CommonHealth

A Journal of the College of Public Health at Temple University

VOLUME 6, ISSUE 1 | APRIL 2025

Editorial Board

About the Editorial Board

CommonHealth, a journal of the College of Public Health at Temple University, is a peer-reviewed, online-only, open access journal for rapid dissemination of high-quality research and scholarship related to all aspects of public health. The Editorial Board includes representatives from each of the College's departments, with emphasis on student participation and membership. This membership aligns with the CPH's mission to promote transdisciplinary collaboration and develop the next generation of leaders in research, scholarship, service, and innovation. Our Board recognizes the need for shared governance with students so that the administration of the journal can serve as a training opportunity as well.

VOLUME 6 | ISSUE 1 | APRIL 2025

CommonHealth

A Journal of the College of Public Health at Temple University

https://tuljournals.temple.edu/index.php/commonhealth
Online ISSN: 2690-6910

TABLE OF CONTENTS

College of Public Health

Visit our website to download a PDF of any article you see.

ORIGINAL RESEARCH ARTICLE
Volume 6 (2025), No. 1, pp. 01-14
DOI: 10.15367/ch.v6i1.688

Does a Peer Led Autism Travel Training Program Work? A Collaborative Autoethnography

AMBER POMPONIO DAVIDSON, MPH[1], LUKE TOMCZUK[1], MOYA KINNEALEY, PhD, OTR/L, FAOTA, BCP[1], BETH PFEIFFER, PhD, OTR/L, BCP, FAOTA[1]
[1]Department of Health and Rehabilitation Sciences, College of Public Health, Temple University, Philadelphia, PA

Correspondence: amber.davidson@temple.edu (Amber Pomponio Davidson)

Introduction

Implementing education programs that involve real-life experiences and one-on-one support for autistic youth is crucial for teaching them how to travel independently. However, evaluating how well intervention programs that include interactive social and problem-solving aspects work in real-life situations is quite challenging. Specifically, it is difficult to evaluate peer led intervention programs that require close coordination with supervisors and training teams. An autoethnography lends itself to exploring assumptions and themes underlying this peer led training process.

Transportation is a critical component to community participation for young adults with Autism Spectrum Disorder (ASD).[1–3] Access to transportation facilitates their development and post-secondary school transition into work, education, social and leisure activities and independent living.[4] Competency in the use of local accessible public transportation can be a critical element in visualizing and accessing opportunities to meet personal goals and actively participate in community resources.[5,6] ASD is associated with developmental differences in communication, social interaction and cognition, and reactions to sensory stimuli.[7] No single behavior is always present for individuals with ASD.[7] These characteristics exacerbate their difficulties with transportation use.[8] Achieving independent mobility to access work, study, and to experience social aspects of adulthood relies on a complex interplay of social participation and mobility skill development starting early in adolescence.[9]

Access to transportation increases community participation.[4,10] Increased community participation including employment, access to health services, social participation is often associated with increased quality of life.[11] Individuals with ASD experience reduced rates of participation which contribute to poor health outcomes including quality of life.[12,13]

One way to increase community participation for individuals with ASD is to decrease barriers to transportation.[2,3] Low-cost independent mobility options such as public transportation can have a positive association with increased participation and quality of life. Individuals with ASD responded to a 2010 survey and indicated that public transportation was critical to meet social and employment goals.[14] An additional pilot survey reported 68% of individuals with Intellectual or Developmental Disability (IDD) believed using public transportation would increase their independence.[15]

Travel training interventions have been designed to increase mobility for individuals with ASD.[16] Transportation interventions that remove barriers are crucial to increasing community participation for individuals with ASD.[3,10] Specifically the interventions target increasing skills necessary to efficiently use a specific mode of transportation.[16] [16] Research on travel training interventions has identified evidence-based techniques for improving specific transportation-related competencies in AYA with ID.[17,18] These are often limited to one specific skill or one type of transportation. There is additional evidence to support travel training for one mode of transportation such as public transportation,[1] or walking,[19] but limited evidence that examines more comprehensive travel training interventions that address multiple skills for a variety of transportation modes. Notwithstanding the importance of prior work, its narrow focus on relatively homogenous groups of people with similar transportation challenges limits its applicability to large numbers of people with ASD. Moreover, most travel training interventions use a "one-size-fits-all" approach, thus reducing their effectiveness for people with certain transportation-related needs, preferences, and challenges.

Many individuals with ASD lack the training necessary to access public transportation. In addition, training anxieties and self-efficacy can affect their overall travel abilities. A one-on-one travel training intervention is seen as a feasible option for decreasing these barriers. The Kennedy Center developed a Travel Training curriculum Travel Training Guide and Curriculum to support individuals with IDD. The program has been widely used but the efficacy of the program is yet to be determine. This autoethnography was generated as part of a larger study by Pfeiffer, Temple University, (manuscript in review) on travel training using a modified version of the Kennedy Center curriculum with an additional element, peer support, to better encourage self-efficacy among individuals with ASD.

Peer Trainer/Instructor

Peer support "is a unique supportive relationship between two or more individuals based on mutual support, mutual respect, and connection".[20] Peer support is often provided by peers, peer trainers, peer mentors, and peer interventionists. These types of peer support differ by level of training. These terms are confusing and are sometimes used incorrectly in research. For example, the term "peer support" has been utilized with transition age individuals with ASD. However, in these cases "peer support" is often through a mentor who is of similar age and interests but without disabilities teaching a mentee with disabilities. A peer is an individual who is of similar age, interest, and abilities as the person with whom they are interacting.[21] identifies that based on the social learning theory, shared experiential knowledge facilitates positive outcomes. Peer mentoring is designed as a learning partnership with ongoing guidance. The goal of the interaction is the development, learning and growth of the mentee. The relationship can evolve and change over time.[16]

In peer support situations it is hypothesized that learning from a peer can facilitate outcomes that may not occur if young adults experience only professional support.[22,23] Evidence suggests that peer interactions uniquely foster social networks. Facilitating social connection may be essential for participation of socially isolated young adults with ASD.[21] [21] In this study a peer interventionist (PI) was used to facilitate peer supports. A peer interventionist is defined as a peer with broader education and training responsibilities including curriculum development adaptation, planning, and implementing the program. The PI is carefully trained by their supervisor, the travel training program coordinator (TTPC), to perform the intervention. The crucial role of the peer supervisor is alluded to in articles; however the specific role, tasks and interactions are not clear. This role may be a crucial element in the PI's success with the interventions. An

autoethnography is a research tool that can be used to explore these roles.[24]

Autoethnography is an observational and participatory research tool that has the potential to tease out and clarify the important roles and reactions inherent in transportation training of autistic youth.[24] Autoethnography is a qualitative research method based on active self-reflective writing.[25] It explores the lived experience of the author through insight and self-identity including beliefs, practices, values and emotions. Peer interventionist experiences are useful to develop future training. Autoethnography is a tool to collect these experiences. Thoughtful consideration was used to determine that collaborative autoethnography was an appropriate method to explore in-depth factors underpinning the effectiveness of the intervention.

The study reflected insights of the peer interventionist and program coordinator that identify factors that facilitate successful peer interventions. The purpose of this study was to answer the questions; What are the lived experiences and perceptions of the PI and research coordinator involved in the TTPC? What are the underlying assumptions of this type of training that should be explored or incorporated in the future? What insights should be used to guide programs?

Method

In this study the training program relied on close collaboration of the Travel Training Program Coordinator (TTPC) and the Peer Interventionist (PI). This dynamic can be captured best in collaborative autoethnography that is a coauthored dialogue- response, written collaboratively and responsively.[26]

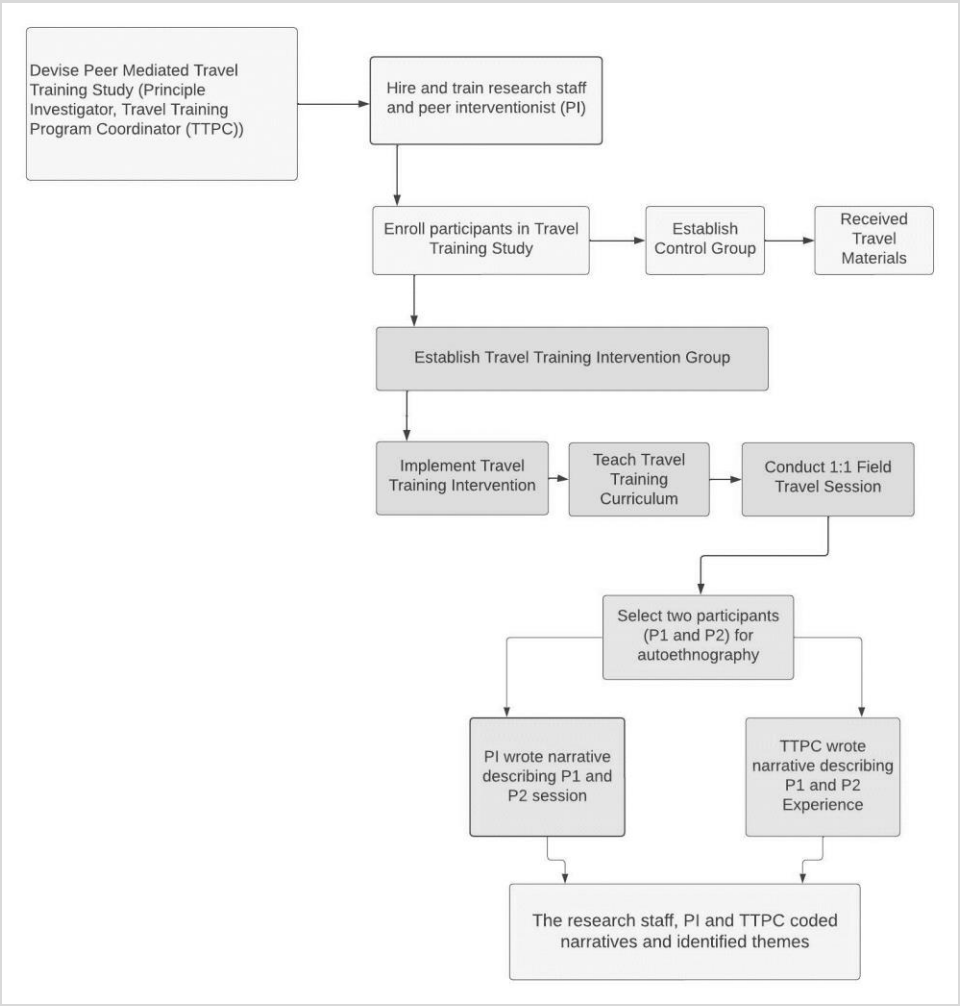
Figure 1 describes the autoethnography process within a larger research project. Individuals with ASD were screened and accepted into travel training based on readiness and inclusion criteria. Inclusion criteria for the study were transitional aged youth or young adults with a diagnosis of autism who could access a transportation rout within ¾ mile of their departure and a destination for travel. The screening assessment was designed for use of the Chance to Ride curriculum used in the program. The 29 item self-report included items such as ability to concentrate, focus, follow direction, communicate, understand street safety, and stranger awareness, manage sensory behavioral and stress situations and know when and how to seek appropriate help.

Individuals were scheduled for 1:1 meeting to consent and complete further readiness and demographic information. After consent was obtained individuals with ASD were randomized into either a travel training program or control. Those assigned to the travel training met with the peer interventionist and program coordinator to participate in the travel training program which includes, curriculum training using the adapted Kennedy Center Travel Training Guide followed by 1:1 community travel. The curriculum training included dyadic sessions on emergency preparedness, trip planning, transportation modes, transportation apps, ticket purchasing, and travel behaviors. These sessions were followed by 1:1 community travel during which the participant and PI planned and accessed travel to and from a destination of the participant's choice. Supervision was eventually reduced resulting in independent travel.

The travel destinations were primarily determined by the participant with influence from the travel training program coordinator (TTPC), family, and support staff. Destinations included places of participant hobby interest, social opportunities, education, and future employment sites. Twelve travel training sessions occurred. The control group received a travel information packet regarding public transportation but no 1:1 travel training occurred. A clinical consultant completed 'fidelity to intervention' observations on the training experience using a peer mediated intervention fidelity checklist. In addition, the peer relationships were observed and scored using a five-point peer process/relationship indicator that included behaviors, clear

communication, active listening, encouragement, working together and enthusiasm.

Figure 1.
Autoethnography Process



Autoethnography

In this collaborative autoethnography the PI and TTPC wrote narratives about their own lived experience as they worked with two participants on two influential travel sessions. The collaborative autoethnography can be evocative or analytical. The process for collaborative ethnography does not follow a specific procedure.[25] Both authors collaborate multiple times with one another to discuss their experiences and encounters. The discussions allow for mining of meaning and for narratives to take shape. They offer personal experiences

and feelings on two specific travel training sessions. The autoethnography is used to examine layers of experience and the broader social implications.[27]

Evocative Descriptions

The following narrative descriptions are accounts from either the Peer Interventionist (PI) or Travel Training Program Coordinator (TTPC) as defined below. They are often presented in the first person in the language and thoughts of the narrator.

Peer Interventionist (PI)

The peer interventionist was a 23-year-old person with ASD. The peer interventionist in this transportation training program had passion and knowledge towards this subject due to a lifelong interest in trains and other modes of public transportation. The PI family's work in the public transportation system encouraged this passion. In addition, PI was interested in advocacy and peer mentorship programs. The PI previously completed a 75-hour Community Autism Peer Specialist (CAPS) program that addressed the core value of wellness, self-advocacy, empowerment, and community inclusion. Topics also included insight and learning behaviors of an effective instructor including clear communication, active listening, encouragement, positive regard for people and enjoyment of activities.

The PI was trained and tested using a modified version of the Kennedy Travel Training Curriculum. The PI worked with peer mentees over the course of 2-3 months. The interventionist implemented the curriculum over the course of three to five 30–60-minute sessions. The PI worked with the mentees to achieve their chosen travel route for 10-12 sessions. A session typically lasted between 1-2 hours.

Travel Training Program Coordinator (TTPC)

In this project mentees were accepted from city and suburbs of a major metropolitan area. The travel training project coordinator reviewed the referral, met with parents or program caretakers and mentees, completed the questionnaires, and worked with the Peer Interventionist to develop teaching materials and schedule training sessions. Since both the peer interventionist and autistic mentee were members of a vulnerable population, safety was a primary concern. Travel training occurred in the community of each mentee. The TTPC was present or on call for parents, mentors and mentees as situations required.

Participants

Male autistic individuals outnumber females 4:1. Two male participants were chosen based on the range of interactions, rich description of travel sessions, and a range of behavioral considerations. Participant 1 (Par1) was a 24-year-old white male living in the suburbs with travel goals that included social interests, employment, and community explorations. Participant 2 was a 21-year-old black male living in the city with travel goals that included transportation to and from a transition program and visits to local community pizza shop

Peer Interventionist's Narrative of Participant 1 (referred to as Par1) Experience

Our participant chose to learn how to get from home to a major mall in Montgomery County to visit his close friend who worked at the mall. Par1 wanted to spend more time with his friend. Par1 wanted to be able travel more quickly than his bike allowed. On the day of the session, we took the bus that would get Par1 to the mall the fastest. I demonstrated the use of Google Maps and the SEPTA App to plan our trip and to see when the bus would depart. We walked through the mall and then we met with our participant's friend. Par1's friend worked at the Chick-fil-A just outside the mall. Par1 was so fulfilled and happy with the experience that he told me Par1 will never forget this day.

At that time, it was approaching two months since I started travel training with participants. Although I have been using buses and trains and public transportation all my life, I was still learning the ropes teaching and did not understand how these interventions could change our participants' lives. Going to Chick-fil-A that day changed perspectives and provided lifelong skills for me and Par1. Par1 was now able to visit his girlfriend and perform other activities on Par1own schedule. It truly was the experience I needed for me to realize how special this career can be for me and for others. For this individual our interventions made a clear improvement of his transportation skills. Par1 went from not being able to travel on his own to travelling independently by the end of his interventions. But more than that, it changed Par1's life as well as mine.

TTPC Narrative of Participant 1 (Par1) Experience

I sat in a regional transportation center parking lot my phone in hand and on call ready to manage any travel issues that arose during the final session between PI and Par1. I couldn't help but smile and reflect on the last six weeks that prepared PI and Par1 for this outing. Par1's participation in the travel training started when we had already worked with a few travel training groups and identified challenges and successes. By this point I knew the importance of earning the parent/caregiver/support agency and participants trust and enthusiasm. Par1's participation in the travel training program was initiated from Par1's mother. The mother called me to learn more about the program and share her safety concerns. The mother needed lots of details and information to fully comprehend and determine their readiness. Par1 mother shared their limited experiences and familiarities with public transportation but acknowledged her child Par1 travelled fairy widely by bike around his community. As the conversation was ending, we seemed to reach a point where she began to trust my answers and knowledge of the program and identified how impactful it would be for Par1 to master using public transportation. By the end of the call, I was able to describe the program, how we were implementing the training via a peer interventionist, and to assure her that the TTPC would be present to support until the circumstances no longer warranted that direct level of support. When the time came for us to meet in person to obtain consent and answer any additional questions, I met Par1. Par1 sat back quietly wearing a sports team hat and sweatshirt. Par1 observed his mom as she immediately began to ask more questions. I felt, once again, that I was putting her mind at ease and answering all her questions. It was now time to talk with Par1, answer his questions, and explain the program again. Par1 was quiet at first, so I searched for a connection that would help set Par1 at ease. Weather, sports, food, pets any connection was useful. Par1 was wearing a sports shirt of a team that I knew well. I asked him about the team, and Par1 was super excited to share their knowledge. This talk led to many more between Par1 and me and later the peer interventionist and Par1. Par1 loved sports.

Par1 watched sports and participated in the Special Olympics.

It was easy to have a conversation with Par1. Par1, unlike his mother, had very few questions and came to the meeting excited to share all the places he wanted to go once he learned how to use public transportation. Par1 was ready. PI and Par1 met a few weeks later. With little support and conversation prompting (knowing both like sports and transportation) similar interests were discovered and they were able build a rapport. I sat back and watched PI go through lessons on how to use public transportation, stay safe, and assure stranger awareness. During the lessons we tried to emphasize skills taught by practicing them in the community. I would walk behind PI and Par1 and observe the interactions and ease they seemed to have with each other. Par1 was an active participant and eager to learn from PI. My need to facilitate and make sure they were safe became less and less. They would be gone for hours. I waited to assist if needed. I was never needed.

Peer Interventionist's (PI) Narrative of Participant 2 (referred to as Par2) Experience

Par2 made significant progress, but the process took longer for him. Par2 was attending a local university program and wanted to use public transportation. Our first trip was to a pizza shop in his neighborhood, which was on the way to the program. Par2's mom and I thought this would be a great trip for Par2. For this trip we took a bus. It was here that I realized Par2 was well-known in his community since the pizza shop workers said hello and knew Par2 by name.

Par 2 needed prompting to pull the cord for their local pizza stop. The same prompting was necessary for the bus trip on the way home. I started to reduce support by allowing them to walk to and from the bus stop by himself. Once I got nervous because I thought Par2 would not remember to meet me at a nearby Rite Aid. He did forget. Par2 ended up walking to the bus stop on their own and we met Par2 there.

We practiced the travel route from their home to the school program and back. Par2 walked to the bus stop, boarded the bus by himself (my supervisor, TTPC, followed him and observed while in her car). I watched Par2 get off the bus at the right stop, the one closest to the program. I subsequently watched Par2 get on the return bus to their home. However, my supervisor, the TTPC, texted me that Par2 got off at the wrong stop. I was unsure of what to do because I was not within walking distance of the participant's location. As I prepared to take the bus to that location, I received word that Par2 made it home safely.

We thought Par 2 would need significant support when we first met. During the curriculum portion of the intervention, Par2 was not verbally responsive to our questions. Par2 indicated through gestures that they understood the material. I adjusted my usual teaching style to fit their needs. One strategy I tried with Par2 once we got closer to the 1:1 travel training was to have Par2 plan a trip using a pencil and paper. Par2 responded well because Par2 knew their goal was to travel to the program independently. I assisted by showing Par2 the route Par2 would take using Google Maps and the SEPTA App. These steps led to Par2 independence on public transportation. I showed patience with Par2 as Par2 took time to learn the bus riding skills including paying for the trip, boarding and exiting the bus, observing landmarks, and pulling the chord for his stop. My patience and support gave Par2 the confidence needed to supplement the newly gained skill. When I see that a participant understands the lessons, I know that the curriculum is registering. This means few adjustments are necessary. For this individual and others, it was a process for me to understand fully what works best for them. On-the-fly adjustments based on the participants' needs were not only the solution the individuals sought but what I sought for myself. Flexibility and solving problems related

to the unpredictability of public transportation, missing a stop, change in schedules, is hard to teach, but exhilarating when you have a successful outcome. It was a satisfying experience for me.

TTPC's Narrative of Participant 2 Experience

Like many of the participants with whom we had been working, Par2's mother was nervous and excited to allow Par2 to participate in the travel training study. Par2's mother was referred to our program. She trusted the St. Joes contacts and believed they would not refer her to an unsafe or poorly run program. Par2 and their mother asked to meet at their home to discuss the study. I could tell based on the initial call to arrange the screening, consent, and information session that Par2 would need a higher support level and there would be many questions. It is important to initially discover a family's reservations and understand the perceived vulnerabilities. As with all the previous participants, identifying common interest, building communication and trust are crucial. When participants are supported by their parents it is necessary to have parents enthusiastic and comfortable with the training.

I met Par2 and his mother at their home during the holiday season. Before sharing our first words I looked for ways to engage. I saw a wonderful puppy and a beautiful, decorated Christmas tree with a train running underneath. Par2 sat on the stairs even after his mother called Par2 into the room. Par2 was not comfortable coming any closer or communicating just yet. Mom and I met for quite a while and discussed the study. I believed I could demonstrate to her I would support Par2 and PI, the peer interventionist, as much as needed and we would move at the pace with which Par2 is comfortable.

Par2 passed the initial screening and readiness but wasn't ready to use a bus and find their way home. Par2's mother wanted to be closely involved and kept in contact during these steps. She shared that Par2 was minimally verbal but could communicate using texts or writing words. Par2 could be contacted using text messages and knows how to use their smart phone. She also shared that many in the community know Par2. He is warmly welcomed at many favorite pizza shops. Pizza shops- PI and Par2 would have that in common. Par2's mom knew how important it was for Par2 to get from the program to home using the bus or trolley system. The route was clear, and she believed, in time, Par2 could complete the task. Par2's mom and I communicated often via text during his travel training sessions. Par2 carried multiple items for comfort and practicality. The multiple bags of items interfered with efficient boarding of public transportation. Par2's mom and I worked with him to prioritize his items into one bag. I would let her know when Par2 left, got on a bus, and was walking home. She needed to know all the important steps that occurred and when they occurred to feel comfortable. PI worked with Par2 regularly. Par2 wasn't the most communicative, but Par2 seemed comfortable with PI. They built a trust without needing lots of words and in return I was comfortable watching their sessions from behind the scenes. I didn't go on the bus or trolley with PI and Par2 after the first few sessions. PI was able to teach Par2 the different bus and trolley routes that Par2 would need to complete his trip to the correct destination.

I watched Par2 on what would be one of his final sessions. PI would make sure Par2 got on the bus from the program to home, but Par2 was going to take the bus home independently. I would be at their house with mom to celebrate the accomplishment. PI texted that Par2 got on the bus correctly. I texted PI and Par2's mom that Par2 was on his way home. I waited to see Par2 get off the bus before heading to his home. I could not tell whether Par2 exited the bus at his destination. I never saw Par2 get off the bus at the correct stop. I no longer saw Par2! I now had to tell

Par2's mom that I did not see Par2 get off the bus or walking the planned route home. I took a deep breath and decided I would need to gather more information before alerting mom. I continued to follow what I thought was the correct bus. PI was aware of the situation and knew to look for Par2 on a later bus with the same route. Before I texted mom, she texted me asking if Par2 was off the bus. I responded no and that I thought he would get off at a different stop, so I followed the bus. I finally saw Par2 walking a different path home.

I learn a great deal during each session and from each participant, but this participant may have taught me the most. I realized how invested I am in the participants' safety and accomplishing their goals. I was calm under pressure but also quietly anxious. I understood the incredible responsibility we have while travel training adults with ASD. I had a brief glimpse into what stress, anxiety, and anticipation parents must feel as they let their adult child independently explore their communities. Finally, I learned that people amaze me. Par2 did get off the bus at the wrong stop, but knew the way home. Par2 knew his neighborhood and was so much more capable than I realized. When Par2 returned home, Par2 was so proud of himself. His mom was so proud to see Par2 arrive home independently. I was relieved that what concerned me turned into one of my greatest impressions; the individuals we are travel training are capable of much more than we often anticipate.

Data Analysis

Data gathered for this study includes participant observation, storytelling, interviews, field notes, schedules, and thematic analysis. The narratives illuminate the lived experiences of peer the interventionist and the TTPC during training with two young adults with ASD learning to use public transportation in their community setting.

The peer interventionist, program coordinator, and researcher analyzed descriptive narratives. The team, through several sessions, expanded evocative descriptions through probing questions and guided insight. The descriptive narratives were reviewed to determine unique and overlapping themes related to the purpose and to explore the experiences of peer intervention led travel training program. Identifying themes as an analysis process aligns with Bruan and Clarke idea that themes capture something important in the data.[28]

Results

Both participants successfully achieved their goal of independently navigating the public transportation system of their neighborhood (suburbs or city) to access places of importance for their participation in social, work, or educational endeavors.

The Peer Interventionist was an autistic youth with an interest, and relevant training for his role. He knew public transportation (and its vagaries) and used public transportation. He helped adapt and taught the didactic component of the transportation curriculum. The PI was also trained to work with youth with autism through a 72-hour training program to become a Community Autism Peer Specialist. Reliability observations indicated educational goals as well as the behavioral characteristics of positive peer interaction was adhered to.

There was an expansion of the peer mentor role in this study consistent with recommended Peer Mentor best practice for IDD-MH.[21] Using the relationship, self-disclosure and outcome driven actions in a community based, mentee- centered approach was emphasized. Also recommended were considerations including safety, mentor matching, degree of structure and mentor

training. These parameters emerged in the natural evolution of the program and infused a flexibility of role to provide what the mentee needed overall and in specific situations.

The role of the TTPC was surprisingly complex and critical outside of recruitment, screening, and scheduling activities. This included the following: 1) building relationships with the family and participants and assuring safety and ongoing communication with the family. 2) exploring interests, priorities and communication differences and behaviors of the PAR to facilitate the positive relationship and comfort between the PAR and PI. 3) Behind the scenes supporting and, in some cases, shadowing or meeting the Par to assure safety and predictability was important for both the PI and Par and family.

The participant's interest and motivation were supported by the program design whereby the participant is taught to identify and plan his training based on his goal for transportation and the transportation options available in his neighborhood. This introduced the important variables of personal relevance and choice.

Discussion

The reflective, descriptive narratives brought into focus several social and cultural assumptions that influenced the effectiveness of the program and deserve further exploration. These include the family/caregiver and participant readiness. The relationship building process was based on safety concerns and the critical role the TTPC played in this time-consuming process established the foundation.

The concept of readiness is fleeting, temporary, circumstantial, and difficult to quantify. All participants had met readiness criteria. However, the TTPC describes how the mothers or primary protectors and caretakers needed to be convinced of the sons' safety, the reliability of the PT, oversite and safety nets as well as the outcome of the training. The mothers knew the children, and the neighborhoods, the child's responses, and vulnerabilities. They had guided their child to this point of readiness. Their sons, in turn, had to find their own comfort level with travel training, their own relationship and trust of the PT and TTPC. All were entering a new realm of public transportation.

Personal choice is a major aspect of self-determination and growth of independence. The Participants in this program chose where they wanted to go. They chose the means of transportation to use after learning the range of options they had in their neighborhood. The TTPC and PI facilitated their choice and accompanied them on the trip. The relationship between the PI and participants developed though collaborative planning, respect for each other, shared interests, and verbal/ nonverbal interactions.

Travel training using public transportation requires the ability to understand conditions, make judgements and develop back up plans. Knowledge and use of google maps, transportation apps and location apps can provide useful information if they can be mastered. However, getting on or off the correct stop of a train, bus or trolley or encountering cancellations or closed transportation stops requires adaptive thinking, corrective changes and or a help number to call. As the PI points out, success in these situations was the most satisfying of all learning situations for all. This process must be incorporated and adapted to the goals and abilities of the trainee. In some cases, this may require a more extensive program or a modification of goals.

The PI had a lifelong special interest in trains and transportation that had not been discouraged. This led him to apply for the position of travel instructor. He describes that before this experience he did not see the importance of this field of interest or how impactful it could be for both participants and him. It is interesting to note that upon completion of the program, the PI was sought out and hired to continue providing travel

training. Also, he matriculated in a Public Health Master's degree program focusing on public policy with a goal of addressing public transportation. The common view is that special interests (referred to as obsessions or obsessive) of individuals with ASD is assumed to interfere with their academic learning and consequently should be extinguished.[29] This situation is one example of the PI's interest from an early age leading to gainful employment and a career path.

In this study the role of the Peer Instructor was modified from that of the peer mentor programs for ASD widely accepted in school inclusion programs in which the peer mentor is a same aged child with no diagnosis. The 2019 recommendations for intellectual/developmental disorders and co-occurring mental health issues have recommended the following be incorporated for appropriate mentorship of this population. Mentors should use "relationships and outcome -driven actions to operationalize the mentee centered approach." Other features and considerations include safety, degree of structure mentor training and collaboration with the mentees support teams.

Peer supported travel training interventions can be enhanced through meaningful policy change through legislative and organizational means. Several potential policy changes became apparent through this study. More meaningful and sustainable transportation interventions can be implemented through policymakers. Subsidized transportation for seniors and people with disabilities in the Commonwealth of Pennsylvania is currently funded by the Pennsylvania Lottery through the People with Disabilities (PwD) program. This provides curb-to-curb transportation only for areas that are greater than three-quarters of a mile from the nearest transit stop, which excludes nearly all our participants. The Community Autism Peer Specialist Program (CAPS), which the peer interventionist completed, services are in the process of expanding, but in many states, peer support is not a billable service. Policymakers could address these issues in multiple ways. Curb-to-curb services could be made available for those with needs to travel less than three-quarters of a mile. Policymakers could consider legislation that would turn peer support into a billable service through Medicaid if they have not already done so. Pennsylvania is fortunate in that many services are billable that are not billable in other states. Some organizations list travel training as a supportive service under a workforce development grant. In organizations or states that do not have this as billable, travel training could be billable in all circumstances. Organizations should take special care to hire skilled peer workers in travel training as this would create a more permanent funding solution for the service and job security for the employees.

The study was exploratory and utilized a qualitative approach to identify themes of subjective lived experiences of a travel training team for autistic youth. Due to the explorative nature of research this is hypotheses generating and suggests the need for future peer led travel training studies.

This autoethnography was part of a larger study and explored the PI, TTPC and Par interaction underlying effective travel training of ASD youth. In this study the PI role was broadened and reflects recommendations of /stakeholders for DDI-MH,[21] including both personal preparation of advocacy training and responsibility for content development, teaching, and peer specialist mentoring. Other stakeholder recommended features include support team collaboration, safety, and mentor support. The reflective descriptions depict the depth and breadth and dynamics of the PI and TTPC.

Several social and cultural assumptions that deserve consideration include the expanded and dynamic role of the PI and the TTPC, the concept of readiness and safety in training ASD youth and the impact on the peer mentor. Finally, recommendations for public policy are presented.

References

1. Haveman, M., Tillmann, V., Stöppler, R., Kvas, Š., & Monninger, D. (2013). Mobility and Public Transport Use Abilities of Children and Young Adults With Intellectual Disabilities: Results From the 3-Year Nordhorn Public Transportation Intervention Study. Journal of Policy and Practice in Intellectual Disabilities, 10(4), 289–299. https://doi.org/10.1111/jppi.12059
2. Lubin, A., & Feeley, C. (2016). Transportation Issues of Adults on the Autism Spectrum. Transportation Research Record: Journal of the Transportation Research Board, 2542(1), 1–8. https://doi.org/10.3141/2542-01
3. Pfeiffer, B., Sell, A., & Bevans, K. B. (2020). Initial evaluation of a public transportation training program for individuals with intellectual and developmental disabilities: Short report. Journal of Transport & Health, 16, 100813. https://doi.org/10.1016/j.jth.2019.100813
4. Crabtree JL OTD, MS, OT, FAOTA. (2017). The Importance of Public Transportation to Community Mobility and Participation. OT Practice. 2017;22(3):CE1-CE8. https://www.aota.org/publications/ot-practice/ot-practice-issues/2020/transportation-checklist
5. Lubin, A., & Feeley, C. (2016). Transportation Issues of Adults on the Autism Spectrum. Transportation Research Record: Journal of the Transportation Research Board, 2542(1), 1–8. https://doi.org/10.3141/2542-01
6. Pfeiffer, B., DeRita, J., Giacomucci, E., Gubler, J., Halteman, T., O'Donnell, E., Seifried, G., & Pompanio, A. (2020). Barriers and Facilitators to Public Transportation Use for Individuals with Intellectual and Developmental Disabilities. Occupational Therapy in Mental Health, 37(1), 1–14. https://doi.org/10.1080/0164212x.2020.1832013
7. American Psychiatric. (2013). Diagnostic and Statistical Manual of Mental Disorders (DSM-5®). American Psychiatric Pub.
8. Deka, D., Feeley, C., & Lubin, A. (2016). Travel Patterns, Needs, and Barriers of Adults with Autism Spectrum Disorder. Transportation Research Record: Journal of the Transportation Research Board, 2542(1), 9–16. https://doi.org/10.3141/2542-02
9. Kersten, M., Coxon, K., Lee, H., & Wilson, N. J. (2020). "In Their Own Time": Parents Gently Push Their Autistic Youth Towards Independent Community Mobility and Participation. Journal of Autism and Developmental Disorders. https://doi.org/10.1007/s10803-020-04384-9
10. Bezyak, J. L., Sabella, S., Hammel, J., McDonald, K., Jones, R. A., & Barton, D. (2019). Community participation and public transportation barriers experienced by people with disabilities. Disability and Rehabilitation, 42(23), 1–9. https://doi.org/10.1080/09638288.2019.1590469
11. Lindsay, S. (2016). Systematic review of factors affecting driving and motor vehicle transportation among people with autism spectrum disorder. Disability and Rehabilitation, 39(9), 837–846. https://doi.org/10.3109/09638288.2016.1161849
12. Billstedt, E., Gillberg, C., & Gillberg, C. (2005). Autism after Adolescence: Population-based 13- to 22-year Follow-up Study of 120 Individuals with Autism Diagnosed in Childhood. Journal of Autism and Developmental Disorders, 35(3), 351–360. https://doi.org/10.1007/s10803-005-3302-5
13. Bishop-Fitzpatrick, L., & Kind, A. J. H. (2017). A scoping review of health disparities in autism spectrum disorder. Journal of Autism and Developmental Disorders, 47(11), 3380–3391. https://doi.org/10.1007/s10803-017-3251-9
14. Deka, D., Feeley, C., & Lubin, A. (2016). Travel Patterns, Needs, and Barriers of Adults with Autism Spectrum Disorder. Transportation Research Record: Journal of the Transportation Research Board, 2542(1), 9–16. https://doi.org/10.3141/2542-02

15. Pfeiffer, B., Bevans, K.B. (2019). Services Access and Transportation: Impact of a Comprehensive Travel Training Program for Individuals with Intellectual and Developmental Disabilities. In.
16. Lindsay, S., & Lamptey, D.-L. (2018). Pedestrian navigation and public transit training interventions for youth with disabilities: a systematic review. Disability and Rehabilitation, 1–15. https://doi.org/10.1080/09638288.2018.1471165
17. Mechling, L., & O'Brien, E. (2010). Computer-Based Video Instruction to Teach Students with Intellectual Disabilities to Use Public Bus Transportation. Education and Training in Autism and Developmental Disabilities, 45(2), 230–241. http://www.jstor.org/stable/23879809
18. Davies, D. K., Stock, S. E., Holloway, S., & Wehmeyer, M. L. (2010). Evaluating a GPS-Based Transportation Device to Support Independent Bus Travel by People With Intellectual Disability. Intellectual and Developmental Disabilities, 48(6), 454–463. https://doi.org/10.1352/1934-9556-48.6.454
19. Batu, S., Ergenekon, Y., Erbas, D., & Akmanoglu, N. (2004). Teaching Pedestrian Skills to Individuals with Developmental Disabilities. Journal of Behavioral Education, 13(3), 147–164. https://doi.org/10.1023/b:jobe.0000037626.13530.96
20. Visagie, S., Eide, A. H., Dyrstad, K., Mannan, H., Swartz, L., Schneider, M., Mji, G., Munthali, A., Khogali, M., van Rooy, G., Hem, K.-G., & MacLachlan, M. (2017). Factors related to environmental barriers experienced by persons with and without disabilities in diverse African settings. PLOS ONE, 12(10), e0186342. https://doi.org/10.1371/journal.pone.0186342
21. Schwartz, A. E., Young Adult Mental Health/Peer Mentoring Research Team, Kramer, J. M., Rogers, E. S., McDonald, K. E., & Cohn, E. S. (2020). Stakeholder-driven approach to developing a peer-mentoring intervention for young adults with intellectual/developmental disabilities and co-occurring mental health conditions. Journal of applied research in intellectual disabilities : JARID, 33(5), 992–1004. https://doi.org/10.1111/jar.12721
22. Balcazar, F. E., Kelly, E. H., Keys, C. B., & Balfanz-Vertiz, K. (2011). Using Peer Mentoring to Support the Rehabilitation of Individuals with Violently Acquired Spinal Cord Injuries. Journal of Applied Rehabilitation Counseling, 42(4), 3–11. https://doi.org/10.1891/0047-2220.42.4.3
23. Kelly, P. J. A., Pilla, J., Otor, A., Hoadley, A., & Bauerle Bass, S. (2022). "We figured it out as we went along": Staff perspectives of COVID-19 response efforts at a large North American syringe services programme. Health & Social Care in the Community, 10.1111/hsc.13864. https://doi.org/10.1111/hsc.13864
24. Michael D. Hannon. (2017). Acknowledging Intersectionality: An Autoethnography of a Black School Counselor Educator and Father of a Student with Autism. The Journal of Negro Education, 86(2), 154. https://doi.org/10.7709/jnegroeducation.86.2.0154
25. McMahon, J., Wiltshire, G.-E., McGannon, K. R., & Rayner, C. (2019). Children with autism in a sport and physical activity context: a collaborative autoethnography by two parents outlining their experiences. Sport, Education and Society, 25(9), 1002–1014. https://doi.org/10.1080/13573322.2019.1680535
26. Robertson Hornsby, E., Davis, A., & Reilly, J. (2021). Collaborative Autoethnography: Best Practices for Developing Group Projects. InSight: A Journal of Scholarly Teaching, 16, 104–114. https://doi.org/10.46504/16202105ro
27. Stacy Holman Jones, Adams, T. E., & Ellis, C. (2013). Handbook of Autoethnography. Walnut Creek Taylor And Francis.
28. Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. Qualitative Research in Sport, Exercise and Health, 11(4), 589–597. https://doi.org/10.1080/2159676X.2019.1628806
29. Nowell, K. P., Bernardin, C. J., Brown, C., & Kanne, S. (2020). Characterization of Special Interests in Autism Spectrum Disorder: A Brief Review and Pilot Study Using the Special

Interests Survey. Journal of Autism and Developmental Disorders, 51(8). https://doi.org/10.1007/s10803-020-04743-6

SYSTEMATIC REVIEW
Volume 6 (2025), No. 1, pp. 15-26
DOI: 10.15367/ch.v6i1.736

The Effect of Physical Activity on Symptoms Associated with Premenstrual Syndrome: A Critically Appraised Topic

LACEY HARRIS, DAT, ATC[1], JAMIE L MANSELL, PhD, LAT, ATC[2], RYAN T TIERNEY, PhD, LAT, ATC[2], ANNE C RUSS, PhD, LAT, ATC[2]
[1]Athletic Training Department & Department of Health and Kinesiology, Texas A&M-Kingsville University, Kingsville, TX
[2]Department of Health and Rehabilitation Services, College of Public Health, Temple University, Philadelphia, PA

Correspondence: anne.russ@temple.edu (Anne Russ, PhD, LAT, ATC)

An estimated 80-90% of menstruating individuals experience premenstrual syndrome (PMS) and up to 95% experience symptoms that may limit daily activities. There are a wide range of treatment options ranging from over-the-counter medications, prescription medication and hormonal birth control, all of which could have adverse effects. The purpose of this study is to assess if physical activity could help reduce PMS symptoms. Across three studies, all with different types of physical activity, there was a significant improvement in PMS symptoms compared to a control group. Physical activity has shown to be an effective intervention for symptoms associated with PMS.

***Keywords**: exercise, menstruation, quality of life*

Introduction/Clinical Scenario

Premenstrual syndrome (PMS) is characterized by emotional, behavioral and physical symptoms that occur around menstruation, including the late luteal and early follicular phases.[1-3] An estimated 80-90% of menstruating individuals experience PMS and up to 95% experience symptoms that may limit daily activities and affect quality of life.[1,4,5] These symptoms fall into 3 different groups, emotional (e.g., irritability), physical (e.g., breast pain) and behavioral (e.g., appetite changes/food cravings), and range from mild to moderate to severe.[3-5] Recognition and treatment of these symptoms is important to those affected to improve quality of life.[1-4] Symptoms can be monitored with the Premenstrual Symptoms Screen Tool (PSST), a patient-rated outcome measure, which includes questions regarding all premenstrual symptoms and a measure of impairment.[3,6]

People experiencing PMS have a wide range of treatment options, including over-the-counter pain medications (e.g., acetaminophen), prescriptions to treat specific symptoms (e.g., selective serotonin reuptake inhibitors for anxiety and depression related symptoms) and hormonal birth control.[3-5] While these treatments can be effective many try to avoid the contraindications, high cost and side effects of these medications.[1,3] Exhaustion, insomnia,

headache, menstrual dysfunction, decreased sexual ability, gastrointestinal disturbances, nausea and vomiting, which are common side effects with prescription treatments, may impede one's ability to focus on daily tasks and could affect daily quality of life.[3,7] These side effects, along with personal preference, may result in an unwillingness to take these medications.[1,3]

Another consideration for improving and managing PMS symptoms is physical activity as a treatment.[1-5,8] The type of physical activity can vary according to the individual, is based on an individual's level of comfort and physical ability and can include varying types of activities (e.g., yoga, aerobic, anaerobic).[2-4] The use of exercise is in line with the American College of Sports Medicine's (ACSM) "Exercise is Medicine" initiative.[9] This includes setting a goal of implementing physical activity assessment and exercise prescription as a standard part of disease prevention and treatment paradigm for patients.[9] Prescriptive exercise has been shown to improve physical and mental health in both healthy individuals and those with medical conditions.[9] The ACSM does not have specific guidelines for managing PMS symptoms; however, individuals are recommend to regularly participate in moderate aerobic physical activity between 150 and 300 minutes per week, or vigorous aerobic physical activity between 75 and 150 minutes per week.[10] Additionally, the American College of Obstetricians and Gynecologists (ACOG) recommends 30 minutes of exercise most days of the week to help relieve PMS symptoms[11], however, this recommendation lacks the support of high-quality evidence.[2]

Focused Clinical Question

In those who experience PMS, does physical activity help reduce PMS symptoms?

Search Strategy

A search was conducted in June of 2023 through August of 2023 of PubMed and Medline using a PICO strategy to evaluate the question.

- **P**atient group: Individuals who experience PMS
- **I**ntervention/assessment: Physical activity
- **C**omparison: No physical activity
- **O**utcome: PMS symptoms and/or severity

The search was conducted using the Boolean phrases (PMS) AND (physical activity), as well as (Premenstrual syndrome) AND (physical activity). The articles were included if the study participants met the following criteria: had a diagnosis of PMS and had not reached menopause. Additionally, studies were included if they were randomized control trials and published in the last 7 years. Potential articles were excluded if the studies included participants that had been diagnosed with Female Athlete Triad, as these individually may have a disrupted menstrual cycle making tracking of symptoms through their cycle difficult. Furthermore, studies with participants who had been diagnosed with PCOS, endometriosis, uterine fibroids, or other gynecological disorders were also excluded. These exclusions were due to a higher amount of and severity of symptoms.

Evidence Quality Assessment

The Physiotherapy Evidence Database (PEDro) Scale was used to critically appraise each article.[12] The PEDro Scale consists of 10 yes or no items, such as whether subjects were

randomly allocated into groups, if the allocation was concealed, if subjects were similar as baseline, and if there was blinding of both the subjects and researchers.[11] Each criteria is scored (0) for absent and (1) for present. A higher score indicates higher methodology quality.[12]

Results of Search: Summary of Search, "Best Evidence" Appraised, and Key Findings

In total, this search yielded 266 articles from PubMed and Medline. Each article was reviewed for the inclusion and exclusionary criteria, resulting in 3 articles included (see Table 1).[2-4] All three articles compared an exercise intervention (i.e., swimming, aerobic exercise, yoga) to control groups who had no activity and the duration of the exercise intervention ranged from 2 to 3 months.[2-4] Overall, there were significant improvements in symptoms from pre-intervention to post-intervention in the physical activity groups, while the control group did not experience significant reduction in symptoms.[2-4]

Table 1.
Summary of Included Studies

Author(s)	Maged et al.[2]	Dehnavi et al.[4]	Kamalifard et al.[3]
Study Title	Effect of swimming exercise on premenstrual syndrome	The effect of 8 weeks aerobic exercise on severity of physical symptoms of premenstrual syndrome: a clinical trial study	The effect of yoga on women's premenstrual syndrome: A randomized controlled clinical trial
Study Participants	70 women recruited from El Gezira Youth Center and clubs related to Ministry of Sports after full examination at Specialized Sports Medicine Center in Nasr City from April 2016 to May 2017 with a premenstrual syndrome (PMS) diagnosis	65 women at Mashhad University of Medical Sciences, with symptoms of PMS. 30 were randomly assigned to the control group, and 35 to the intervention	Starting with 150 females that had been referred to private obstetrics and gynecology clinics in Tabriz, Iran from April to October 2015. Using the premenstrual symptom screening test (PSST) questionnaire for 2 months to track their PMS symptoms, 62 subjects with PMS entered the study. Randomly assigned into 2 groups. 31 in the yoga group, 31 in the control group
Inclusion Criteria	All participants were virgins. Their age ranged from 18 - 25 years, and their Body Mass Index ranged from 18 to 25 kg/m2. They were clinically and medically stable	Regular menstrual cycles (cycles of 21-35 days with a bleeding time of 3 - 10 days), PMS (according to the interim screening questionnaire, having 4 of 11 The question mark) and Score below 40 from	20 - 45 years old, having PMS according to the PSST questionnaire, having regular menstrual periods, being non-athletic for duration of 3 months, not being under any treatment with

	during the study with regular menstrual cycle of 23 - 35 day duration	Beck Depression questionnaire	chemical/herbal medications or oral contraceptives, having no depression and genital tract diseases, not drinking alcohol or smoking cigarettes, not to be a tobacco or illicit drug user, not having any joint diseases, rheumatoid arthritis, or surgeries that could affect yoga exercise, not to be a caffeine user (expressed by subjects) and have a willingness to participate in the study
Exclusion Criteria	Excluded were those with cardiopulmonary or orthopedic problems, women taking any hormonal drugs or drugs that affect hormones as antidepressant during the preceding 3 months before participation in the study, and any abnormality in ovulation or those with pelvic inflammatory diseases (PID). Women with endocrine abnormality as thyroid, pituitary, or ovarian disorders were also excluded	Prior to study exclusion included pregnancy, participation in other sports programs, continuous use of medication, chronic disease, Women with neurological, psychological disorders, women under hormonal treatment, women with endocrinological diseases, women with local lesions causing pain as PID, severe depression (according to the depression questionnaire having a score above 40), the incidence of adverse events in the last 3 months. During the study exclusion included dissatisfaction with the continuation of the research, pregnancy during the study, changes in menstrual cycle during study, the failure to complete the questionnaire (3 consecutive days and 5 days interrupted) and any adverse or stressful feelings	Not willing to continue the investigation and/or have had experienced yoga exercise before

Timeline	Each group completed 3 months of initial assessment of PMS symptoms. A 3 month period followed where the intervention group completed the swimming protocol and the control group had no intervention. PMS symptoms were tracked in both groups in this phase	2 months prior to intervention daily PMS symptom questionnaire completed by both control and intervention groups followed by a 2-month period where the intervention group completed exercise and a control group did not. All completed the PMS questionnaire	2 consecutive months prior to intervention PSST issued to both control and intervention groups to ensure participants were eligible for the study followed by a 10-week yoga program for the intervention group. All participants completed the PSST at the end of the 10-week intervention period
Intervention Physical Activity Parameters	Duration of 3 months. Completed a moderate intensity (aerobic) swimming workout 3 times per week for 30 minutes per session. Weekly total: 90 minutes	Duration of 8 weeks. Completed a moderate intensity aerobic exercise 3 times per week for 20 minutes per session. Weekly Total: 60 minutes	Duration of 10 weeks. Completed a non-aerobic yoga exercise 3 times per week for 20 minutes per session. Weekly Total: 60 minutes
Outcome Measures	Number of participants experiencing PMS symptoms in 17 categories pre- and post- intervention in each group. Mann-Whitney U test was used to compare the groups. Statistical significance was set at $p<0.05$	Pre- and post- symptom severity means, as well as pre- and post- difference in 11 categories were compared between groups pre- and post-intervention. Multiple independent t-tests were used to compare pre-, post- and difference scores between groups. Statistical significance was set at $p<0.05$	PSST means were compared between and within groups. An ANCOVA was used to compare between group effects and a paired samples -test was used to examine within group effects. Statistical significance was set at $p<0.05$
Results	The intervention group showed significant improvements compared to the control in 14/17 symptoms assessed. See Table 2 for further details.	The intervention group showed lower symptoms severity scores post-intervention compared to the control in 4/11 categories. The intervention group experienced a significant within group change compared to the control in 4/11 categories. See Table 3 for further details.	The intervention group showed significant post-intervention PSST score compared to the control in all 3 categories. The intervention group also experienced a significant decrease pre- to post- in all 3 PSST categories that was not observed in the control group. See Table 4 for further details

Evidence Quality Score	8/10	8/10	10/10
Support for the Answer	Yes	Yes	Yes

Results of Evidence Quality Assessment

The three articles in this critically appraised topic each have a Strength Of ReccomendationTaxonomy level of evidence of a 1.[13] All studies were randomized control trials, which had consistent findings across relevant populations. Maged et al[2] and Dehnavi et al[4] both received a rating of 8/10 on the PEDro scale. Points were deducted for the studies not blinding participants or assessors. Kamalifard et al[3] had a rating of 10/10. All three studies included participants who were similar at baseline and randomly assigned to the intervention and control groups. Key outcomes were based on symptoms experienced surrounding premenstrual syndrome.

Clinical Bottom Line: Strength of Recommendation

There is consistent evidence across all three studies that physical activity is effective to reduce PMS symptoms. Physical, emotional, and behavioral symptoms were reduced following physical activity interventions in the three studies.[2-4] Regardless of physical activity intervention, PMS symptoms improved with exercise.[2-4] Each study differed in their approach to physical activity. In Maged et al,[2] the intervention group participated in a moderate aerobic swimming intervention of 30 minutes 3 times a week (90 minutes/week) for 3 months. Kamalifard et al[3] had their intervention group participate in non-aerobic yoga intervention 3 times a week for 20 minutes each session (60 minutes/week) over 10 weeks. Lastly, Dehnavi et al[4] had the intervention group engage in a moderate aerobic activity for 30 minutes, 3 times a week (90 minutes/week) for 8 weeks. While the studies did not reach the ACSM guidelines for physical activity,[10] nor the ACOG's physical activity recommendation[11] to help with PMS, there was still a marked improvement in the intervention groups compared to the control groups.

All three studies showed improvements in multiple PMS symptom categories. Maged et al[2] and Dehnavi et al[4] looked at specific symptoms chosen by each individual study (see Tables 2 and 3). Kamalifard et al[3] used the Premenstrual Symptom Screening Tool (PSST) to examine the effects of physical activity on emotional, physical, and behavioral symptom subscales (see Table 4). With the significant findings across all three studies, physical activity as an intervention for patients experiencing PMS is effective at reducing physical, emotional, and behavioral symptoms. The Strength of Recommendation Taxonomy[12] grade for this research is an A.

Table 2.
Change in Number of Participants Reporting Premenstrual Symptoms from Maged et al.[2]

Symptom	Variable	Intervention Participants Reporting	Control Participants Reporting	P Value
Anxiety	Pre	3	5	0.16
	Post	0	5	0.0001*
	% change pre to post	-33.3%	0%	0.0001*

Irritability	Pre	0	0	0.92
	Post	0	0	0.86
	% change pre to post	0	0	0.98
Depression	Pre	14	10	0.06
	Post	3	12	0.0001*
	% change pre to post	-79.29%	15.56%	0.0001*
Tension	Pre	15	12	0.07
	Post	3	12	0.0001*
	% change pre to post	− 81.18%	− 6.79%	0.0001*
Mood	Pre	3	6	0.84
	Post	0	7	0.001*
	% change pre to post	-33.3%	0%	0.01*
Feeling Out of Control	Pre	5	7	0.88
	Post	0	7	0.0001*
	% change pre to post	-91.67%	0%	0.002*
Poor Coordination	Pre	11	12	0.46
	Post	0	10	0.0001*
	% change pre to post	100%	-9.55%	0.0001*
Insomnia	Pre	2	0	0.13
	Post	0	0	0.79
	% change pre to post	− 71.43%	0%	0.0001*
Confusion	Pre	10	11	0.55
	Post	2	9	0.0001*
	% change pre to post	− 84.17%	− 9.55%	0.0001*
Headache	Pre	14	17	0.12
	Post	3	15	0.0001*
	% change pre to post	− 77.78%	− 6.94%	0.0001*
Crying	Pre	0	0	0.86
	Post	0	0	0.27
	% change pre to post	0%	0%	0.26

Fatigue	Pre	14	12	0.39
	Post	4	12	0.0001*
	% change pre to post	− 65.69%	0%	0.0001*
Aches	Pre	15	14	0.24
	Post	5	11	0.0001*
	% change pre to post	− 65.83%	− 8.93%	0.0001*
Breast Tenderness	Pre	10	8	0.37
	Post	2	8	0.0001*
	% change pre to post	− 87.87%	4.55	0.0001*
Cramps	Pre	15	18	0.88
	Post	6	17	0.0001*
	% change pre to post	− 60.77%	4.55%	0.0001*
Swelling	Pre	11	7	0.004
	Post	4	6	0.27
	% change pre to post	− 55.05%	− 8.33%	0.0001*
Food Cravings/Increased Appetite	Pre	0	0	>0.99
	Post	0	0	0.94
	% change pre to post	0%	0%	0.92

*Note: * denotes significance at P ≤ 0.05. P values are from the Mann-Whitney U test comparing groups at pre-, post- and % change pre to post. Intervention n = 35, Control n = 35*

Table 3.
Changes in Severity of Premenstrual Symptoms from Dehnavi et al.[4]

Symptom	**Variable**	**Intervention Severity**	**Control Severity**	**P Value**
Headache	Pre	1.48 ± 1.50	1.93 ± 1.36	0.21
	Post	0.85 ± 0.74	1.6 ± 1.3	0.001*
	Within Group Difference	-0.42±0.69	-0.5 ± 0.82	0.7
Fatigue	Pre	1.51 ± 1.37	1.56 ±1.4	0.88
	Post	1.14 ± 1.16	1.16 ± 1.17	0.8
	Within Group Difference	-0.6 ± 0.84	-0.3 ± 0.74	0.13
Breast Tenderness	Pre	2.74 ± 0.65	2.56 ± 0.81	0.33
	Post	1.80 ± 0.93	1.90 ± 0.95	0.7
	Within Group Difference	-1.05 ± 0.9	-0.7 ± 0.98	0.13
Breast Swelling	Pre	1.42 ± 1.31	1.56 ± 1.38	0.68
	Post	0.98 ± 0.97	1.36 ± 1.32	0.001*

	Within Group Difference	-1.00 ± 0.71	-0.33 ± 0.71	0.002*
Food Cravings/Increased Appetite	Pre	1.97 ± 1.36	2.00 ± 1.25	0.93
	Post	1.34 ± 0.99	1.7 ± 1.05	0.1
	Within Group Difference	−0.91± 0.88	-0.36 ± 0.71	0.008*
Acne	Pre	1.85 ± 1.26	1.9 ± 1.37	0.89
	Post	1.11 ± 0.9	1.26 ± 1.08	0.09*
	Within Group Difference	-0.82 ± 1.04	−0.66± 0.92	0.5
Bloating	Pre	1.34 ± 0.88	1.34 ± 0.66	0.5
	Post	0.53 ± 0.32	0.89 ± 0.43	0.08
	Within Group Difference	-0.54 ± 0.88	-0.26 ± 0.63	0.01*
Dizziness	Pre	1.44 ± 1.57	2.23 ± 1.19	0.06
	Post	1.20 ± 1.25	1.7 ± 1.16	0.06
	Within Group Difference	-0.4 ± 0.73	-0.4 ± 0.77	0.7
Flushing	Pre	1.77 ± 1.37	2.02 ± 1.21	0.42
	Post	1.31 ± 1.20	1.83 ± 1.17	0.08
	Within Group Difference	-0.8 ± 0.99	-0.36 ± 0.71	0.04*
Nausea, Diarrhea, Constipation	Pre	1.68 ± 1.45	1.90 ± 1.39	.054
	Post	1.01 ± 0.91	1.6 ± 1.24	0.01*
	Within Group Difference	-0.45 ± 0.78	-0.43 ± 0.89	0.9
Heartbeat (Palpations)	Pre	1.08 ± 2.34	1.8 ± 1.27	0.17
	Post	1.4 ± 0.97	1.4 ± 1.1	0.09
	Within Group Difference	-0.91 ± 0.98	-0.5 ± 1.00	0.12

*Note: * denotes significance at P ≤ 0.05. P values are from the independent samples t-test performed between groups at pre-, post- and within group difference. Intervention n = 35, Control n = 30*

Table 4.
Changes in Premenstrual Symptom Screening Tool Means from Kamalifard et al.3

PSST Subscale	Variable	Intervention Group (M±SD)	Control Group (M±SD)	Between Groups P Value
Emotional	Pre	62.34 ± 16.26	54.32 ± 19.16	0.11
	Post	26.28 ± 16.54	54.91 ± 21.31	<0.001*
	P Value (Within Group)	<0.001*	0.856	
Physical	Pre	71.15 ± 22.39	78.57 ± 14.95	0.155
	Post	32.69 ± 20.81	72.01 ± 22.24	<0.001*
	P Value (Within Group)	<0.001*	0.077	
Behavioral	Pre	45.51 ± 19.89	44.04 ± 18.54	0.078
	Post	10.90 ± 14.10	44.05 ± 22.32	<0.001*
	P Value (Within Group)	<0.001*	1	

*Note: * denotes significance at P ≤ 0.05. Between group P values are from the ANCOVA. The PSST scale ranges from 0-100, with lower scores indicating lower symptom experience and severity. Within group P values for each PSST scale are from paired samples t-tests. Intervention n = 31, Control n = 31*

Implications for Practice, Education, and Further Research

Individuals who experience PMS can suffer from symptoms that affect their daily quality of life through emotional, physical, and behavioral symptoms. These symptoms can be treated with over-the-counter medications, prescription medications and hormonal birth control. The side effects or lack of desire to take medications has led to research around other more holistic approaches to treating and reducing the severity of PMS symptoms. Physical activity is not only easily accessible in many forms but can be catered to the individual and their abilities, creating a more patient-centered treatment option. Research evidence supports that physical activity helps reduce the symptoms associated with PMS in menstruating individuals.[1-4]

All three studies evaluated in this CAT showed improvement in PMS symptoms following the intervention activities as compared to the control groups.[2-4] These study findings combined also show that different types of physical activity interventions can help decrease symptoms. Each of the studies implemented exercise interventions ranging from non-aerobic to moderate aerobic activity.[2-4] Dehnavi et al was the only group who monitored physical activity intensity with the Borg Scale, as participants were instructed to stay within the range of moderate intensity.[4] While none of the studies met the ACSM physical activity guidelines[10] or the ACOG[11] recommendation, the physical activity interventions still helped individuals with their PMS symptoms. Since all participants in the studies were individuals who were not currently active, even some physical activity over none could be considered as an effective intervention.[2-4] These findings may be helpful in encouraging lower-level physical activity in those who may be hesitant to exercise and experience PMS symptoms.

Each study used different screening methods and there were some common themes to how PMS symptoms were screened and compared. Kamalifard et al[3] administered the PSST with their study participants and compared pre- and post- scores between groups with an ANCOVA, as well as within group differences with a paired samples t-test. The PSST is a reliable and validated patient rated outcome measure designed to assess individuals'

emotional, physical, and behavioral PMS symptoms.[3,6,14] Instead of using the PSST, the other researchers used longer questionaires.[2,4] Maged et al.[2] used the Daily Symptoms report, where participants indicated each day the severity (0 indicating no symptom to 4 indicated overwhelming/unable to carry out daily routine) of 17 different symptoms. A Mann-Whitney U test was used to compare the number of participants in the control and intervention groups who reported symptoms in those 17 categories pre- and post- intervention (Table 2).[2] Dehnavi et al.[4] had their participants record the severity of 11 daily PMS symptoms, however, they did not provide a scale to interpret the numbers. These pre- and post- values, as well as changes in score, were compared via an independent t-test between the control and intervention groups (Table 3).[4] Although each study used a different approach, the symptoms captured on each scale addressed physical, emotional, and behavioral components.

All three studies showed fewer PMS symptoms in the intervention groups compared to the control post-exercise.[2-4] In Maged et al, the number of participants who experienced symptoms significantly decreased in the intervention group compared to the control in 12 of the 17 symptoms (Table 2).[2] The percent reduction in the intervention group ranged from 33 to 88%, while the differences in the control group ranged from a 10% reduction to a 15% increase in those same symptoms.[2] Dehnavi et al[4] observed significantly lower post-intervention symptom severity scores, including breast swelling, food cravings, bloating, and flushing, in the intervention group as compared to the control (Table 3). Additionally, Dehnavi et al[4] found a significant difference in post-scores symptom severity, with the intervention group scoring lower than the control group in headache, swollen breast, acne, and nausea. However, due the using a t-test over a repeated measures ANOVA, we are unable to determine if this was a true interaction effect between group and time. Finally, Kamalifard et al[3] saw a significant interaction effect, with the intervention group reporting a significant reduction in all symptom scales of the PSST compared to the control group (Table 4). Additionally, the intervention group experienced a highly significant reduction in their post-intervention PSST scores, which was not observed in the control group. With all three studies seeing the similar results, even with different screening tools and with different types of physical activity, bolsters the results that physical activity can be effective in reducing PMS symptoms.

While the evidence across these three studies supports the use of physical activity as a method to reduce PMS symptoms, more information is still needed. Since all individuals in these studies were not active individuals at the start of the study, we cannot extrapolate these findings to those who are already physically active. There could also be concern for a ceiling effect in which usual physical activity may no longer provide symptom relief/reduction. Future studies should include an active population, as well as examine if different methods of exercise or altering a person's usual physical activity can provide PMS symptom relief. Furthermore, since all exercise protocols were below the ACSM guidelines and ACOG recommendations, future studies should explore if symptoms can improve even more with increased activity. Finally, researchers should use the PSST over other scales, as it can provide more details about PMS symptom severity, as well as quality of life.

CAT Kill Date: August 2026

CATs have a limited life and should be revisited approximately 2 years after publication.

Statement of Contributions

LH designed and directed the project. All authors provided critical feedback and helped shape the clinical question, literature search, analysis, and manuscript.

References

1. Kawabe, R., Chen, C. Y., Morino, S., Mukaiyama, K., Shinohara, Y., Kato, M., Shimizu, H., Shimoura, K., Nagai-Tanima, M., & Aoyama, T. (2022). The relationship between high physical activity and premenstrual syndrome in Japanese female college students. BMC Sports Science, Medicine & Rehabilitation, 14(1), 175. https://doi.org/10.1186/s13102-022-00569-0
2. Maged, A. M., Abbassy, A. H., Sakr, H. R. S., Elsawah, H., Wagih, H., Ogila, A. I., & Kotb, A. (2018). Effect of swimming exercise on premenstrual syndrome. Archives of Gynecology and Obstetrics, 297(4), 951–959. https://doi.org/10.1007/s00404-018-4664-1
3. Kamalifard, M., Yavari, A., Asghari-Jafarabadi, M., Ghaffarilaleh, G., & Kasb-Khah, A. (2017). The Effect of Yoga on Women's Premenstrual Syndrome: A Randomized Controlled Clinical Trial. International Journal of Women's Health and Reproduction Sciences, 5(3), 205–211. https://doi.org/10.15296/ijwhr.2017.37
4. Mohebbi Dehnavi, Z., Jafarnejad, F., & Sadeghi Goghary, S. (2018). The effect of 8 weeks aerobic exercise on severity of physical symptoms of premenstrual syndrome: a clinical trial study. BMC Women's Health, 18(1). https://doi.org/10.1186/s12905-018-0565-5
5. Valérie Bougault, Sandrine Schiano-Lomoriello, Castanier, C., Buisson, C., Ericsson, M., Teulier, C., & Collomp, K. (2023). Physical activity and combined hormonal contraception: association with female students' perception of menstrual symptoms. 14. https://doi.org/10.3389/fphys.2023.1185343
6. Chamali, R., Emam, R., Mahfoud, Z. R., & Al-Amin, H. (2022). Dimensional (premenstrual symptoms screening tool) vs categorical (mini diagnostic interview, module U) for assessment of premenstrual disorders. World Journal of Psychiatry, 12(4), 603–614. https://doi.org/10.5498/wjp.v12.i4.603
7. Dimmock, P. W., Wyatt, K. M., Jones, P. W., & O'Brien, P. S. (2000). Efficacy of selective serotonin-reuptake inhibitors in premenstrual syndrome: a systematic review. The Lancet, 356(9236), 1131–1136. https://doi.org/10.1016/s0140-6736(00)02754-9
8. Shi, Y., Shi, M., Liu, C., Sui, L., Zhao, Y., & Fan, X. (2023). Associations with physical activity, sedentary behavior, and premenstrual syndrome among Chinese female college students. BMC Women's Health, 23(1). https://doi.org/10.1186/s12905-023-02262-x
9. Thompson, W. R., Sallis, R., Joy, E., Jaworski, C. A., Stuhr, R. M., & Trilk, J. L. (2020). Exercise Is Medicine. American Journal of Lifestyle Medicine, 14(5), 511–523. https://doi.org/10.1177/1559827620912192
10. American College Of Sports Medicine. (2021). ACSM's guidelines for exercise testing and prescription (11th ed.). Wolters Kluwer/Lippincott Williams & Wilkins Health.
11. Premenstrual Syndrome (PMS). November 2023. Www.acog.org. https://www.acog.org/womens-health/faqs/premenstrual-syndrome
12. PEDro. (1999). PEDro scale. https://pedro.org.au/wp-content/uploads/PEDro_scale.pdf
13. Ebell, M. H., Siwek, J., Weiss, B. D., Woolf, S. H., Susman, J., Ewigman, B., & Bowman, M. (2004). Strength of recommendation taxonomy (SORT): a patient-centered approach to grading evidence in the medical literature. American family physician, 69(3), 548–556
14. Steiner, M., Macdougall, M., & Brown, E. (2003). The premenstrual symptoms screening tool (PSST) for clinicians. Archives of Women's Mental Health, 6(3), 203–209. https://doi.org/10.1007/s00737-003-0018-4

NARRATIVE REVIEW
Volume 6 (2025), No. 1, pp. 27-46
DOI: 10.15367/ch.v6i1.770

AI-Empowered Qualitative Data Analysis: Training Future Public Health Researchers

CHRISTOPHER W. WHELDON, PhD, MEd, MSPH[1], RYAN W. MCKEE, PhD, MEd, MS[1]
[1]Department of Social and Behavioral Sciences, College of Public Health, Temple University, Philadelphia, PA, USA

Correspondence: chris.wheldon@temple.edu (Christopher W. Wheldon)

Advances in generative artificial intelligence (AI) are transforming qualitative data analysis in public health research. By enhancing the efficiency and scalability of data analyses, AI-empowered tools allow researchers to handle larger datasets (i.e. interview transcripts) and uncover deeper insights than traditional methods of manual or computer assisted analysis. However, while AI tools like NVivo, Atlas.ti, and MAXQDA enhance efficiency by automating coding and theme identification, they are still limited in their ability to replicate the nuanced interpretative role of human researchers. In addition, the adoption of these technologies necessitates careful consideration of ethical implications. Educating public health students on the use and limitations of AI tools, alongside traditional qualitative methods, will prepare them for the evolving research landscape. In this article, we describe current AI-empowered tools for qualitative data analysis, review their strengths and weaknesses, and outline learning objectives with sample lesson plans to prepare public health students to critically employ these tools in their own research endeavors.

***Keywords**: Generative AI, Qualitative Data Analysis, Public Health Education, CAQDAS, Ethical Considerations, AI Tools*

Background

Qualitative methods have become an integral part of public health research,[1] allowing researchers and practitioners to achieve a wide range of objectives (See Stickley and Colleagues for a recent overview).[2] Qualitative data collection methods can include interviews, focus groups, participant observation, and textual analysis. Qualitative designs are flexible and iterative, and help researchers understand the meaning behind people's health decisions and behaviors, as well as the symbolic meaning behind participants' words and actions. In addition, qualitative researchers attempt to understand the structural barriers that lead to negative health outcomes, and evaluate interventions designed to promote health and wellness through the analysis of rich data sources.[3] Qualitative study designs have gained increasing acceptance as stand-alone methodologies, driven by a growing emphasis on cross-cultural health and health equity.[4,5]

Qualitative data analysis encompasses a diverse set of methods designed to systematically interpret and make meaning from data (e.g., textual, audio, visual data).1 While approaches vary depending on the study's epistemological framework, most qualitative analyses involve an iterative process of data immersion, data reduction through qualitative coding, and making meaning from the data.[6] Common analytic approaches include thematic analysis (i.e., methods to identify themes from

the data), grounded theory (i.e., identify patterns and develop new theories), framework analysis (i.e., apply existing theories to reduce data into meaningful chunks), and content analysis (i.e., categorizing data by counting the frequency of words, phrases, or concepts), each offering distinct strategies for identifying and interpreting patterns within the data. Data analysis is usually conducted in teams, where discussions and reflexivity play a crucial role in ensuring rigor, reducing bias, and enhancing the credibility of findings. Since the 1980s, researchers have utilized computer assisted qualitative data analysis software (CAQDAS), significantly enhancing the efficiency of qualitative data analysis (e.g., coding data and identifying themes).[7,8] More recently, the rise of inexpensive and accessible generative artificial intelligence (AI) tools has presented the opportunity to transform many industries and academic fields. The disciplines of public health and qualitative research are equally poised to gain from these groundbreaking technologies.[9,10] However, these advancements also raise important questions regarding the effectiveness of AI tools in research and the ethical considerations surrounding their use.[9–12]

In this article, we provide a brief history of CAQDAS, explore how generative AI can support qualitative researchers, assess the strengths and limitations of select widely available AI tools for data analysis, and discuss the ethical considerations of using generative AI in qualitative research. Finally, we will share and describe a lesson plan aimed at helping public health students learn about and use generative AI tools for qualitative data analysis.

The Role of Generative AI in Qualitative Data Analysis

The widespread availability of generative artificial intelligence tools is opening a new world of possibilities for qualitative researchers.[9,10] By leveraging advanced algorithms, generative AI can process and analyze vast amounts of qualitative data with unprecedented speed and efficiency.[12] Generative AI can quickly identify patterns, themes, sentiments, and trends in data. It can also be used to develop coding schemes (a set of codes used to help categorize information) and, potentially, reduce biases inherent in human analysis.[13] By automating the coding process, generative AI tools can expedite tasks that traditionally required extensive manual effort, such as categorizing and organizing open-ended responses, making qualitative research more efficient and scalable.

Generative AI can transcribe interviews, or even provide real-time analysis of audio and video interviews.[14] These tools can be fitted to traditional coding methodologies like deductive (top-down coding organized by pre-existing themes) and inductive coding (bottom-up coding, in which new codes are developed from data), enhancing the objectivity and scalability of qualitative research.[15] Generative AI can support complex research frameworks such as grounded theory, which involves multiple stages of coding and the identification of connections between codes.[16] Further, some researchers even use generative AI to create synthetic data that can be used for training students or in situations where real data is difficult to obtain or sensitive in nature.[17] By leveraging these capabilities, generative AI can complement human researchers, allowing them to focus on the more nuanced aspects of qualitative analyses, such as interpreting results, formulating conclusions, and determining broader implications.

In table 1, we provide specific examples of how AI-empowered tools can be used at each step of the thematic data analysis process, as described by Braun and Clarke (2006). This includes automatic transcription of audio files, generating word counts and concept clouds, auto-coding transcripts, generating summative themes, cross-referencing themes with coded segments, and creating tables and figures to illustrate findings. These capabilities can enhance the efficiency and credibility (i.e., validity of conclusions drawn from the raw data) of qualitative research, enabling researchers to manage larger datasets and gain deeper insights.[18]

But while generative AI offers exciting possibilities for advancing qualitative research in public health, it also presents challenges that need to be addressed to fully realize its potential benefits. The key will be to leverage AI as a tool to complement human expertise, not replace it. As AI becomes more integrated into public health research, there will be a need for increased education on its capabilities and limitations, as well as the development of rigorous regulations to guide its use.

Table 1.
Examples of AI Use in the Thematic Data Analysis

Steps in Qualitative Data Analysis	Examples Using AI-Empowered Tools
Data familiarization: Preliminary ideas start to emerge through repeated exposure to the data	Automatically transcribe audio files in real time; Generate word counts and concept clouds; Generate and review AI-derived summary codes without specific prompts; Ask for narrative summarizes of the data; Summarize, edit, and synthesize analytic memos in real time.
Generating initial codes: Initial process to reduce textual data into smaller meaningful coded segments	Auto code transcripts; Prompt more specific coding with a detailed codebook; Specify coding approach (e.g., sentiment, in-vivo codes); Interact with data using conversational AI features.
Searching for themes: categorizing codes into meaning summative themes	Automatically collate data relevant to each code; Generate summative themes with associated text extracts; Explore coded segments using different layouts and visualizations; Ask conversational AI to list patterns, themes, and key summaries.
Reviewing themes: Mapping themes back onto original coded extracts	Cross-reference themes to coded segments and specific quotes from the text; Validate themes with AI-driven data checking.
Defining and naming themes: Edit and refine themes producing clear definitions of each theme	Generate automatic code and document summaries; Cross-reference theme descriptions with published research; Generate alternative definitions and names.
Reporting: Creating tables and figures that provide evidence for how themes relate to codes and to extracted quotes from the original data	Generate summary tables and figures to illustrate findings.

AI and CAQDAS

Commercialization of CAQDAS tools increased in the following decades, yet integration of these software products into qualitative research methods pedagogy has been slow despite the availability of a wide variety of user-friendly packages.[7,19] Many CAQDAS software packages have been available for decades and have continued to add features (Table 2). Packages such as NVivo, ATLAS.ti, and MAXQDA were originally developed in the 1990s, but continue to adapt. These packages now have web-based applications joining newer web-based only applications (e.g., Dedoose). The rapid emergence of generative AI technologies represents the latest advancement impacting CAQDAS. Established software packages have begun to incorporate AI features

into existing web-based and desktop applications.

Table 2.
Examples of AI-Empowered Tools for Qualitative Data Analysis as of the Writing of this Article

Name	Type	Release Date	Platform	Student License	Free Trial
ATLAS.ti	QDAS	1993	Windows Mac Web-based	Yes	Yes
Chat-GPT	General purpose AI	2020	Web-based	No	Yes
Claude AI	General purpose AI	2023	Web-based	No	Yes
CoLoop	AI specific text analysis	2022	Web-based	No	No
MAXQDA	QDAS	1989	Windows Mac Web-based	Yes	Yes
Nvivo	QDAS	1981	Windows Mac Web-based	Yes	Yes

Examples of Current AI-Empowered QDA Tools

We conducted a cursory examination of existing AI-empowered QDA tools; however, the availability of these tools and their specific features are rapidly changing. At the time of this writing, Atlas.ti has deployed features on their cloud-based application that can, if desired by the researcher, fully automate the coding process. This tool can also suggest codes during manual coding and allow the user to ask a chatbot questions about specific documents (e.g., "What are the main themes from this transcript?"). The desktop version has these features in addition to what is called "AI summaries," which provide a concise description of the text documents. All these features are in beta testing and use OpenAI's GPT models.

MAXQDA has also added features powered by OpenAI to their desktop application. Some features are like those available in Atlas.ti, such as suggested codes. However, MAXQDA also offers the ability to suggest subcodes to manually coded data. The software can also automatically transcribe audio and video in over 45 languages. The rest of their AI features are focused on summarizing, explaining, and paraphrasing coded segments.

NVivo, also leveraging the power of OpenAI's ChatGPT, offers a similar set of AI tools to process and analyze qualitative data. As with the previously mentioned software packages, NVivo's Autocode Wizard enables the user to analyze text documents (e.g., interview transcripts) by applying codes. However, Nvivo's AI tool can learn coding strategies from previously analyzed documents that were manually coded (referred to as "pattern coding"). This enables the user to create and apply a codebook using traditional methods and then have Nvivo's tool apply that codebook to new documents. Users can also apply sentiment analyses and control how much of the text segments to code, such as sentences, paragraphs, or whole transcripts. The results can

then be displayed as a coding hierarchy or a matrix.

New software packages developed with the sole focus of leveraging AI for CAQDAS are also being produced. In contrast to traditional QDAS that have incorporated AI powered features, CoLoop is designed specially to leverage AI technologies for qualitative data analysis. Developed by Genei.io, the tool is described as an "AI Copilot," that allows the researcher to ask questions of the data through a chat function. CoLoop can also transcribe audio and video files, analyze text data, and output results in a table format. The tool can also provide answers to prompts, summaries for individual interviews, and thematic summaries across multiple transcripts.

A third category of software utilized for CAQDAS includes more general-purpose AI systems such as ChatGPT and Claude. These systems are not solely designed for qualitative data analysis but are being used to support a range of research tasks. For instance, ChatGPT 4.0, with its advanced natural language processing capabilities, can assist researchers in summarizing the content of interview transcripts, abstracting meaning from the text, and generating codebooks. Similarly, Claude, another generative language model, is geared towards understanding and creating human-like text responses. It can be used in qualitative research to simulate interactions, analyze sentiment, and assist in the thematic analysis of large datasets. Both ChatGPT and Claude can be integrated into academic and research-focused products to tailor AI capabilities needed to enhance the efficiency of qualitative analyses. These integrations demonstrate the potential of generative AI tools to significantly impact the field of qualitative research by providing robust, scalable solutions for data interpretation.

Strengths and Limitations of Current Tools

The integration of AI into CAQDAS offers significant strengths that enhance the research process. Efficiency and speed are among the most evident benefits, as AI tools like ChatGPT and Claude can quickly process large volumes of data, reducing the time researchers spend on manual coding. This increased efficiency enables researchers to handle larger datasets than traditionally possible in qualitative research, addressing scalability issues and allowing for the study of broader sample sizes.

Additionally, AI-driven CAQDAS can enhance insight and improve accuracy. These tools may help uncover patterns and connections that human coders may overlook, thus providing a novel method for member checking and triangulation. This capability not only bolsters the reliability of research findings but also expands the analytical possibilities of text data (e.g., open coding of electronic medical records).[20]

Despite these strengths, the integration of AI into CAQDAS is not without limitations. Many AI features in tools like Atlas.ti, MAXQDA, and CoLoop are still in beta testing, which may pose reliability issues. The rapid incorporation of AI functionalities often means these features are underdeveloped and may not meet all research needs immediately.

A gap exists between the current capabilities of AI-driven CAQDAS and more advanced qualitative coding methods. Qualitative coding methods are complex and varied. Saldaña and colleagues described more than 32 coding methods.[6] For instance, methodologies such as constant comparative analysis by document groups or emotion coding require nuanced coding methods. For example, understanding how participants describe vaccine hesitancy requires more than identifying keywords—it involves interpreting shifts in reasoning, emotional tone, and underlying social influences. A researcher often wants to systematically apply different coding methods to a dataset, synthesize codes into broader categories and themes, and engage in iterative interpretation of the data. Existing AI-driven CAQDAS tools cannot, at this time, fully replicate these varied systematic approaches.

Currently, AI-assisted CAQDAS tools are limited in their ability to extend beyond text

analysis. Qualitative data can include the coding and analysis of images and other visual mediums. For example, qualitative research has been used to analyze internet memes to surveil trends public perceptions of pandemics (e.g., COVID-19).[21] These methods are commonly used to understand contexts contained in images and video.[22] They are also central to the evaluation of public health programs employing novel methods like PhotoVoice.[23] However, AI image processing is rapidly advancing, and innovative qualitative research applications will have the possibility to yield tremendous benefits (e.g., using AI-driven software to identify pain and emotions from facial expressions).[24]

There are also limitations inherent to existing large language models that should be considered, such as their ability to understand subcultural, regional and generational slang (i.e., ubiquitous informal language that is highly culturally context dependent).[25] Interpretive methods, such as ethnography, are highly focused on understanding emic knowledge (i.e., descriptions of a culture from the point of view of those who use a common language and have a common lived experience), which require an analysis of subcultures that might be marginalized, and whose discourse may be outside the purview of the data corpus used to train the large language models. The potential inability of large language models to understand the use of slang, and the likelihood of bias, is likely greater for non-English languages. This is particularly concerning for public health research that is often focused on global health issues (e.g., HIV prevention in sub-Saharan Africa) where there are already language barriers that need to be addressed using qualitative methods (e.g., HIV prevention in African countries).[26] Further, the lack of human emotion and cultural nuance (emic perspectives) in AI analysis could result in misinterpretations of qualitative data, particularly when analyzing slang or culturally specific discourse.

This also raises a larger issue related to potential bias in large language models. Their use introduces the risk of "inheriting" the biases of those who develop and program the software, or biases that are present in the training data.[27] Such inherent bias could skew research outcomes (particularly in health disparities research involving marginalized populations). While human coders are not immune to bias, reliance on large language models like those developed by OpenAI, which are used in commercial software such as Atlas.ti, MAXQDA, and CoLoop, could impact analysis and findings, particularly in sensitive research areas. It is crucial for researchers to remain vigilant and critically evaluate AI-generated insights, ensuring that the final interpretations accurately reflect the data's context and inherent meanings. Such human oversight is of scientific importance and has ethical implications as noted below.

Ethical Considerations

The integration of AI technologies into qualitative data analysis necessitates unique ethical considerations. AI-powered tools like Atlas.ti, MAXQDA, and NVivo store and process data through cloud computing systems. This raises significant concerns about data security and confidentiality. Additionally, general-purpose AI systems such as ChatGPT and Claude may use the data to train their language models, posing additional risks. It is crucial for researchers to understand these implications and take appropriate measures to protect participant data in compliance with ethical standards. The Belmont Principles (i.e., Respect for Persons, Beneficence, and Justice) provide a useful framework to consider some of these issues.

Respect for Persons requires that participants are fully informed about the use of AI in data analysis and the potential risks. This includes transparency about how AI will process and interpret their data, with a focus on ensuring participants comprehend the implications of AI involvement. Given that not all participants may be familiar with AI technologies, researchers must provide clear, simplified explanations. Additionally, privacy and confidentiality must be rigorously maintained. Again, all the AI

CAQDAS tools reviewed in this article utilize cloud computing to store and process data. This inherently involves third party companies. In many cases, the ways in which data are protected, accessed, and used by these companies are not explicitly stated. For example, Atlas.ti indicates that they "...have concluded a Data Processing Agreement, including the Standard Contractual Clauses (SCC) with OpenAI" to ensure "the safety of your personal data," users should be aware that this data is transferred through an application program interface (API) to run the OpenAI models. Furthermore, Atlas.ti "may also send select portions of content to third-party contractors (subject to confidentiality and security obligations) for data annotation and safety purposes."

Participants should also be made aware if their data will be used to train AI models. This is essential to ensure that the respect for persons criteria is met. Researchers must approach the use of AI-assisted CAQDAS with caution, ensuring that participants are fully aware of the risks of, and provide explicit consent for, their data to be used in training AI models. This transparency is vital to maintain the integrity of the research and respect participants' rights.

Under the principle of Beneficence, researchers must conduct a thorough risk-benefit analysis to ensure that the integration of AI does not introduce risks that outweigh the benefits. In qualitative research, a main concern is often the breach of confidentiality. Qualitative methods often involve the collection and analysis of sensitive data, which in public health research may include personal health information, sensitive participant narratives (e.g., sexual health, substance use), and other personal information. Data editing and the removal of identifiers are crucial steps in safeguarding sensitive information. Researchers should be cautious about using cloud-based AI transcription services for sensitive data unless they can guarantee that audio files are thoroughly de-identified. Alternatively, using local, or "offline", AI-based transcription tools (e.g., noScribe) can mitigate the risks associated with cloud storage. This approach helps prevent unauthorized access and helps ensure that participant confidentiality is maintained. Additionally, researchers and IRBs must consider the unique ways AI threatens confidentiality (e.g., voice recognition, triangulation of multiple datapoints to re-identify a participant), which could inadvertently lead to the identification of participants. Evaluating and mitigating these risks is essential to protecting participants' privacy.

The principle of Justice emphasizes that those who bear the burdens of research should receive the benefits in equal measure to the burdens. AI algorithms are only as good as the data they are trained on. If the training data lacks diversity or underrepresents certain population subgroups, the large language models will not be able to accurately analyze or reflect the experiences of these populations. The potential for AI to make errors or misinterpret data of vulnerable populations is an ethical consideration. Thus, it is crucial to implement robust validation protocols that can be used to check AI outputs and mitigate the risk of harm caused by erroneous data interpretation. Using existing qualitative data validation techniques such as member checking, triangulation, audit trails, and peer debriefing can significantly enhance the ethical principle of justice in AI-driven qualitative data analysis. These techniques can be applied to ensure a more equitable representation of all participant groups, particularly marginalized and vulnerable populations.

In addition to these principles, algorithmic transparency is crucial. AI systems used in research should be transparent in their operations, allowing researchers to understand and explain methodological decisions and interpretations. However, many AI models, particularly deep learning systems, function as "black boxes," where decision-making processes are not easily interpretable even to developers. This presents a significant challenge for ensuring full transparency in qualitative research applications. Collaboration with AI experts is essential to navigate these complexities and promote ethical implementation, but achieving true interpretability remains an ongoing challenge.

Using AI Empowered CAQDAS in the Classroom

As with past technological advancements, the rise in generative AI will change the way scientific research is conducted. Public Health programs, including qualitative researchers and research methods instructors, must become adept at utilizing these tools so that they may prepare students for their roles as future researchers and program evaluators. Understanding the utility and ethics of AI-assisted qualitative research will enable students to engage critically with contemporary scholarship. Furthermore, the next generation of public health researchers will need to be able to make the most of generative AI to contribute to a field that is already being shaped by these tools.

As generative AI become ubiquitous, public health research will demand a skillset that is inclusive of generative AI tools for data analysis and interpretation. Additionally, only those with a comprehensive understanding of the ethical issues surrounding the use of generative AI in research, and their responsibilities as researchers, will be able to ensure that participants and their data are protected during the qualitative research process. Those who are highly skilled at working with this technology to increase productivity, creativity, and participant safety will be sought after in the job market, and on the forefront of innovation in qualitative research and analysis.

Related competencies are already guiding curriculum at all levels of public health education. In our own masters and doctoral programs, a core competency is to identify and evaluate emerging methods and technologies that can advance public health research and practice. Students must also establish ethical principles in research and practice. The field is rapidly advancing, and our curriculum needs to keep pace.

To assist students in learning how to use generative AI tools, instructors must stay up to date on advancements in platforms. Finding a community of researchers to converse with through academic societies, social media or their university library can help instructors stay current in their understanding of generative AI tools. In the classroom, instructors can utilize free trial periods offered by many of the computer assisted qualitative analysis software programs. Most of the programs offer lower-cost student licenses as well (Table 2). Additionally, we have included sample objectives and activities (see Table 3). Instructors can utilize these objectives and activities to develop new lesson plans or integrate them into their existing classroom strategies.

To further assist instructors, we have included two sample lesson plans aimed at integrating generative AI into qualitative methods courses. The first sample lesson plan (Lesson Plan 1; Appendix A) introduces students to the fundamentals of using QDAS with generative AI capabilities. The lesson, designed for undergraduate students, allows students to explore the possibilities and limitations of using AI tools for qualitative analysis and discuss the ethical considerations involved.

Lesson Plan 2 (Appendix B) is an interactive and comprehensive session focused on the possibilities of using AI-empowered tools to conduct qualitative analysis of textual data. It begins with an introduction, followed by hands-on segments for manual coding and employing AI tools. The workshop emphasizes understanding the strengths and limitations of these approaches, incorporating discussions on ethical considerations in AI usage. It concludes with a reflective group discussion and Q&A, aiming to deepen the understanding of qualitative data analysis in the modern research landscape. This lesson plan was created for a graduate-level research methods course for public health students focusing on social and behavioral sciences. When it was first delivered in the fall semester of 2023, most students described very limited exposure to AI tools like ChatGPT. There was a rich discussion around research ethics and the unique issues raised by using AI-empowered tools in qualitative data analysis.

Table 3.
Learning Objectives and Strategies to Incorporate AI-Empowered Qualitative Data Analysis in Undergraduate and Graduate Courses.

Learning Objective	Sample Activities
Describe what generative AI is and how it can be used in qualitative data analysis	**Interactive Demonstrations:** Use simple, interactive demonstrations of generative AI tools to show how they can process and analyze qualitative data. **Case Studies:** Present case studies where generative AI has been used in qualitative research, highlighting the process and outcomes. **Critical Analysis:** Engage students in critically analyzing the strengths and limitations of generative AI in qualitative research.
Recognize ethical issues that arise from using AI empowered tools for qualitative data analysis	**Ethical Debates:** Facilitate debates on the ethical implications of using AI in research, promoting awareness of responsible use. **Scenario Analysis:** Present hypothetical scenarios where AI tools are used in qualitative research, prompting students to identify potential ethical issues. **Policy Review:** Analyze existing policies on AI ethics in research, guiding students to understand the regulatory landscape.
Use AI empowered QDAS to generate initial first cycle codes of qualitative data and generate summary themes	**Interactive Demonstration**: Demonstrate how to use specific AI-empowered tools to analyze a qualitative data set. Focus on different coding strategies (e.g., descriptive, sentiment, etc.) and themeing methods (e.g., axial coding, pattern coding). **AI Coding Workshop:** Provide students with a dataset of qualitative responses. They will use an AI-powered Qualitative Data Analysis Software (QDAS) to input the data and generate initial codes. The activity will guide them through refining these codes into coherent themes.
Compare and contrast AI generated results to manually coded qualitative data	**Dual Coding Challenge:** Give students a set of qualitative data to code manually. Afterward, they will use an AI tool to code the same data. The class will then compare results, discussing similarities and differences. **Accuracy Assessment Task:** This task involves students assessing the accuracy of AI-generated codes against a 'gold standard' set of manually coded data. They will evaluate precision, recall, and overall accuracy.

	Reflective Analysis Seminar: Students will reflect on their experiences with both manual and AI coding, considering factors like time efficiency, ease of use, and perceived accuracy. They will share insights in a seminar format.
Create a data analysis plan to integrate AI empowered tools into a qualitative methods research project	**Mock Group Research Project:** In groups, students will design a mock qualitative research project, incorporating AI tools into their methodology. They will present their plans, highlighting how AI will be used at each stage.
	Individual Grant Proposal Project: Students will individually draft a sample grant proposal for a qualitative research study that incorporates the ethical use of AI-empowered CAQDS

Conclusion

The integration of AI tools into qualitative data analysis represents a transformative shift in public health research. By enhancing the efficiency and scalability of data processing, AI-empowered tools allow researchers to handle larger qualitative datasets and uncover deeper insights than traditional methods. However, the adoption of these technologies necessitates careful consideration of ethical implications, including data security, bias, and the need for transparency. Educating public health students on the use and limitations of AI tools, alongside traditional qualitative methods, will prepare them for the evolving research landscape.

Acknowledgements

We acknowledge the use of AI tools, including Microsoft Copilot and ChatGPT, in the development of this manuscript. Microsoft Copilot was utilized to brainstorm objectives and to compare its generated lesson plan to our initial draft, ensuring comprehensiveness. ChatGPT was also used early in the process to brainstorm and outline ideas, which were then compared with our independently developed concepts to refine the manuscript's overall structure and content.

Statement of Contributions

Both authors contributed equally to this manuscript. Dr. Wheldon led the writing of the sections detailing the current tools, their strengths and limitations, and the ethical considerations surrounding the use of AI in qualitative data analysis. Dr. McKee lead the sections focused on the overview of qualitative methods, the impact of AI on qualitative research, and the pedagogical strategies for teaching public health students about AI in qualitative data analysis. Both Drs. Wheldon and McKee contributed example lesson plans. Dr. Wheldon took the lead in organizing the manuscript and preparing it for publication.

References

1. Padgett, D. (2012). Qualitative and Mixed Methods in Public Health. https://doi.org/10.4135/9781483384511
2. Stickley, T., O'Caithain, A., & Homer, C. (2022). The Value of Qualitative Methods to Public Health research, Policy and Practice. Perspectives in Public Health, 142(4), 175791392210838. https://doi.org/10.1177/17579139221083814
3. Tolley, E. (2016). Qualitative Methods in Public Health: A Field Guide for Applied Research. John Wiley & Sons, Incorporated. http://ebookcentral.proquest.com/lib/templeuniv-ebooks/detail.action?docID=7104122
4. Taylor, B & Francis, K. (2013). Qualitative Research in the Health Sciences: Methodologies, Methods and Processes. Taylor & Francis Group. http://ebookcentral.proquest.com/lib/templeuniv-ebooks/detail.action?docID=1244832
5. Griffith, D. M., Shelton, R. C., & Kegler, M. (2017). Advancing the Science of Qualitative Research to Promote Health Equity. Health Education & Behavior, 44(5), 673–676. https://doi.org/10.1177/1090198117728549
6. Saldaña, J. (2009). The Coding Manual for Qualitative Researchers. SAGE Publications. https://doi.org/10.1109/test.2002.1041893
7. Wolski, U. (2018). The History of the Development and Propagation of QDA Software. The Qualitative Report. https://doi.org/10.46743/2160-3715/2018.2984
8. Gilbert, L. S., Jackson, K., & di Gregorio, S. (2013). Tools for Analyzing Qualitative Data: The History and Relevance of Qualitative Data Analysis Software. Handbook of Research on Educational Communications and Technology, 221–236. https://doi.org/10.1007/978-1-4614-3185-5_18
9. Sallam, M. (2023). ChatGPT Utility in Healthcare Education, Research, and Practice: Systematic Review on the Promising Perspectives and Valid Concerns. Healthcare, 11(6), 887. https://doi.org/10.3390/healthcare11060887
10. Biswas, S. S. (2023). Role of Chat GPT in Public Health. Annals of Biomedical Engineering, 51(5). https://doi.org/10.1007/s10439-023-03172-7
11. Computer Does Qual: Avoiding AI-overclaim & false equivalency. (2023). Greenbook.org. https://www.greenbook.org/insights/the-prompt-ai/computer-does-qual-avoiding-ai-overclaim-and-false-equivalency
12. Hryciw, B. N., Andrew, & Kwadwo Kyeremanteng. (2023). Guiding principles and proposed classification system for the responsible adoption of artificial intelligence in scientific writing in medicine. PubMed, 6. https://doi.org/10.3389/frai.2023.1283353
13. AI is Transforming Qualitative Research Coding. (2024). Greenbook.org. https://www.greenbook.org/insights/qualitative-market-research/ai-is-transforming-qualitative-research-coding
14. Atefeh Jebeli, Lujie Karen Chen, Guerrerio, K., Papparotto, S., Berlin, L. J., & Brenda Jones Harden. (2023). Quantifying the Quality of Parent-Child Interaction Through Machine-Learning Based Audio and Video Analysis: Towards a Vision of AI-assisted Coaching Support for Social Workers. ACM Journal on Computing and Sustainable Societies. https://doi.org/10.1145/3617693
15. Xiao, Z., Yuan, X., Liao, Q. V., Abdelghani, R., & Oudeyer, P.-Y. (2023). Supporting Qualitative Analysis with Large Language Models: Combining Codebook with GPT-3 for Deductive Coding. 28th International Conference on Intelligent User Interfaces. https://doi.org/10.1145/3581754.3584136
16. Muller, M., Min Kyung Lee, Eric, Mimno, D., & N. Sadat Shami. (2016). Machine Learning and Grounded Theory Method. https://doi.org/10.1145/2957276.2957280
17. Guo, X., & Chen, Y. (2024). Generative AI for Synthetic Data Generation: Methods, Challenges and the Future. ArXiv.org. http://arxiv.org/abs/2403.04190

18. Korstjens, I., & Moser, A. (2017). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. European Journal of General Practice, 24(1), 120–124. https://doi.org/10.1080/13814788.2017.1375092
19. Luiz Rafael Andrade, António Pedro Costa, Ronaldo Nunes Linhares, Azevedo, C., & Luís Paulo Reis. (2018). Qualitative Data Analysis Software Packages: An Integrative Review. Advances in Intelligent Systems and Computing, 279–290. https://doi.org/10.1007/978-3-030-01406-3_24
20. Knevel, R., & Liao, K. P. (2022). From real-world electronic health record data to real-world results using artificial intelligence. Annals of the Rheumatic Diseases, annrheumdis-2022-222626. https://doi.org/10.1136/ard-2022-222626
21. Al-Rawi, A., Siddiqi, M., Li, X., Vandan, N., & Grepin, K. (2021). A thematic analysis of Instagram's gendered memes on COVID-19. Journal of Visual Communication in Medicine, 44(4), 1–14. https://doi.org/10.1080/17453054.2021.1941808
22. Covert, H. H., & Koro-Ljungberg, M. (2015). Layers of narratives, images, and analysis. Qualitative Research Journal, 15(3), 306–318. https://doi.org/10.1108/qrj-08-2014-0042
23. Seitz, C. M., & Muhsin Michael Orsini. (2022). Thirty Years of Implementing the Photovoice Method: Insights From a Review of Reviews. Health Promotion Practice, 23(2), 281–288. https://doi.org/10.1177/15248399211053878
24. Park, I., Jae Hyon Park, Yoon, J., Song, I.-A., Hyo-Seok Na, Ryu, J.-H., & Oh, A.-Y. (2023). Artificial intelligence model predicting postoperative pain using facial expressions: a pilot study. Journal of Clinical Monitoring and Computing, 38(2), 261–270. https://doi.org/10.1007/s10877-023-01100-7
25. Prescott, M. R., Yeager, S., Ham, L., Rivera, C. D., Serrano, V., Narez, J., Dafna Paltin, Delgado, J., Moore, D. J., & Montoya, J. (2024). Comparing the Efficacy and Efficiency of Human and GenAI Qualitative Thematic Analyses (Preprint). JMIR AI, 3, e54482–e54482. https://doi.org/10.2196/54482
26. Duby, Z., Hartmann, M., Mahaka, I., Munaiwa, O., Nabukeera, J., Vilakazi, N., Mthembu, F., Colvin, C. J., Mensch, B., & van der Straten, A. (2015). Lost in Translation: Language, Terminology, and Understanding of Penile–Anal Intercourse in an HIV Prevention Trial in South Africa, Uganda, and Zimbabwe. The Journal of Sex Research, 53(9), 1096–1106. https://doi.org/10.1080/00224499.2015.1069784
27. Morgan, D. L. (2023). Exploring the Use of Artificial Intelligence for Qualitative Data Analysis: The Case of ChatGPT. International Journal of Qualitative Methods, 22. https://doi.org/10.1177/16094069231211248

Appendix A:
Lesson 1: Introduction to Generative AI for Qualitative Data Analysis in Public Health Research

Objectives:
- Understand the role of generative AI in enhancing qualitative data analysis within the context of public health research.
- Explore practical applications of generative AI tools specific to public health studies.

Duration:
- 60 minutes

Materials Needed:
- Projector or screen for presentation
- Laptops or computers with internet access
- Access to AI enhanced QDA software for student use

Activity Steps:
1. **Introduction to Generative AI (15 minutes)**
    - Briefly define generative AI as a subset of artificial intelligence that generates new content based on patterns learned from existing data.
    - Present specific use cases of generative AI tools applicable to public health research:
        - Text summarization: How generative AI can summarize lengthy qualitative interviews or reports.
        - Topic modeling: Identifying key themes and topics within large datasets.
        - Sentiment analysis: Analyzing public health-related social media posts.
    - Discuss potential benefits of using these tools in qualitative or mixed-method public health studies.
        - Efficiency and speed
        - Improved accuracy
        - Scalability
        - Enhanced insights
        - Predictive modeling
        - Others?
2. **Hands-On Exploration (30 minutes)**
    - Form small groups of students.
    - Provide access to a generative AI platform (e.g., OpenAI's GPT-3 Playground).
    - Assign a public health research question (e.g., "Explore barriers to vaccination acceptance") to each group.
    - Instruct students to use a generative AI tool to generate relevant content related to their research question (e.g., prompt AI to "draft ten 200-word first-person vignettes from the perspectives of different individuals who were hesitant to get vaccinated or had trouble accessing them).
    - Instruct students to use an AI tool to analyze the vignettes: searching for themes/codes/sentiment
    - Share findings within the class.
    - Proposed discussion questions
        - How might using AI to generate the data have influenced the findings?

        - What similarities and differences were there in the AI themes/codes and how you would interpret the data using manual qualitative coding?
3. **Ethical Considerations (10 minutes)**
    - Discuss ethical implications of using AI-generated content in public health research:
        - Bias: How generative AI models may inherit biases from training data.
        - Transparency: The importance of transparency when reporting AI-generated results.
        - Privacy: Considerations when handling sensitive health data.
        - IRB: What questions might be raised by an IRB about AI assisted qualitative research?
    - Brainstorm strategies to mitigate these ethical challenges.
4. **Conclusion (5 minutes)**
    - Summarize the potential of generative AI in advancing qualitative data analysis within the field of public health.
    - Encourage students to explore further and critically evaluate the role of AI in their research endeavors.
        - Students evaluate the work
        - Choose 2 (1 from each group) to demonstrate that have free versions

Appendix B:
Lesson 2: Using AI for qualitative data analysis

This is an interactive and comprehensive session designed for undergraduate or graduate students, focusing on the possibilities of using AI-empowered tools to conduct qualitative data analysis of text data.

Learning Objectives:
1. Apply manual template and emotion coding to excerpts from qualitative interviews.
2. Describe current capabilities of AI-empowered qualitative data analysis software (e.g., Atlas.ti).
3. Explore text analysis capabilities in ChatGPT and discuss ethical issues using AI tools.

Preparation:
1. Register for a Free Trial of Atlas.ti Cloud https://atlasti.com/free-trial-version
2. Register an account with ChatGPT at https://chat.openai.com/

Materials Needed:
- Sample qualitative interview excerpts.
- Access to Cloud based Atlas.ti and ChatGPT.
- Projector and screen for demonstrations.
- Handouts with step-by-step instructions.
- Students needs computers connected to the internet.

Activities:
1. **Introduction (10 minutes)**
    - Brief overview of qualitative data analysis.
    - Introduce the approaches: manual coding and AI auto-coding and summarizing.
2. **Approach 1: Manual Coding (30 minutes)**

- **Lecture (10 minutes):** Explain template and emotion coding, their importance in qualitative analysis.
- **Practice (20 minutes):** Hands-on activity with interview excerpts.
  - Provide excerpts and guide students through the coding process.

3. **Approach 2: AI Tools in Atlas.ti (30 minutes)**
   - **Lecture (10 minutes):** Overview of AI-empowered tools and their applications in Atlas.ti.
   - **Practice (20 minutes):**
     - Demonstration of Atlas.ti features.
     - Discussion on how AI tools aid in qualitative data analysis.
4. **Approach 3: ChatGPT for text analysis (30 minutes)**
   - Lecture (10 minutes): Overview of ChatGPT and large language models
   - Practice (20 minutes):
     - Demonstration of ChatGPT capabilities and the importance of well-designed prompts.
     - Discussion on how ChatGPT compares to AI tools in Atlas.ti.
5. **Q&A and Discussion (10 minutes)**
   - Address questions and discuss practical applications.

Group Discussion Questions:

- What was most surprising about what you learned today?
- What are some strengths and limitations of the approaches we demonstrated today?
- What would you want to learn more about?
- What are the key ethical considerations using AI tools for QDA?

Post-Workshop:

- Provide an online resource list for further learning.
- Share the presentation slides and practice data sets with attendees.

Approach 1: Manual Coding

The **purpose** of this assignment is to **practice qualitative coding** and compare the results of the qualitative analysis with your classmates. Below you will find **open-ended responses** that were provided in a study about HPV vaccination among gay and bisexual men (ages 18-26). In this study the participants completed a questionnaire about HPV vaccination. For those who indicated that they intended to get vaccinated within the next 12 months, they were asked the following open-ended question: **Why did you decide to get the HPV vaccine?** Your task is to read the responses and generate qualitative codes. You can apply more than one code per response. The codes should descriptive and concise. You can reuse codes when appropriate.

Instructions:

First Cycle Coding

1. Deductively code responses using established codebook/framework. Each open-ended response should be coded as a behavioral belief, normative belief, or control belief. If these don't fit code it as 'something else'.
2. Inductively code using emotion and open coding.

3. Compare your codes with your group. Did you generate any of the same codes? Where did you differ?

A priori **codebook based on Theory of Planned Behavior**

Construct	Definition
Behavioral Beliefs	An individual's belief about consequences of particular behavior. The concept is based on the subjective probability that the behavior will produce a given outcome.
Normative Beliefs	An individual's perception about particular behavior, which is influenced by the judgment of significant others.
Control Beliefs	An individual's beliefs about the presence of factors that facilitate or impede performance of the behavior.

Second Cycle Coding

The second round of coding allows the researcher to refine codes and categories in order to develop themes and align data with research and theory. Some approaches to second cycle coding include:

- **Pattern coding**, which groups similar codes/categories into a smaller number of sets, themes, or constructs.
- **Focused coding**, which searches for the most frequent or significant codes/categories to create or align with conceptual themes.
- **Axial coding**, which explores how codes, categories, and subcategories relate to each other.

Open-Ended Response	Framework Coding	Emotion Coding	Open Coding
1. Because vaccines are safe and if there is a significant benefit for me, I believe the benefits outweigh the insignificant costs.			
2. So I can hookup with one less worry about getting an STD.			
3. I believe in preventative medicine, where doing something now to prevent something very serious down the road is the ideal course of action.			
4. I Would rather be safe than sorry.			

5. It protects me and others from getting ill, so it should be a no-brainer.			
6. I want to live a healthy life and safeguard myself from preventable diseases. This would all be for my peace of mind, and for the safety of my future sexual/romantic partners.			
7. It's one less disease to worry about contracting from sexual contact. There are generally no downsides to getting vaccinated aside from occasionally feeling a little sore at the location of the shot.			
8. If it was easy enough. I've talked to my doctor about an HPV test before but he didn't really get it. Many doctors don't seem to know that gay/bi men are at risk and need to be tested/ vaccinated. My experience so far has been rather dismissive. When I last got a round of STD testing, my doctor, by default, excluded the HPV test. I asked about it but was unable to convince them to order the test.			
9. The increased risk of cancers, possibility of unknowingly transferring something to someone, and anal warts don't really sound like a great time to be honest either.			
10. Anything that would help me stay healthy I am all for it.			

11. I could be spreading it without even realizing it.			
12. My mom wanted me to get vaccinated.			
13. My doctor recommended I get vaccinated, so it was really convenient to get it then.			
14. My insurance paid for it so it was free to me. So why not!			

Approach 2: Exploring AI in Qualitative Data Analysis with ATLAS.ti

Objective:
- Understand the application of AI tools in qualitative data analysis, focusing on sentiment analysis and AI-driven coding.

Duration:
- 25 minutes

Tools Required:
- Cloud-based ATLAS.ti

Thought Questions:
Before starting the tasks, consider the following questions:

1. **Strengths and Limitations:**
    - What strengths do you anticipate AI will have in qualitative data analysis?
    - What limitations or challenges might AI face in this context?
2. **Ethical Considerations:**
    - What ethical issues could arise from using AI in qualitative data analysis?
    - How might AI impact the interpretation of qualitative data?
3. **Comparison with Traditional Methods:**
    - How do you think AI-assisted analysis will compare with traditional manual coding?
    - In what ways could AI enhance or detract from qualitative data analysis?

Tasks:

1. **Import a sample text dataset into ATLAS.ti.**
    - Choose a dataset relevant to your field of study.
2. **Read through a few excerpts and manually code them as 'positive', 'negative', or 'neutral'.**
    - Select excerpts that clearly convey an emotion.
3. **Run the AI sentiment analysis tool on the same excerpts.**
    - Compare the AI-generated codes with your manual codes.

4. **Reflect on the results of the sentiment analysis.**
    - Consider the accuracy and nuances captured or missed by the AI.
5. **Experiment with line-by-line AI suggested codes.**
    - Analyze how the AI interprets and codes each line.
6. **Apply AI coding to the entire document.**
    - Observe the patterns and themes identified by the AI.
7. **Engage with the conversational AI feature, if available, to ask questions about the data,**
    - Evaluate the usefulness of conversational AI in exploring qualitative data.

Reflection and Discussion:

- After completing the tasks, write a brief reflection on your findings, particularly focusing on the thought questions. Be prepared to discuss your insights in the next class session.

Approach 3: Utilizing ChatGPT for Qualitative Analysis

Objective:

- Explore text analysis capabilities in ChatGPT and discuss ethical issues using AI tools.

Duration:

- 25 minutes

Tools Required:

- Access to ChatGPT and excerpts from an HPV vaccination study.

Pre-Activity Thought Questions:

Before you begin, consider:

1. **ChatGPT's Analytical Approach:**
    - How might ChatGPT interpret and code data differently from a human researcher, especially in a sensitive topic like HPV vaccination?
2. **Accuracy and Depth:**
    - What level of accuracy and depth do you expect from ChatGPT in identifying themes and sentiments in the data?
3. **Ethical Considerations:**
    - What ethical considerations should be kept in mind when using AI for analyzing health-related qualitative data?

Tasks:

1. **Prepare Excerpts from the HPV Vaccination Study.**
    - Excerpts will be provided.
2. **Perform Emotion/Sentiment Coding Using ChatGPT.**
    - Input the excerpts into ChatGPT.
    - Ask ChatGPT to code each excerpt as positive, negative, or neutral based on the sentiment conveyed.
3. **Conduct Open Coding with ChatGPT.**
    - Ask ChatGPT to identify themes or categories in the data without preconceived labels.

4. **Create a Thematic Table with ChatGPT.**
    - Request ChatGPT to construct a table summarizing the main themes, associated codes, and representative quotes from the data.
5. **Evaluate ChatGPT's Performance.**
    - Assess the appropriateness of the sentiments and themes identified by ChatGPT.
    - Note how well ChatGPT captures the nuances and complexities of the data.
6. **Reflect on the Use of ChatGPT.**
    - Consider how the AI's analysis aligns with or deviates from your understanding of the data.
    - Think about the potential uses and limitations of AI in qualitative health research.

Reflection and Discussion:

- After completing the tasks, write a brief reflection on your experience and findings, focusing on your initial thought questions and the effectiveness of ChatGPT in this context. Be prepared to discuss your insights and any surprises or challenges you encountered in the next class session.

OP-ED
Volume 6 (2025), No. 1, pp. 47-50
DOI: 10.15367/ch.v6i1.713

The Administration of Cardiopulmonary Resuscitation (CPR) in Persons with Obesity: Physical Differences or Cognitive Bias?

DAVID B. SARWER, PhD[1], KYLE P.F. HARRIS, PhD[2], KRISTA SCHROEDER, PhD, RN[3]
[1]Center for Obesity Research and Education, College of Public Health, Temple University
[2]Health and Rehabilitation Sciences, College of Public Health, Temple University
[3]Nursing, College of Public Health, Temple University

Correspondence: dsarwer@temple.edu (David B. Sarwer, Ph.D.)

In 2023, a study found that chest compressions were less deep and successful in persons with obesity.[1] More specifically, in a simulation scenario, trained emergency responders did not deliver chest compressions at a minimum of 80% of the American Heart Association (AHA) recommended depth (50 mm). This study is not the first to make this observation. Obesity is one of several factors that can affect the success of chest compressions.[2] The findings suggest a need for greater attention to ensuring high-quality resuscitation for persons with obesity who experience cardiac arrest. As the AHA has written "poor quality CPR is a preventable harm."[3]

Presently, over 40% of American adults have obesity (body mass index (BMI) > 30 kg/m2).[4] Furthermore, 11.5% of women and 6.9% of men have clinically severe obesity (BMI > 40 kg/m2). These statistics, already sobering, are expected to worsen in the next decade. By 2030, over 1 billion adults around the world are anticipated to have obesity.[5] Obesity in all its forms is associated with major health complications that can increase the risk for cardiac arrest, including type 2 diabetes, hypertension, and coronary heart disease.

Current estimates suggest that in the United States, CPR is performed on approximately 350,000 individuals each year.[6] Considering this statistic with rates of obesity, it is clear that hundreds of thousands of individuals with obesity receive CPR annually. Most applications of CPR occur outside of a health care facility, where the first person to begin chest compressions is often not a medical professional. Bystander CPR can save lives; if performed immediately, it can double or triple the chance of survival from an out-of-hospital cardiac arrest[8]. However, the average response time to start CPR is eight minutes from the time of collapse. Survival is believed to decrease by approximately 10% for each minute elapsed from the time of collapse[9].

CPR certification has been available to the general public for decades, but few individuals outside of health care workers and those required to be certified for their employment undergo training. Verified, high-quality CPR competence is the new standard of care. Innovative CPR programs adhere to the AHA's Resuscitation Education Science guidelines on educational strategies to improve outcomes from cardiac arrest[10]. These programs utilize brief (15-20 minutes) refresher programs, conducted frequently (every three months)

using mannequins equipped to capture the AHA performance metrics for CPR. Modern CPR mannequins provide automated, objective feedback on rate, depth, pauses, and incomplete release on compressions. These programs document compliance with performance metrics and, thus, demonstrate continued competence, which is now defined as "successful CPR course completion".

CPR certification typically takes place on a mannequin created to estimate an average weight male. While mannequins designed to depict people with obesity do exist, they represent a very small percentage of available training tools. Their use is not required for CPR course completion and what percentage of CPR trainings use them is unknown. Further, if CPR instructors are unaware the compression depth can be negatively affected by obesity, they may not see a reason to include mannequins that depict a person with obesity in their training. For these reasons, it is quite possible that many individuals - both health care providers and lay persons - with CPR certification are not trained on how to effectively administer CPR to an individual with obesity.

While this is concerning, there may be more to the obesity-CPR relationship beyond the need for additional training. Weight stigma and bias are pervasive in the Western world. Weight stigma is grounded in the inaccurate and blame-focused belief that weight is the result of individual-level behavior (or individual "failures"), rather than being a clinical outcome resulting from a complex interaction between social, behavioral, biological, and genetic factors. Much of the weight stigma work has documented the stigmatizing comments and behaviors from the general public, but also from coworkers, friends, and family members.

These experiences are not innocuous. The experience of weight stigma has been associated with weight-related conditions, such as increased waist circumference, elevated levels of C-reactive proteins, and poor glycemic control, as well as an increased risk for all-cause mortality[11]. These and other factors are associated with an increased risk of a cardiac event.

Persons with obesity are also stigmatized in health care settings. Health care professionals have been repeatedly shown to have both explicit as well as implicit bias toward patients with obesity[12-13]. This includes professionals who provide care for persons with obesity. Research on these behaviors by first responders is lacking. However, if these biases are common across outpatient and inpatient health care providers, it is a reasonable hypothesis that they may be seen among first responders as well.

Given the widespread prevalence of obesity, and the recent finding related to CPR administration, now is the time to examine how first responders are educated and trained to administer care to individuals with obesity, particularly more severe forms of the disease. Educating these professionals about the multifactorial nature of the disease may reduce weight-biased attitudes by challenging the notion that weight is exclusively within an individual's behavioral control. Trainings that have provided opportunities for medical students to interact with standardized patients with obesity might hold promise for increasing empathy and confidence in delivering effective treatment. We would argue that all allied health professionals, not just medical students, would benefit from these trainings.

Efforts to improve CPR delivery for persons with obesity could be directly informed by research with first responders about their weight-related beliefs. For example, first responders may express concern about ergonomic safety when moving a person with a larger body into a position to receive CPR. In response, training can be refined to include information about safe body mechanics when repositioning unconscious individuals, including individuals with larger body sizes.

Efforts to reduce weight-bias among first responders will require not only individual-level education, but systems-level change as well. For example, in addition to educating first responders, organizations who provide CPR certification should allot funds to invest in mannequins with diverse body types and tailor course content to explicitly note the equity implications of providing CPR without bias. Both individual-level training and systems-level

change may need to be tailored to reflect the diverse settings in which CPR is provided, as obesity-related issues may manifest differently for CPR provision in a community setting versus an inpatient hospital setting.

Collectively, such efforts are strongly recommended so that our nation's first responders are ready to deliver CPR effectively but also to treat persons with obesity with dignity and respect during a health emergency.

Disclosures

Dr. Sarwer currently has grant funding from the National Institute of Dental and Craniofacial Research (R01-DE026603), and National Institute for Drug Abuse (R21-AA-029145), and Department of Defense. He has consulting relationships with Ethicon, Novo Nordisk, and Twenty30 Health. Dr. Schroeder currently has grant funding from the National Institute on Child and Human Development (K23-HD101554).

References

1. Longo, J. A., Lyman, K. J., Hanson, T. A., Christensen, B., & Gianluca Del Rossi. (2023). An Evaluation of the Quality of CPR Chest Compressions Performed on Football-Equipped and Obese Simulation Manikins. Prehospital Emergency Care, 28(1), 92–97. https://doi.org/10.1080/10903127.2023.2172494
2. Edelson, D.P., Abella, B.S., Kim, S., Vanden Hoek, T.L., & Becker, L.B. (2006). Abstract 56: The effects of obesity on CPR quality and survival after cardiac arrest. Circulation 2006;114 (Suppl 18):II_1199
3. Panchal, A. R., Berg, K. M., Hirsch, K. G., Kudenchuk, P. J., Del Rios, M., Cabañas, J. G., Link, M. S., Kurz, M. C., Chan, P. S., Morley, P. T., Hazinski, M. F., & Donnino, M. W. (2019). 2019 American Heart Association Focused Update on Advanced Cardiovascular Life Support: Use of Advanced Airways, Vasopressors, and Extracorporeal Cardiopulmonary Resuscitation During Cardiac Arrest: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation, 140(24). https://doi.org/10.1161/cir.0000000000000732
4. Hales, C.M., Carroll, M.D., Fryar, C.D., & Ogden, C.L. (2020). Prevalence of obesity and severe obesity among adults: United States, 2017–2018. NCHS Data Brief, no 360. Hyattsville, MD: National Center for Health Statistics.
5. World Obesity Federation, World Obesity Atlas 2023. https://data.worldobesity.org/publications/?cat=19
6. American Heart Association 2023 https://cpr.heart.org/en/resources/cpr-facts-and-stats
7. Garcia, R. A., Spertus, J. A., Girotra, S., Nallamothu, B. K., Kennedy, K. F., McNally, B. F., Breathett, K., Del Rios, M., Sasson, C., & Chan, P. S. (2022). Racial and Ethnic Differences in Bystander CPR for Witnessed Cardiac Arrest. New England Journal of Medicine, 387(17), 1569–1578. https://doi.org/10.1056/nejmoa2200798
8. American Heart Association. American Heart Association. www.heart.org. Published 2019. https://www.heart.org/en/
9. Larsen, M. P., Eisenberg, M. S., Cummins, R. O., & Hallstrom, A. P. (1993). Predicting survival from out-of-hospital cardiac arrest: A graphic model. Annals of Emergency Medicine, 22(11), 1652–1658. https://doi.org/10.1016/s0196-0644(05)81302-2
10. Cheng, A., Nadkarni, V. M., Mancini, M. B., Hunt, E. A., Sinz, E. H., Merchant, R. M., Donoghue, A., Duff, J. P., Eppich, W., Auerbach, M., Bigham, B. L., Blewer, A. L., Chan, P. S., & Bhanji, F. (2018). Resuscitation Education Science: Educational Strategies to Improve Outcomes From Cardiac Arrest: A Scientific Statement From the American Heart Association. Circulation, 138(6). https://doi.org/10.1161/cir.0000000000000583

11. Wu, Y.-K., & Berry, D. C. (2018). Impact of weight stigma on physiological and psychological health outcomes for overweight and obese adults: A systematic review. Journal of Advanced Nursing, 74(5), 1030–1042. https://doi.org/10.1111/jan.13511
12. Gudzune, K. A., Beach, M. C., Roter, D. L., & Cooper, L. A. (2013). Physicians build less rapport with obese patients. Obesity, 21(10), 2146–2152. https://doi.org/10.1002/oby.20384
13. Huizinga, M. M., Cooper, L. A., Bleich, S. N., Clark, J. M., & Beach, M. C. (2009). Physician Respect for Patients with Obesity. Journal of General Internal Medicine, 24(11), 1236–1239. https://doi.org/10.1007/s11606-009-1104-8