used in data analysis. Pre-intervention data will be used to calculate a mean in overall empathy and subscores. This data will be used to compare empathy of our cohort to the control. The post-intervention scores will be used to calculate a mean. A paired samples t-test will be performed to assess whether there is a significant difference of the pre- and post-intervention data.

Subscores from P-CE, N-CE, P-AE, and N-AE will also be used to calculate a baseline for each subset as well as a post-intervention mean for each subset. These subscores will also be used in a t-test to assess changes in individual categories.

Limitations:

A major limitation to the current study is the lack of a control group and cannot be neglected. While a control was considered, adding an additional group with similar time commitments and intensity of training is not feasible at the current time. Future studies utilizing a control group may be warranted to evaluate the validity of this study. A possibility for a control group may be a cohort of Open Water or Advanced Open Water divers, with similar time commitments but without a stated and intentional empathy training element.

Another limitation of this study is the inability to achieve random assignment. With the nature of this study including third-party instruction and significant time and financial commitments, this was not practical.

Finally, some self-reported measures of empathy have reliablility and validity concerns.[8,9] Using a clear definition of what the researcher is attempting to measure, and using a construct that has been tested for reliability and validity, is of the utmost importance. The Perth Empathy Scale has been empirically tested.[4]

Results

Results from our study were included below, in Tables 1-5. Table 1 was provided by the original developers of the Perth Empathy Scale from a sample at the University of Western Australia. It is devided into subscales of positive and negative "Cognitive Empathy," (CE) and positive and negative "Affective Empathy (AE)." Table 1 also sums totals for CE, AE, and Empathy (total). Finally, Table 1 calculates means and standard deviations for each subscale or composite, which was used as a control in Table 5.

Table 2 and Table 3 include our pre-intervention data from our cohort. Table 2 includes our original cohort of n=7, Table 3 includes only our cohort which completed the course successfully n=5.

Table 4 includes our post-intervention empathy subscores and calculations, which were compared to Table 3 in our final analysis.

	Total Sample (*N*=638)			Females (*N*=451)			Males (*N*=187)	
Subscale/ Composite	***M***	***SD***	**Cronbach's alpha**	***M***	***SD***	***M***	***SD***	
Subscales								
N-CE	19.1	3.83	.87	19.2	3.76	18.6	3.98	
P-CE	19.1	3.55	.85	19.2	3.59	18.9	3.45	
N-AE	12.0	3.67	.73	12.4	3.71	11.1	3.39	
P-AE	15.9	3.98	.77	16.1	3.94	15.4	4.04	
Composites								
G-CE	38.2	7.09	.92	38.4	7.06	37.6	7.14	
G-AE	27.9	6.48	.80	28.5	6.55	26.6	6.12	
Empathy (total)	66.1	11.2	.88	66.9	11.3	64.1	10.9	

Table 1: Results from an Australian Adult and General Community and University (n=638)

	M	SD
N-CE	20	2.65
P-CE	20.5	2.76
N-AE	12.4	4.2

P-AE	18.6	3.3
G-CE	40.4	5.3
G-AE	31	7.3
Empathy (total)	71.4	8.3

Table 2: Pre-Intervention empathy subscores (n=7)

	M	SD
N-CE	18.6	1.34
P-CE	19	1.41
N-AE	13.2	4.92
P-AE	18.8	3.83
G-CE	37.6	2.30
G-AE	32	8.51
Empathy (total)	69.6	9.48

Table 3: Pre-Intervention empathy, excluding participants lost to follow-up (n=5)

	M	SD
N-CE	17.2	1.1
P-CE	18.8	3
N-AE	11.6	3.4
P-AE	17.8	5.5
G-CE	36	3.7
G-AE	29.2	8
Empathy (total)	65.2	10.8

Table 4: Post-Intervention empathy subscores (n=5)

Calculations

To determine if mean empathy of our cohort pre-intervention (n=7) is higher than mean empathy as reported by Perth Empathy Scale, we performed an Independent Samples T-Test to find the p value. We also compared each subscore, data below in column two of table 5.

To determine if mean empathy changed over the course of the intervention, we ran a paired samples T test to calculate p values. Data in table 5, column 3.

	P Value (Perth v Pre-I)	P Value (Pre v Post)
N-CE	0.54	0.05
P-CE	0.30	0.85
N-AE	0.77	0.30
P-AE	0.07	0.36
G-CE	0.41	0.30
G-AE	0.21	0.17
Empathy	0.21	0.21

Table 5: p values of mean empathy

Discussion

Based on the statistical analysis we performed, we see no statistically significant difference in baseline empathy scores between our control and our cohort of adaptive dive buddy candidates. This suggests our cohort of seven scuba divers (pre-intervention) has similar empathy levels as the Perth Empathy Scale sample of 638. The analysis also showed no significant increase in empathy after the intervention. Means were similar in total empathy and subscores across pre- and post-intervention data.

There are many potential reasons the data was unremarkable. It may be that the training simply does not improve empathy. To expect a dramatic, statistically significant increase in empathy scores over a long weekend may be overly ambitious. Through an informal debrief with the cohort, though, they do believe their empathy for adaptive divers increased across the weekend because of the immersive training.

Another confounder we acknowledge is that we simply may not have enough data collected. Unfortunately, the second cohort of Adaptive Dive Buddies was canceled for 2023. If we were able to collect data from a subsequent cohort, our data analysis may be more insightful.

We also explored the empathy scale utilized for measurement as a source of uncertainty. As discussed earlier, there are many empathy scales that have been developed over the last half a century. Each scale emphasizes different aspects of empathy and measures empathy in different contexts. For example, the Jefferson Scale of Physician Empathy was developed specifically to measure empathy in physicians, with subsections such as "Perspective Taking," "Compassionate Care," and "Standing in Patient's Shoes."[10] Even within this scale are forms for medical students, physicians, and other health professionals. (source) It may be that we require an empathy scale that is specific to those who provide care to those with disabilities, such as the relatively new "Employed Carer Empathy Towards People with Intellectual Disabilities" (EMP-ID).[11]

Study design is another area of potential concern. In this study, we used a self-reported empathy measure. Other ways researchers try to quantify empathy are through observer rating scales, "tests," of empathy, and even measuring neural biochemical markers with advanced fMRI

imaging.[12] While self-reported measures were the only feasible option, and are the simplest of these measures to employ, questions remain regarding their accuracy and reliability.[9]

Finally, psychology is beginning to paint a picture that empathy may be a "reserve," similar to how we think about stamina. We may have a certain, intangible, immeasurable amount of empathy that we utilize through our thoughts and actions. This reserve can be depleted through difficult emotional circumstances, or even just exercising empathy at work.[13] This empathy battery of sorts can be recharged through frequent breaks and other means.[14] Speculatively, the size of the tank can be increased and decreased through some means.

To that end, we propose that hunger, fatigue, mood, and other physiological and psychological factors may be at play. After four days of intense training, sitting out in the July Texas heat, it may be that the empathy reserves of our cohort were depleted. One idea to offset this possibility is to wait a period before administering the post-intervention questionnaire. This may give our cohort adequate time to rest and recharge, and potentially replete their empathy reserves.

Future Directions

While we were a bit discouraged by our results, we are excited for future directions that are possible for this project.

One direction is to try the same scale with a new cohort and check for any discrepancies between the two cohorts. We also considered using an alternate questionnaire, such as the Questionnaire of Cognitive and Affective Emapathy (QCAE). A potential strength of this scale is it employs more concrete examples in "perspective taking" and "responsivity", rather than the somewhat abstract and hypothetical concepts in the Perth Empathy Scale.[15] Due to our eventual goal, we may also consider using the Jefferson Scale of Empathy.We are also considering the feasability of writing our own empathy scale for those specifically who work with at-risk

populations, as it may be of more use to us and others exploring these specific questions. While it would be a useful tool, a major limitation to this would be validation.

Once we iron out a repeatable way to evaluate the training, we would like to set the training against a control with a similar time commitment and intensity. One idea we are discussing is to evaluate a generic Open Water certification course, which is involved and intense but has no true 'empathy training' in the curriculum. Our partners at Adaptable Scuba offer these courses as well, which would be convenient for us as a research team.

Regardless of the immediate direction of the next project, a few ultimate goals pesist: to accurately evaluate the impact of the HSA Adaptive Buddy training program on the empathy of the individual. We are commited to this goal because we would like to add to the body of literature that supports and validates empathy as a skill that can be improved upon. We also realize the need to evaluate empathy training in the medical field, such as the training in The Anne Burnett Marion School of Medicine's Preparation for Practice curriculum.

Conclusions

Unfortunately, we did not observe a statistically significant increase in the empathy of our cohort as measured by the Perth Empathy Scale. As discusssed in the 'Future Directions' section, we are interested in reworking our study in the future and running the experiment with a new cohort of Adaptive Dive Buddies. We believe this work is important because of the time and energy expended to become an adaptive dive buddy and the empasis the HSA places on the empathy training.

We also believe this research important because of the generalizability. Being able to accurately and reliably measure increases in empathy after an intervention could be useful not only in this area, but also in medicine. Stepien and Baernstein's review of empathy training in medical education shows their is much to still be worked out in terms of implementing, standardizing, and evaluating the interventions.[16] Finding a repeatable way to evaluate a training program such as the HSA's Adaptive Buddy course would be a great first step. Medicine is one field that is subject to decreasing empathy over time and if we could design and evaluate interventions with the goal of increasing or enduring empathy, it may promote resilience, compassion, and mental wellbeing for physicians and other healthcare workers.

Compliance

Clearance to perform this study was obtained through the Texas Christian University Institutional Review Board (IRB). The study was approved on April 25, 2023 and has an identifier of IRB#2023-08. Investigators were required by the IRB to provide a letter of support from Adaptable Scuba. Investigators were also required to provide a Research Information Sheet, detailing the study, to potential participants. All compliance requirements were followed by the researchers.

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