Multidisciplinary Undergraduate Research Projects in Health (MURPH)

2021-2022
INTRODUCTION TO MURPH

MURPH is an undergraduate research program at the University of British Columbia - Okanagan campus that aims to offer a unique cross-disciplinary platform to undergraduate students for engaging in academic research, while also providing professional training through custom-designed workshops. The core component of MURPH includes project teams comprising multiple undergraduate students and faculty members across different disciplines working together on applied (often industry driven) health research projects.

MURPH MANAGEMENT TEAM

Dr. Joan Bottorff
Professor
School of Nursing

Dr. Abbas Milani
Professor
School of Engineering

Dr. Harry Miller
Professor
Psychology, Southern Medical Program

Dr. Neil Eves
Associate Professor
School of Health and Exercise Sciences

Dr. Natalie Forssman
Lecturer
School of Engineering

Dr. Mahdi Takafolli
Research Engineer and MURPH Founder
Materials and Manufacturing Research Institute

INTRODUCTION TO MURPH

MURPH GRADUATE MENTORS

Negin Kazemian
PhD Candidate
Applied Science

Natasha Haskey
PhD Candidate
Biology

“I was able to enhance my ability to conduct research in all aspects, learn how to communicate with people from different disciplines under a professional setting, and develop on my personal organisation and teamwork skills.”

- A MURPH Scholar
Multidisciplinary Undergraduate Research Projects in Health (MURPH): Structure

The MURPH program is a multidisciplinary and interdepartmental research hub at University of British Columbia Okanagan (UBCO), fostering collaborations at the edge of basic and applied research between local, national, & international research & development sectors.

**Mission**

To engage undergraduate students in multidisciplinary research and offer learning objectives mainly relevant to collaborative techniques that are not typical outcomes of current undergraduate research programs at universities.

**Core Objectives**

MURPH offers a unique multidisciplinary research setting along with scholarly and professional development training to undergraduates at UBCO, targeting various learning objectives including:

1. Developing skills for collaboration, scientific discussion, and brainstorming with undergraduate/graduate peers, faculty members, and collaborators from other disciplines;
2. Developing and refining research plans and protocols collaboratively; and
3. Engaging in health research activities that are meant to have meaningful impact on communities, hospitals, industries, etc.,

**History & Success Stories**

The 2021-2022 program supported 10 applied health projects encompassing 10 disciplines with a total of 17 faculty members and 21 MURPH Scholars. Below are examples of projects and achievements by students in the program (MURPH Scholars).
MURPH 2021-2022 Highlights

MURPH Launch Event
(Oct 13, 2021)
Introduction to the program, management members, and funded project teams

Workshop #1
(Nov 18, 2021)
Teamwork & Collaboration

Workshop #2
(Jan 19, 2022)
Client Focus in Research

Workshop #3
(Mar 2, 2022)
Research Dissemination & Presentation

UBC Okanagan Interdisciplinary Student Health Conference
(Mar 10, 2022)

Recognitions

- MURPH funding was awarded by the Office of the Vice-President, Research and Innovation.
- MURPH inspired the launch of the Faculty of Medicine Multidisciplinary Research Program in Medicine at UBC Vancouver.
- One of the ten MURPH presentations at the 2022 virtual UBC Okanagan Interdisciplinary Student Health Conference (Kelowna) was awarded the best oral presentation in its respective category.
- One MURPH Scholar (Aidan O'Callahan) was awarded the 2021 Lieutenant Governor’s medal.
Purpose

The purpose of this research is to create a mixed reality training platform to support educators in guiding/instructing medical and nursing students. The objective is to use a mixed reality device (ex: Hololens, Oculus) to increase interaction during teaching in order to improve the delivery of clinical content and decrease the use of physical medical supplies that are experiencing shortages due to COVID-19. Traditional training methods are limited to lectures and in-person demonstration, while mixed reality devices can enhance interaction through virtual and augmented reality and perform remote collaborative learning. The instructor can utilize this platform and device to teach the class in person or remotely, however, the platform can also allow students to practice the skills on their own time without the instructors’ presence and physical supplies.

Research Impact

With the spread of COVID-19, the use of online learning has increased exponentially, and students in the medical and nursing fields are finding it difficult to effectively learn clinical skills online, and with strict time limitations in the labs, barely enough time is allotted to practice these important skills. Our project, hopes to create an immersive technology training platform/application to not only bolster engagement in learning and enhance knowledge retention, but also provide students with an alternative method to learn where physical lab time, and instructor presence is not necessarily needed needed.

Due to COVID-19, medical supplies are extremely scarce due to increased demand, therefore AR guidance technology offers unique opportunities for students to practice clinical skills.

Testimonial

“It is a great opportunity to be able to work with individuals outside of our discipline, collaborate together to see our project visions come to life, and mimic the work environment in a university setting.”

- Vanessa & Jiyoung

MURPH Scholars
Vanessa Lo
Jiyoung Jang

Principal Investigators
School of Engineering
Dr. Abbas Milani

School of Computer Science
Dr. Mohammad Khalad Hasan

Research Team

Testimonial
Sleep and Family Relationships Before and During the COVID-19 Pandemic

Purpose

Since the start of the COVID-19 pandemic, sleep across the lifespan has worsened, with women being more adversely affected. In a study of Canadian children aged 4 to 14 years, 40% of parents reported that the COVID-19 pandemic had negatively influenced their child’s sleep and 60% of parents (mainly mothers) also reported that their sleep had worsened since the start of the pandemic (Mackenzie et al. 2021). Poor sleep is associated with decreased daytime functioning in children and adults, and can negatively impact family relationships and dynamics. Thus, it is critical to understand changes in family relationships and sleep brought about by the COVID-19 pandemic. The overall objectives of this study are: (1) to describe whether the COVID-19 pandemic has influenced sleep and family relationships in Okanagan families of preschool children aged 2 to 5 years, and (2) to identify factors that might put some families at greater risk of negative outcomes.

Research Impact

This study helps us understand changes in sleep brought about by the COVID-19 pandemic and the effects on family relationships, so that we are better able to develop effective interventions to reduce the long-term impacts of the COVID-19 pandemic.

MURPH Scholars

Andrea Tam
Tristen Ramsay

Principal Investigators

Department of Psychology
Dr. Susan Holtzman

School of Nursing
Dr. Elizabeth Keys

Research Team Testimonial

“The MURPH program is an immensely enriching experience that allows us to gain valuable research experience and expand on our teamwork skills through working with people from different disciplines.”

- Andrea & Tristen
Restorative Approach to Addressing Healthcare Harm: Building a Curriculum

**Purpose**

Patient Harm in providing health services is a significant safety issue. Many efforts have been made to improve patient safety and prevent harm, however high rates of patient safety events continue to occur every minute and 18 seconds and result in 28,000 deaths/year in Canada. Healthcare harm occurs when an individual experiences harm as a result of an interaction with the healthcare system. This type of harm is most often unintentional, but when it does occur, all parties become involved in processes that ultimately do not facilitate healing. A restorative approach is a worldview encompassed by relational communication which fosters mutual understanding and healing to instill trust in the system. The purpose of this project is to develop a curriculum that teaches about a restorative approach and how it can facilitate healing for all parties involved when events of healthcare harm occur.

**Research Impact**

Developing a curriculum to teach what a restorative approach is will help healthcare providers and patient safety experts to understand how relational communication will be beneficial to fostering an environment of healing after harm occurs. Implementation of this curriculum in various health authorities and sectors will allow this approach to be recognized and facilitate its use within the health system.

“Working within a multidisciplinary team has greatly enhanced the quality of our project by allowing each member of our group to consider new perspectives from each other’s disciplines of study.”

- Alisha, Dylan, & Madyson

Relational healing through conversation.
Foundations of Equitable Nursing Documentation and the Design of Healthcare Fairness Artificial Intelligence

**Purpose**

Historically, various marginalized populations have had difficulties with accessing healthcare due to biases within our healthcare system. These biases often surround topics such as racism and sexism (amongst others), which cause discriminated individuals to avoid seeking healthcare in times of need. Importantly, these inequities are readily observed by community health nurses (CHNs) around BC. CHNs are also the ones who actively document healthcare information, through electronic health records (EHRs). Unfortunately, EHRs themselves are a root problem in equitable healthcare because they can be found to promote inequities in documentation. For these reasons, through interviews, we are examining how CHNs think about equitable healthcare, how they document equitable healthcare, and how the design of EHRs shape documentation. This information will then be incorporated into an artificial intelligence program to identify and prevent future inequities, thus allowing patients to feel safe to access healthcare.

**Research Impact**

The development of an equitable documentation style for community health nurses will allow the identification and reduction of implicit biases through artificial intelligence. This project could encourage marginalized groups to seek healthcare where they historically may have avoided it.

Medical records are the first step to equitable healthcare..
Using Artificial Intelligence to Assess Performance of Fine Motor and Upper-Limb Skills in Health and Disease

**Purpose**

About 80% of Canadians with strokes have difficulty moving their arms or legs. However, rehabilitation is often expensive and it requires the person to come into the clinic. To solve this, our research uses a new system called DeepLabCut, and a camera, to detect a person’s movement. By doing so, the person does not have to travel to a clinic because we can track their recovery progress from their own home. Additionally, the person does not need to purchase expensive machines that a clinic would use. With that, our project will help provide a cost-effective solution to monitor recovery progress for individuals with stroke from their home.

**Research Impact**

This project is important because individuals with stroke who live far from clinics now have access to rehabilitation. Using this new system and a camera, we can track their movements from home, so individuals do not have to travel to a clinic. This should improve fairness to care for individuals with stroke.

"The opportunity to become a MURPH Scholar has allowed us to apply our knowledge from the classroom and continuously learn and utilize knowledge from different disciplines in providing solutions that could be useful for the community. It also provides a space to create connections and learn to work effectively in a team."

- Ella & Nadine
Generating Mucus Factories to Combat Intestinal Diseases

Purpose

The microbes in our gut represent a powerful physiological force for harm or for good. Recent studies have shown that sugars called O-glycans, present in our gut’s protective mucus barrier, can directly promote beneficial health-promoting microbial functions. The purpose of our research is to develop a system to produce mucus and then test its ability to decrease inflammation associated with inflammatory bowel disease (IBD) and colon cancer. Mucus has been found to promote healthy microbes to reduce inflammation, which would combat IBD and colorectal cancer. Finally, we could alter the mucus producing cells to maximize the anti-inflammatory affects.

Research Impact

Intestinal diseases are prevalent and greatly decrease the quality of life for people with them. This research will be the first of its kind and will lead the way for possible treatments for IBD and colon cancer via mucus production. This can set the stage for commercial mucin-based therapeutics.

MURPH Scholars

Spencer Ursel
Ojogbane Amedu

Principal Investigators

Department of Biology
Dr. Kirk Bergstrom

Department of Chemistry
Dr. Wesley Zandberg

Research Team Testimonial

“Through MURPH we have gained a greater understanding of research and new appreciation for different disciplines.”

- Spencer & Ojogbane

Generation of mucus factories from human colon organoids.
A Mobile MakerSpace to Support Inclusive Patient and Community-led Technology Solutions for Rural Health and Wellness

**Purpose**

Rural residents and health service providers have long experienced struggles in accessing affordable and inclusive health and wellness goods and services compared to their urban counterparts. Therefore, the goal of this project is to understand the health-related needs of rural BC communities, and then creating a mobile Makerspace that includes community-led technology solutions for rural health and wellness. A Makerspace is a place in which people with shared interests, especially in computing or technology, can gather to work on projects while sharing ideas, equipment, and knowledge. The goal of the proposed Makerspace is to improve access, broaden participation, support diversity, and act as an “equalizer” for people to apply and advance knowledge towards the aim of supporting health and wellness in rural communities.

**Research Impact**

Over 18% of Canadians are living in rural and remote areas. But, as health and well-being challenges experienced by rural citizens require more inclusive and locally-driven solutions, this project seeks to expand the design and use of makerspaces beyond an urban lens. We hope that our proposed Makerspace will improve the health and well-being of people living in rural BC communities.

Mobile rural MakerSpace project overview.
The ‘Personal Belongings Carrier’ and its Impact on Vulnerable Communities

**Purpose**

The ‘Personal Belongings Carrier’ or PBC was first created in 2018 by a group of engineering students at UBC Okanagan. The goal was to create a safe and functional alternative to the shopping cart so the homeless population could store and transport their belongings with ease. Shortly after its creation, UBCO’s School of Engineering partnered with the School of Social Work to prepare the PBC for the streets. Through this multidisciplinary qualitative study, we will examine the effectiveness of the PBC by gathering information on how it is viewed and used by Kelowna’s homeless community. We are also exploring how the PBC could be used during evacuation events.

**Research Impact**

One of the largest stressors for the homeless community is finding a way to safely store and transport their belongings without anything getting lost or stolen. By designing an effective belongings carrier, our hope is to eliminate this element of stress and allow homeless individuals to apply their time and energy elsewhere.

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The Personal Belongings Carrier was designed by engineering students at UBCO with the intention of providing the homeless community with a safe and effective way to store and transport their belongings.

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**MURPH Scholars**

Paige Reekie
Deniz Gunduz

**Principal Investigators**

School of Social Work
Dr. Shirley Chau

School of Engineering
Dr. Abbas Milani

**Research Team Testimonial**

“We are grateful to have the opportunity to combine our knowledge of engineering and humanities; we hope that we can use this experience to create a positive impact in the lives of the homeless community and better understand the scope of our practices.”

- Paige & Deniz
An Online Resource for Safe Active Recreation for Families Living with Autism

**Purpose**

Physical activity for children with neurodevelopmental disabilities (NDD) is important for their physical, psychological, and social development. Participation in recreational activity by children with autism spectrum disorder (ASD) is important for health and social inclusion. However, children with ASD and their families often experience barriers to recreation participation such as parental safety concerns surrounding active recreation (i.e., wandering and running away from family) and a lack of educational resources. In this study, we are designing a web-based parent resource to increase safety awareness in recreational settings. Results from an online survey with parents will be used to inform website design in terms of topics and format of information and resources that parents would like to see included to assist with supporting their children to engage in safe and active recreation.

**Research Impact**

This project aims to encourage active recreation for families with ASD by providing information that will reduce the risk of harm during these activities, boost excitement and provide access to resources and support. This study will inform us of topics that interest parents and their preferences for safety information surrounding active recreation for their children. This research will help to address these concerns and encourage healthy recreation participation for families.

"The MURPH program has allowed us to explore previously learned topics from our degree, while expanding our knowledge through a multidisciplinary lens."

- Paige & Rebecca

Family out for a walk.
Steps to Indoor Normalcy through COVID-19 Particle Spread Experiments

**Purpose**

The main purpose of our research is to analyze harmful aerosol dispersion in indoor environments and test the effectiveness of mitigation strategies. To do this, harmless and traceable aerosols similar to those in question will be released in classrooms and hospital rooms, and their presence and behaviour will be measured. This simulation work will help determine how effective mitigation technology is (e.g., portable air filters) and how factors like room size, HVAC ventilation levels, viral load, and respiratory activity influence the spread of aerosols, which will ensure our data is useful for maintaining safe indoor environments for both students and patients.

**Research Impact**

Through our experiments we aim to specify more exact protocols that should be followed in indoor spaces to ensure public and worker safety. Thanks to this specification, the way society handles pandemics could drastically change, and become not only more efficient, but also more effective, helping reduce the spread of potentially dangerous conditions.

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**MURPH Scholars**

Riya Naik
Endrio Rambelli

**Principal Investigators**

School of Engineering
Dr. Sunny Li
School of Health and Exercise Sciences
Dr. Jonathan Little

**Research Team Testimonial**

“Working in a multidisciplinary research team on a relevant worldwide issue presents the chance to learn from our peers in other fields of study and hence presents a valuable opportunity for personal growth.”

- Riya & Endrio
INTRODUCTION

Background:
- Due to the Covid-19 pandemic, students in healthcare are finding it challenging to learn practical clinical skills online.
- The pandemic has led to a global scarcity of medical supplies with manufacturers prioritizing hospitals, leaving education/facilities with limited supplies to utilize for training purposes.
- Inspired by the recent advancements of augmented and virtual reality technology, we created a mixed reality training platform for healthcare students.

With mixed reality, physical and digital objects co-exist in a way that enables interactivity between the two.

METHODS

1. Review of existing AR and VR training solutions
2. Development of mixed reality training platform
3. User feedback and evaluation

A Mixed Reality Guidance Tool For Medical Training
Vanessa Lo, Jay Jang, Rohith Jayaraman Krishnamurthy, Iman Jalivand, Mohammad Khalad Hasan, Abbas Milani

The University of British Columbia, Okanagan Campus

Sleep and Family Relationships Before and During the COVID-19 Pandemic: A Study of Central Okanagan Families with Preschool-aged Children
Tristen Ramsay, Andrea Tam, Elizabeth Keys, Susan Holtzman
University of British Columbia, Okanagan Campus

CONCLUSION

Undergraduate Projects

The mixed reality training platform aims to enhance the quality of students’ training experience and enable educators to make the shift to disruptive technology in the training of future healthcare professionals.

This platform has potential to become a valuable tool in bridging the gap between practical and theoretical knowledge in healthcare training.

Next Steps:
- Collect data regarding students’ perceptions of the training platform
- Collaborate with further feedback on learning outcomes and efficiency of the training
- Publish findings in academic journals to guide future mixed reality training development in the field

PRELIMINARY FINDINGS & NEXT STEPS

Background:
-... (same as above)

Objectives:
-... (same as above)

METHODS

1. Review of AR and VR solutions in medical and medical training
2. Review of AR and VR systems implementations and methodologies
3. Development of mixed reality training platform

A stronger link between sleep quality and family relationship quality in the pandemic cohort.

Hypothesis

We expect...
- Participants in the COVID-19 cohort to report poorer sleep and lower family relationship quality compared to the pre-pandemic cohort.
- A significant association in both cohorts between sleep quality and family relationship quality.
- A stronger link between sleep quality and family relationship quality in the pandemic cohort.

METHODS

- Collect data during the current 2022 COVID-19 wave through an online survey tool (Qualtrics)
- Compare these to a pre-pandemic 2019 cross-sectional dataset
- Online questionnaire will ask about parent-child and partner relationship quality, child sleep duration, parental sleep quality and fatigue, child and parental well-being and mental health, and child and household sociodemographic characteristics
- Participants will be recruited through social media and community partners

Implications

- Understanding changes in sleep brought about by the COVID-19 pandemic and the effects on family relationships is crucial to developing effective interventions to reduce long-term impacts.

Findings will:
- Inform local programming
- Add to the emerging evidence base on the impact of the COVID-19 pandemic on families with young children

Multidisciplinary Undergraduate Research Projects in Health (MURPH)
Developing and evaluating an educational program for using a restorative approach to address healthcare harm

Dylan Rogers, Madyson Campbell, Alisha Sindhu, Dr. Colin Reid, Alison Kooijman, Melissa Faulkner, Dr. Nelly Oelke

Introduction

Every 10 s, a patient safety incident occurs in the Canadian healthcare setting, resulting in the deaths of 28,000 Canadians a year. Healthcare harm occurs when an individual experiences harm due to an unintended interaction with the healthcare system. This type of harm is often unintentional, but when it does occur, these events can negatively affect the patient’s health and well-being. Current administrative approaches focus on attributing blame and punishment and ultimately the needs of patients, their families, and providers often go unmet.

A restorative approach is a worldview encompassed by relational communication which fosters mutual understanding and healing to support just relations between people, communities, and institutions. It encourages conversation and sharing of experiences related to harm, so to articulate healing needs, reconcile conversation and sharing of experiences related to harm, so to articulate healing needs, reconcile communities, and institutions.

The purpose of this project is to develop a pilot curriculum that teaches about restorative approach (RA) and how it can facilitate healing for all agents involved when events of healthcare harm occur.

Developing a curriculum to teach what RA is will help health care providers and patient safety experts to understand how relational communication will be beneficial to fostering an environment of healing after events of harm.

Method

The qualitative data concerned the strengths and weaknesses of the program, and fostered space to host communication as to how to facilitate the learning of others in the future. The results reflected a keen interest in further case studies, with comments such as “demonstrating an interest in moving beyond conceptual toward application.”

The closed-ended, qualitative questions consisted of five responses which ranged from strongly disagreed to strongly agreed, associated with a numerical value from 1 to 5 (with 1 being strongly disagreed and 5 being strongly agreed).

Of the qualitative questions, two regarded the learner’s background and their experience with RA. The following three questions concerned the learner’s experience with the curriculum. The quantitative results were analyzed for the mean and standard deviation, providing insight as to how the collective responded to the curriculum’s content and medium of presentation.

One question regarding the learner’s knowledge following the curriculum returned a mean of 4.2 out of 5, denoting a strong confidence in the accumulated knowledge following the curriculum; a following question asked how the learner’s understanding of RA improved following the curriculum, and returned a mean of 4.53 out of 5.

When asked whether they would like to receive further learning opportunities concerning the use of RA in healthcare contexts, the sample response had a mean of 4.87 out of 5, demonstrating a statistically strong interest in further learning opportunities.

Impact and Future Work

The objective of this pilot curriculum was to provide learners with the foundational knowledge to continue lifelong learning of RA. Learners were introduced to the key facets of a RA worldview and explored an alternative means of addressing healthcare harm.

The Qualtrics survey results reflect a growing interest and engagement with RA principles within the collective involved with this pilot curriculum. Responses will be used to adapt the curriculum and guide future training opportunities on using RA in healthcare contexts. Future projects include RA-facilitator training in partnership with the Canadian Justice Institute and feasibility projects in two BC health authorities.

References


Acknowledgement

Thanks to the BC Patient Safety & Quality Council and Multidisciplinary Undergraduate Research Projects in Health for supporting this project.

The increased interest and use of Artificial Intelligence (AI) also risks for exacerbating existing societal biases. As the technology progresses, it is important to ensure that AI is developed in an equitable and ethical manner.

Understanding the Complexity in Clinical Documentation of Health Equity: Beginning Steps Towards Equitable AI

David Shifflett, Dawson Penner, Dr. Shirley Chau, Dr. Xiaoxiao Li, and Dr. Charlene Rongqiu

Introduction and Objectives

A key goal in health care delivery is ensuring that everyone in a society has equal access to the same level of health care. The increased interest and use of Artificial Intelligence (AI) in healthcare systems presents an opportunity to improve access and quality of care. However, the incorporation of AI into clinical decision-making has been slow and often fraught with ethical concerns.

A simplified representation of the grounded theory approach

Method

A grounded theory approach, a method for developing theory from data, was employed (see Figure 2 ). As per Glaser and Strauss’ grounded theory methodology (2009), a qualitative study was conducted to collect and analyze data on the development and implementation of a restorative approach in healthcare settings.

Participants

Approximately 30 community health nurses who work in two health authorities in British Columbia were recruited to participate in the study. A snowball sampling method was used to identify and recruit additional participants.

Procedure

Qualitative data was collected through interviews and focus groups (see Figure 3 ). Data collection methods included open-ended questions, role-playing exercises, and observational notes. The data was analyzed using constant comparative methods, and emerging themes were developed and refined throughout the data collection process.

Results, Discussion, and Conclusion

The sampling frame of using two specific health authorities in British Columbia may limit the generalizability of the findings. This study comprises the first in a series of studies in a text corpus of terms used by community health nurses to understand how community health nurses conceptualize and document health equity issues in electronic health records. We address this gap by seeking to obtain diverse participants and introduce the possibility of poor representativeness of the sample.

Future Directions

This study comprised the first in a series of studies in a large program of research that aims to leverage risk, data-driven data to develop and evaluate artificial intelligence algorithms for health systems. Results from this study will be used to inform the development of a framework for understanding how community health nurses conceptualize and document health equity issues in electronic health records. This project is intended to be used in future studies that will build equitable AI predictive risk models for use by community health nurses.

Understanding community health nurses' conceptualization and documentation of health equity in electronic health records

Figure 1. An overview of the first steps in this time and project

Figure 2. A simplified representation of the grounded theory approach

References

Using Artificial Intelligence to assess performance of fine motor and upper-limb skills in health and disease

Nadine Widjaja, Ella Barinon, Soovta Gopalakrishnan, Pamela Holliday, Vicki Komisar, PhD, Sarah N. Kraeutner, PhD

Introduction

• Stroke recovery requires long term interventions • DeepLabCut is a machine learning software that can perform markerless motion capture and would allow for remote tracking of motor recovery.

Hypothesis: We hypothesized that manual tagging with DLC will accurately capture the position data of a participant's hand movement compared to a touch-screen based tracker of position data.

Methods

Here, accounting for camera angle, timing, and sampling rate, we examined the accuracy of DeepLabCut to track hand movements through the following steps:

1. Recorded participants' hand movements during a tracing session using a consumer-grade camera's screen trajectories.
2. Manually tagged the participants' movements.
3. We obtained the x- and y-coordinates (DeepLabCut trajectories) of participants' hand movements based on the tag.
4. We compared the x- and y-coordinates between the DeepLabCut trajectories and touch-screen trajectories of the participants.

Funding: Multidisciplinary Undergraduate Research Projects in Health (MURPH) and the Irving K. Barber Faculty of Science

Acknowledgements

Funding: Multidisciplinary Undergraduate Research Projects in Health (MURPH)

Results

Discussion

• Based on the results, manually tagging participants' hands may accurately track human movements.
• However, there were a few things to note with the current study; it was challenging to extract more than 100 frames and points to replicate the screen trajectories accurately with lower sampling.
• Furthermore, we learned that the angling of the camera is crucial in ensuring that these plots follow the same trajectories.
• Nevertheless, it is essential to note that this is initial human tagging, where it is more prone to human error. There is work in progress in testing the DLC using a supercomputer to obtain more data points for more accurate DLC trajectories.

Conclusion

Our study acts as initial evidence in the concept of markerless motion capture.

We identified areas to focus on for future studies, such as determining optimal sampling rate and gaining a deeper understanding of the sources of human error.

This lays a more robust groundwork for future validation studies that explores markerless motion capture with consumer-grade equipment.

References


Acknowledgement

This work was supported by the teaching and learning work of graduate student data analysts, and hvorir was guided by their research.
Introduction/Background

We aim to establish the conceptual and practical foundations to inform the development of a makerspace for health and wellness that will serve rural British Columbia communities, with a focus on inclusive and creative technology solutions. Makerspace is defined as: “A place in which people with shared interests, especially in computing or technology, can gather to work on projects while sharing ideas, equipment, and knowledge.” The goal of the eventual makerspace is to improve access, broaden participation, support diversity, and act as an “equalizer” to foster innovations in supporting health and wellness in rural communities.

Objectives

Study purpose: This is an exploratory multiple case study that aims to identify and articulate the requirements to build an inclusive makerspace focused on enabling the development of health and wellness solutions in rural British Columbia communities.

The study includes the following objectives:

1. To understand how existing makerspaces in cities and rural communities in British Columbia have been developed.
2. To understand provider experiences running and maintaining a makerspace and user experiences of using a makerspace.
3. To understand the extent to which health and wellness projects have been targeted in existing makerspaces.
4. To gain insight into how makerspace users determine what counts as innovation.

Methods

To address the study objectives, we implement a two-component research design: integrated literature review and multiple case study.

Component 1 – Integrated Literature Review

Component 2 – Multiple Case Study

We will identify three makerspace sites in British Columbia to conduct a multiple qualitative case study. We will use purposive and snowball sampling to recruit participants from each makerspace site. All participants will be provided with an honorarium as a token of thanks for their participation. We will use thematic analysis to analyze study data.

Data we will collect in this study include:
- Individual interviews
- Focus groups
- Document artifacts

Study population:
We aim to establish the conceptual and practical components: prototype design and data collection.

The prototype cart was designed by a group of UBC engineering students. The cart has many features, including a lockable safe, USB solar panel, an internal power bank, a GPS system, LED fencing, and 0.5 m³ of storage.

Methods

Results

It was determined that the homeless community would benefit from the implementation of a PBC device, however, only with certain alterations.

Many participants suggested that those who are unwilling/unable to live in shelters would benefit most from having the PBC. To address this community specifically, it was recommended that shelter-like components such as a pull-out canvas tent or an extendable chair be included.

Figure 1. A side-view of the PBC prototype.

Acknowledgement

We would like to give thanks to our supervisors, who provided guidance and support throughout this project.

References


Future Work

In the coming months, we plan to continue data collection in downtown Kelowna. After sufficient data has been collected, the team of engineers will develop a new prototype that encompasses the feedback we received. Then, we hope to create a plan to distribute the PBC throughout Kelowna as well as other cities.

Future Work

We hope that our work will prompt future researchers and investors to actively build a health Makerspace and fund the project adequately respectively. We hope to see Makerspaces being not only urban-centric but also focused to rural communities.

Conclusion

Upon completion of our study, these are the things that we hope to achieve:

- Necessary knowledge to build an inclusive makerspace for health and wellness solutions in rural BC communities.
- The goal of the eventual makerspace to improve access, broaden participation, support diversity, and act as an "equalizer" to foster innovations in supporting health and wellness in rural communities.

The ‘Personal Belongings Carrier’ (PBC) and Its Effect on Vulnerable Communities

Paige Riehle1, Deniz Gündüz2, Shirley Chau, Ph.D.2, Abbas S. Milani, Ph.D.2

Background

The ‘personal belongings carrier’ was created by a group of engineering students at UBC Okanagan. The goal was to create a functional alternative to the shopping cart that enabled the homeless population to store/move their belongings with peace of mind (UBC Okanagan News, 2018). The PBC was recognized by the city as a device that could help facilitate independence and improve quality of life (Journey Home, 2018).

The issue of homelessness reaches far beyond a lack of housing; homeless individuals face additional barriers such as stigmatization, criminalization, and an inability to secure their property (Eisenmann and Orgario, 2021). Homeless individuals spend excessive amounts of time transporting and protecting their belongings, this can prevent them from accessing services. During natural disasters, shelters often do not have a system in place to safely and efficiently store belongings, this makes it a prominent issue (Cho et al., 2020). It is possible that a PBC-like device could be implemented at these shelters to increase security and promote recovery.

Objective

This study investigates how a locally engineered ‘personal belongings carrier’ can be used to improve the quality of life for vulnerable communities, specifically the homeless population and natural disaster evacuees. We will receive feedback on the PBC prototype design so we can engineer a more desirable model.

Methods

This human-centered design study can be separated into two components: prototype design and data collection.

The prototype cart was designed by a group of UBC engineering students. The cart has many features including a lockable safe, USB solar panel, an internal power bank, a GPS system, LED fencing, and 0.5 m³ of storage. The dimensions are 27.5” in width, 29” in length, and 38.5” in height. The empty weight is 55 lbs.

Results

It was determined that the homeless community would benefit from the implementation of a PBC device, however, only with certain alterations.

Many participants suggested that those who are unwilling/unable to live in shelters would benefit most from having the PBC. To address this community specifically, it was recommended that shelter-like components such as a pull-out canvas tent or an extendable chair be included.

Figure 1. A side-view of the PBC prototype.

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References


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Introduction
- Physical activity for children with neurodevelopmental disabilities (NDD) is important for their physical, psychological, and social development.
- For children with autism spectrum disorder (ASD), participation in recreational activities contributes to social inclusion and quality of life.
- Children with autism and their families experience many barriers to recreation participation.

Research Objectives
- This project aims to develop a web-based resource for families of children with ASD to mitigate barriers surrounding safe and active recreation.

Methods
- A web-based parent resource is being designed to increase safety awareness in recreational settings.
- We collected data through an online survey to incorporate parent preferences into the website.
- To date, 8 parents and 7 service providers have responded (n=15).
- A literature review of peer-reviewed academic sources and reputable gray literature is currently being completed on safe swimming and water activities, hiking and camping.
- Academic articles are being identified through Psycinfo, CINAHL, and Google Scholar.

Preliminary Survey Results:
- Access to supervisors and coaches with safety-related training was rated as the most important topic to include for accessing safe environments.

Website Design:
- Survey participants cited reliable and trustworthy information, well-organized pages, and ease of navigation between pages as the top 3 most important website features to include.

Outdoor Activities:
- Outdoor activities can be very beneficial for a child’s development.
- Children with autism show preferences for outdoor play with sensory elements.
- There is a risk of injury while children engage challenging, exciting play that may include a possibility of harm may benefit children including those with autism.
- Hiking and Camping:
- Outdoor activity can be beneficial for children with autism, but may include hazards.
- Situations are variable and can be adapted to each child’s needs.
- To mitigate risk, it is important to prepare and plan for all scenarios.

Swimming and Water Safety:
- Swimming has been found to have therapeutic, social, and physical benefits for children with autism.
- It has been noted that swimming is the most preferred physical activity for children with autism.
- Unintentional drowning because of elopement (running away) reported as the leading cause of death in children with ASD under 14.
- To mitigate these risks, autism-specific swimming lessons have been found to be effective, as well as using individualized modifications for safety while in the water.

Additional References:

References:
- This project aims to develop a web-based resource for families of children with ASD to mitigate barriers surrounding safe and active recreation.

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