Original Research

The Concussion Awareness Training Tool for Women's Support Workers Improves Knowledge of Intimate Partner Violence-Caused Brain Injury

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Abstract

Women who experience physical intimate partner violence (IPV) are at high risk of suffering a brain injury (BI) due to head impacts and/or strangulation. Currently, most staff at women's shelters tend not to be aware of IPV-caused BIs. The objective of this study was to address this by developing a new online module within the Concussion Awareness Training Tool (cattonline.com) specifically focused on IPV-caused BI, and measuring its effectiveness in increasing BI awareness and knowledge among staff members at women's shelters. A mixed-methods approach was used which included (i) a survey to measure participant knowledge before and after completing the module; (ii) a 1-on-1 interview 6 months post-training to better understand participants' perceptions of what effect the training had on how they worked with women in their job; and (iii) an evaluation of the content of the module using behavior change techniques. About 81 participants recruited from staff at women's shelters completed the pre/post survey. The average BI knowledge score increased significantly from the pre-survey ($M = 8.12/12$, SD = 1.05) to the post-survey ($M = 9.72/12$, SD = 1.62), $t(80) = 9.12$, $P < .001$, $d = 1.01$). Analysis of the interviews with 9 participants highlighted 3 main themes arising from the module: knowledge, mindfulness, and advocacy. All participants felt their knowledge of IPV-caused BIs had increased and said they would recommend the training to their co-workers. Analysis of the module content revealed the most frequent behavior change techniques were related to instructions on how to perform screening and accommodation for IPV-caused BI. The results showed the module was effective in increasing knowledge of IPV-caused BIs amongst women's shelter staff as well as improving how they advocate for, and are mindful of, their clients with BIs. This online training may help improve the care women with IPV-caused BIs receive, and ultimately improve their quality of life.

Keywords

intimate partner violence, brain injury, strangulation, behavior change, women's shelters

What do we already know about this topic?
Very little is known about how training on IPV-caused BI could help women's shelter staff provide better support for those experiencing this.
How does your research contribute to the field?
This research evaluates the effectiveness of a training tool designed to increased knowledge of IPV-caused BI and shows that can contribute to changes in practice that take BI into account.
What are your research's implications toward theory, practice, or policy?
The implication of this work is that in changing practice, there is an increased likelihood that survivors of IPV-caused BI will get the help and support they need.

Introduction

Intimate partner violence (IPV) is a global health crisis. IPV can include physical violence, sexual violence, emotional abuse, social isolation, and/or economic control involving a current or previous intimate partner. Worldwide, approximately 1 in 3 women across every socioeconomic status, culture, and age group will experience IPV in their lifetime,[1] and the COVID-19 pandemic has exacerbated the problem.[2] In Canada, more than 1 in 4 women have experienced IPV in their lifetime, and women are 6 times more likely than men to be sexually assaulted by an intimate partner.[3] Women who survive IPV are at high risk of experiencing a brain injury (BI) resulting from blows to the head, face, neck, and/or strangulation, although it is difficult to accurately estimate the prevalence.[4] Given the high incidence of repeated violence or abuse,[5] IPV survivors often suffer multiple BIs.[6-8]

Unfortunately, research shows staff at women's shelters have little knowledge of IPV-caused BIs, are unprepared to identify signs and symptoms, and, as a result, rarely screen their clients for such injury.[9-12] As a consequence, many BIs resulting from IPV likely go unnoticed, undiagnosed, and untreated, potentially contributing to the many challenges faced by this already underserved population. Increasing knowledge and awareness of BI among staff at women's shelters would help address this gap in the provision of services. Although some websites have been developed to disseminate knowledge on IPV-caused BI for researchers, community practitioners/advocates, and survivors (eg, ABI Toolkit [https://www.abitoolkit.ca/]; Ohio Domestic Violence Network Online Learning Academy [https://odvn.talentlms.com/]; Brain Injury Canada [https://braininjurycanada.ca/en/intimate-partner-violence-advocacy]; Brain Injury Association of America [https://www.biausa.org/public-affairs/media/domestic-violence-as-a-cause-of-tbi]; Training Institute on Strangulation Prevention [https://www.strangulationtraininginstitute.com/]), these tools and resources have yet to be tailored to the local context, needs, and barriers faced by staff at women's shelters.

The Knowledge-to-Action (KTA) Framework[13] is often used alongside the Theoretical Domains Framework (TDF)[14] and used in implementation research to understand the factors that influence behavior and inform intervention design.[15] The TDF consists of 14 domains that can be used to identify barriers and facilitators with regards to a specific behavior and link these domains to intervention options. The domains within the TDF are knowledge, skills, social/professional role and identity, beliefs about capabilities, optimism, beliefs about consequences, reinforcement, intentions, goals, memory, attention and decision processes, environmental context and resources, social influences, emotion, and behavioral regulation. The common barriers women's shelter staff face in relation to screening their clients for BI include a lack of knowledge, emotion related to nervousness, influences by their clients, lack of skills, resources, and confidence in their capabilities.[12] Based on this information, and in partnership with a local women's shelter in the interior of British Columbia, the following intervention recommendations were developed with the goal of raising knowledge and awareness of IPV-caused BIs in these settings[12]: (1) establishing formal policies and procedures requiring clients to be assessed for BIs; (2) providing BI-specific training to staff who work in women's shelters; (3) assessing BIs in an informal, conversational style, and not necessarily as part of the initial intake process; (4) educating clients about BIs, and (5) developing a referral system for clients who have experienced, or are at risk for, BI.

In response to these recommendations, an online training tool for staff at women's shelters was co-developed to increase knowledge and awareness of IPV-caused BIs. In particular, a new module within the Concussion Awareness Training Tool (CATT) was developed for women's support workers (CATT-WSW). Originally launched in 2013, the CATT includes eLearning modules on concussions for other audiences including medical professionals, coaches, parents or caregivers, school professionals, youth, athletes, and workers and employers. The training tool is free, and contains targeted, evidence-based information and resources about concussions that are reviewed and updated monthly to incorporate new and emerging information. The CATT has been shown to be effective in significantly raising knowledge of concussion in healthcare professionals, and increasing their confidence in making informed decisions about the appropriate steps to take after a concussion has occurred.[16]

The CATT–WSW (https://cattonline.com/womens-support-workers/) was developed to "provide women's support

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workers with the information they need to take an evidence-based approach in responding to and managing concussion" using evidence-based research on IPV-caused BIs. Because the CATT-WSW focuses on IPV, it was the first CATT module to incorporate strangulation, which is highly prevalent in IPV, and can lead to anoxic/hypoxic/ischemic BI, as well as having high levels of lethality.[4,17] The CATT-WSW is also the first CATT module to incorporate the voice of a survivor, using quotes from a woman talking about her experiences with IPV-caused BI. The training is available in English and French and takes approximately 45 min to complete. It includes a course overview and information on recognizing, screening and managing a BI. Learning check quizzes are included throughout the course to measure the participants' understanding of the content before moving forward. Downloadable resources are also included throughout the course, and a training certificate is provided upon completion.

The goal of the current study was to systematically evaluate the impact of the CATT-WSW module on BI knowledge and awareness in women's shelter staff using the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework. The KTA and RE-AIM frameworks are complementary in that the former is a process model that outlines steps of the action cycle, a number of which incorporate evaluation. The latter has been used to measure the impact of real-world interventions for various public health interventions at the individual and organizational level and is ideally suited to address the evaluation steps of the KTA.[18] For this study, we characterized the components of the RE-AIM framework that focus on individual levels of impact (reach, effectiveness, and maintenance). Reach was measured by collecting data on the number of people who have taken the CATT-WSW since launch, and comparing that to an estimate of the total number of women's shelter staff in Canada. Additionally, reach beyond women's shelter staff specifically was assessed by identifying which other sectors have benefited from the CATT-WSW training since launch. Effectiveness was measured through a TDF survey and a brain injury knowledge survey, whereas maintenance was measured through interviews that were completed by participants 6-month after they had completed the CATT-WSW.

Finally, interventions for behavior change are more likely to be effective if they are based in behavior change theory.[19] A number of techniques have been developed to help with both evaluating and designing interventions and are identified and defined in the Behavior Change Techniques (BCT) Taxonomy v1[20] (BCTTv1). BCTs are defined as the observable, replicable, and irreducible active ingredient in an intervention that acts to change a behavior.[20] Using the BCTTv1 can help with retrospectively characterizing interventions that may not have been developed using a behavior change framework. In an effort to systematically describe the CATT-WSW content, the BCTTv1 was used to characterize the key BCTs incorporated into the module.

Methods

Design

This was a pragmatic, cross-sectional design study using quantitative and qualitative data to determine reach, effectiveness, and maintenance of the CATT-WSW. Aligned with pragmatism, this study was conducted in partnership, with an interdisciplinary team of researchers and knowledge users. When knowledge users are engaged throughout the research process, the resulting knowledge can be more insightful, relevant, and useful.[21] For this paper, the research team included the director of a women's shelter and gender-based violence advocate (KM), academic researchers with expertise in brain injury (PvD, SB), behavior change and knowledge translation (HG), and post-doctoral (SPA), graduate (AS, BN, SA), and undergraduate (AM) students. KM and PvD are partners and co-founders of the Supporting Survivors of Abuse and Brain Injury through Research (SOAR) Initiative (https://soarproject.ca/). The conflict of interest their partnership creates is mitigated by an appropriate management plan implemented by the University of British Columbia—Okanagan.

Quantitative component. Pre- and post-surveys were collected and included both a knowledge and a TDF questionnaire to determine the effectiveness of the CATT-WSW. The post-survey also included demographic questions. The participants took the pre-survey, followed by the online training, followed by the post-survey. The TDF questionnaire was adapted from a validated measure[22] whereas the knowledge survey was developed for this study and has not been validated. Finally, the content of the CATT-WSW was retrospectively characterized using the BCT Taxonomy V1.[20]

Qualitative component. About 6 months after completing the CATT-WSW, 1-on-1 interviews were conducted with a subset of participants to collect qualitative data to help measure the maintenance of any changes that had occurred.

Informed consent was obtained from each participant prior to study initiation and the study protocol was approved by the Behavioral Research Ethics Board at the University of British Columbia—Okanagan (H17-01143). Research materials related to this paper can be accessed by contacting the corresponding author.

Participants and Recruitment

This study was conducted prior to the general release of the CATT-WSW. Participants included staff members from women's shelters across Canada who support women who have experienced IPV. Staff members were recruited via personal email outreach, and through information posted in e-newsletter communication distributed to members of the national organization, Women's Shelters Canada, and a provincial association, British Columbia Society of Transition Houses. Individuals who agreed to participate were sent a

link to the surveys and the final, unreleased version of the CATT-WSW and given 60 days to complete it. Reminder emails were sent after 14 days. The surveys took approximately 15 min to complete and could be done in either English and French. A $100 gift card prize draw was offered as an incentive for participants. Data collection took place for 3 months, after which the CATT-WSW was broadly launched in September 2020 via dissemination through a variety of channels targeting both the gender-based violence and brain injury sectors. Finally, 6 months after participants had completed the CATT-WSW, they were sent an email about the details of the follow-up interview and were offered $20 for completion. Those who agreed to the interviews were from the interior region of British Columbia.

Measures

Reach

The key variables used to determine Reach were (i) an estimate of the total number of frontline staff working at women's shelters in Canada; (ii) an estimate of the number of organizations/individuals contacted to potentially participate in the study; and (iii) the total number of participants. In addition, we also measured the total number of times the CATT-WSW had been accessed/completed since its general release to give a sense of uptake by those providing support for women experiencing IPV. Additionally, reach beyond women's shelter staff specifically was assessed by identifying which other sectors had benefited from the CATT-WSW training since launch.

Effectiveness

The knowledge questionnaire was developed by the research team. A score of 10 on the 12-item questionnaire (Table 1) was determined as sufficient knowledge of IPV-caused BI. The pre-survey knowledge scores were compared to the post-survey knowledge scores to determine if there was a significant change in knowledge due to the online training.

Factors influencing screening for BIs were measured using an adapted 11-item TDF questionnaire[22] and tailored to an IPV-BI context. The 11 TDF domains found to have content validity in a questionnaire consist of: knowledge, skills, social/professional role and identity, beliefs about capabilities, optimism, beliefs about consequences, intentions, memory, attention and decision processes, environmental context and resources, social influences, and emotion. Responses were completed by participants using a 7-point Likert scale (1—strongly disagree, 7—strongly agree). The pre-survey TDF scores were compared to the post-survey TDF scores to determine how the factors influencing screening for BI had changed due to the online training.

Maintenance

The interviews were semi-structured using a guide developed by the research team. They lasted approximately 30 min in a single sitting, took place via phone, and were conducted by the lead author (BN) in his role as a research associate on the project. During the preamble to the interview, BN discussed with participants the goals and objectives of the research study. The questions were designed to probe how completing the CATT-WSW module had affected participants' work and experiences screening for BI. Participants were asked about conversations they have had with clients about BI, how the training impacted their job as a shelter staff worker, and their evaluation of the CATT-WSW training module.

BCT Coding

BCT coding of the CATT-WSW website was conducted to identify BCTs related to 2 target behaviors: (1) screening of people with BIs from IPV; and (2) accommodation of people with BIs from IPV. Screening was defined as introducing and explaining application of a BI in IPV screening tool (HELPS [adapted from the original for use in IPV-caused BI based on the recommendations from Goldin et al[23]]) with encouragement to apply it, either as an assessment or simply as a framework or guide for a discussion on BI in IPV with survivors. Accommodations were defined as providing tips and suggestions on ways to accommodate and support survivors of BI in IPV and empower women's support workers to learn and provide referrals to relevant community and health care supports.

Analysis

Reach

Reach was determined specifically for the study by calculating the percentage of the total number of participants divided by an estimate of the total number of frontline staff working at women's shelters in Canada. More broadly, it was also determined for module completion by calculating the percentage of an estimate of the total number of women's shelter workers who completed the CATT-WSW module divided by an estimate of the total number of frontline staff working at women's shelters in Canada.

Effectiveness

A paired *t*-test was used to determine whether significant differences existed between the pre and post knowledge and TDF scores. The open-ended responses from the question "What would stop you from screening your client for concussion or other brain injuries?" were coded using the TDF

Table 1. Number and Percentage of Participants Who Responded Correctly to Survey Questions Before and After the Training.

Question number	Questions	Pre-survey correct responses, n (%)	Post-survey correct responses, n (%)	Change in correct responses, n (%)
1	Which of the following can result in a concussion or other brain injury? • Being punched • Being violently shaken • Being thrown down the stairs • Being strangled • **All of the above**	80 (98.8)	81 (100)	1 (1.2)
2	Which of the following is not a sign or symptom of concussion or other brain injury? • Headache • Sensitivity to noise • **Unusual thirst** • Sensitivity to light • Dizziness	78 (96.3)	80 (98.8)	2 (2.5)
3	Select all that apply. Which of the following are concussion red flags? • **Neck pain or tenderness** • **Double vision** • **Loss of consciousness** • **Severe or worsening headache** • Nausea	4 (4.9)	19 (23.5)	15 (18.5)
4	Up to what percentage of survivors of intimate partner violence show signs of concussion or other brain injury? • 0-20 • 20-40 • 40-60 • 60-80 • **80-100**	11 (13.6)	61 (75.3)	50 (61.7)
5	Approximately, how many women in Canada will acquire a concussion or other brain injury each year from intimate partner violence? • 0-1000 • 1000-10 000 • 10 000-100 000 • 100 000-200 000 • **200 000-300 000**	4 (4.9)	41 (50.6)	37 (45.7)
6	**True** or False. More than half of survivors of intimate partner violence report being strangled.	61 (75.3)	72 (88.9)	11 (13.6)
7	**True** or False. After a concussion, there is a 3 times higher risk of suffering another concussion and further injuring the brain.	81 (100)	80 (98.8)	−1 (−1.2)
8	**True** or False. Concussion symptoms can last for years after a concussion.	78 (96.3)	71 (87.7)	−7 (−8.6)
9	True or **False**. Energy levels are only affected in people who lose consciousness from a concussion.	75 (92.6)	75 (92.6)	0 (0.0)
10	True or **False**. Loss of consciousness is required to diagnose a concussion.	77 (95.1)	77 (95.1)	0 (0.0)
11	**True** or False. The severity of the impact is not necessarily an indication of the severity of the concussion.	76 (93.8)	78 (96.3)	2 (2.5)
12	Select all that apply. What strategies can you use to help survivors of intimate partner violence manage their symptoms of a concussion or other brain injury? • **Dimming the lights** • **Talking slowly and clearly** • Use the computer to fill out forms • Stay awake • **Reduce the noise** • **Take breaks**	33 (40.7)	52 (64.2)	19 (23.5)

by 2 independent coders (AS, BN) who met every 20 responses to discuss and resolve any disagreement in codes. If the coders did not agree on a code, a third coder (HG) acted as the arbitrator. Cohen's Kappa and prevalence-adjusted bias-adjusted Kappa statistic (PABAK) was used to calculate inter-coder reliability.

Maintenance

The audio recordings were transcribed verbatim and used a grounded theory approach to determine themes derived from the data. Six phases of thematic analysis were used; (1) familiarizing yourself with your data, (2) generating initial

codes, (3) construction of themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report, as outlined by Braun and Clarke.[24] Participants were recruited for the interviews until saturation was achieved. The analysis was carried out by BN and confirmed by HG.

BCT Coding

About 2 co-authors (AS, SA) independently extracted data from the video module voiceovers, the website text, and all 7 CATT specific PDFs. Both researchers received certified training to use the BCT Taxonomy v1 using the training developed by Michie et al.[20] Cohen's[25] Kappa statistic and PABAK[26] were used to demonstrate reliability between coders. PABAK was used to adjust for bias between coders in selecting codes and the relative probability of both positive (ie, agreement that the same code is present) and negative agreement (ie, agreement that the same code is not present[26]). Agreement between coders was interpreted as substantial for values of .60 to .79 and outstanding for those above .80.[27]

Results

Participant Characteristics

For the effectiveness component, 81 women's shelter workers completed the pre-survey, online training, and the post-survey. The average age of participants was 43 years old (SD = 13.3). They had been working at their organization for an average of 6 years (SD = 6.1), and in the gender-based violence sector an average of 9.5 years (SD = 7.6). Most participants (67.9%) had a university bachelor's or college degree, with smaller proportions having completed a high school degree (9.9%) or a master's degree (13.6%). Furthermore, most participants were female (95%), white (77.8%) followed by Indigenous (6.2%). Finally, most were from British Columbia (69%) with the remainder from other Canadian provinces. For the maintenance component, 9 of the participants (all female) completed the follow-up semi-structured interviews 6 months after the training. None of the participants dropped out of the study and the small number of participants who provided a reason for not taking part cited a lack of time as their main reason.

Quantitative Results

Reach: In its report "More Than a Bed,"[28] Women's Shelters Canada indicates shelters and second stage transition homes across the country employ a total of about 5500 staff. This includes frontline workers who support women fleeing violence, but also includes accounting, fundraising and administrative, children's program, and janitorial staff, many of whom may not find the CATT-WSW immediately relevant to their work and responsibilities. For the purpose of determining reach, and based on the experience of the co-author who worked in the gender-based violence sector, we estimated 75% of staff across the country classify as frontline workers, for an estimated total of 4125. That means the 85 workers who took part in the pre-launch research represent slightly in excess of 2% of all women's shelter workers in Canada.

With respect to reach more broadly, the module was promoted on the SOAR social media platforms—Twitter (346 followers), Facebook (409 followers), and Instagram (715 followers) (follower numbers from time of CATT-WSW release)—and via media release and earned media coverage. Additional promotion and support came from the national gender-based violence sector organization, Women's Shelters Canada and the provincial organization, British Columbia Society of Transition Houses (BCSTH).

Women's Shelters Canada promoted, and provided the link to the CATT-WSW in its e-newsletter, which is distributed to more than 500 shelters across 425 organizations and has a click-through rate of about 30% on average. BCSTH sent 2 emails about the CATT-WSW, and included promotion of it, and links to it, in 5 subsequent e-newsletters that reached an average of 641 addresses, with an average number opened of 189, leading to an average open rate of just over 30%.

As a result of this promotion, since CATT-WSW launched in 2020 until the fall of 2022, it has been completed by approximately 650 individuals from about 175 organizations, either independently or as part of a group training workshop. Participants came from women's shelters, universities, government departments, municipalities, police, healthcare, athletic organizations and health care organizations. We estimate about 75% of the 650 people who have taken the module work in women's shelters, accounting for a total of 487. Those participants represent just less than 12% of the estimated 4125 shelter workers in Canada.

Effectiveness

The average knowledge score on the pre-survey was 8.12/12, whereas on the post-survey it was 9.71/12, which represents a significant increase $t(80) = 9.12$, $P < .001$, $d = 1.01$. Table 1 outlines each knowledge question and the number of participants who answered correctly on the pre- and post-surveys. For the TDF questionnaire, every domain increased in score from the pre-survey to the post-survey (pre-survey $M = 4.5$, SD = 0.82; post-survey $M = 5.3$, SD = 0.65; $t(80) = 8.73$, $P < .001$, $d = .97$) (Table 2). Initially, a high score indicated a bigger barrier for emotion and memory, attention and decision processes; therefore, these 2 domains were reverse coded to have the same scale as the other domains. The lowest rated domains on the pre-survey (ie, biggest barriers) were skills ($M = 3.99$, SD = 1.98), knowledge ($M = 4.31$, SD = 1.75), and environmental context and resources ($M = 4.38$, SD = 1.88). The lowest rated domains on the post-survey were environmental content and resources ($M = 4.91$, SD = 1.83), memory, attention, and decision processes ($M = 4.94$, SD = 2.04), and optimism ($M = 5.12$, SD = 1.80).

Table 2. Rating Scores for TDF Questionnaire Prior to and After the Training.

	Pre-survey rating scores		Post-survey rating scores		Effect size
Theoretical domains	Mean	SD	Mean	SD	*d*
Knowledge	4.31	1.75	6.30	0.96	1.41
Skills	3.99	1.98	5.95	1.20	1.20
Environmental context and resources	4.38	1.88	4.91	1.83	0.29
Social influences	5.00	2.43	5.41	2.06	0.18
Intentions	5.79	1.56	6.23	1.13	0.32
Beliefs about consequences	6.86	0.83	6.68	1.01	0.20
Social/professional role and identity	6.19	1.59	6.60	1.00	0.31
Beliefs about capabilities	5.67	1.88	6.32	1.04	0.43
Optimism	5.04	1.95	5.12	1.80	0.04
Emotion	6.10	1.78	6.07	1.91	0.02
Memory, attention, and decision processes	5.15	1.77	4.94	2.04	0.11

The highest rated domains on the pre-survey were beliefs about consequences ($M=6.86$, SD = 0.83), social/professional role and identity ($M=6.19$, SD = 1.59), and emotion ($M=6.10$, SD = 1.78). Whereas, the highest rated domains on the post-survey were beliefs about consequences ($M=6.68$, SD = 1.01), social/professional role and identity ($M=6.60$, SD = 1.00), and beliefs about capabilities ($M=6.32$, SD = 1.04).

BCT Coding

Average interrater reliability between coders for the target behavior of screening was substantial (Cohen's Kappa: .62; PABAK: .96). In total, 7 BCTs were used on the CATT website for the behavior of screening. The most frequently used BCTs for screening were instruction on how to perform a behavior (6) and adding objects to the environment (4). Other BCTs that were extracted included information about antecedents (1), information about social and environmental consequences (2), credible source (2), information about health consequences (1), and information about emotional consequences (1).

Average interrater reliability between coders for the target behavior of accommodations was moderate (Cohen's Kappa: .57; PABAK: .96). In total 6 BCTs were used on the CATT website for the behavior of accommodation. The most frequently used BCT was instruction on how to perform a behavior (9). Other BCTs that were extracted included adding objects to the environment (2), self-monitoring of a behavior (1), information about health consequences (2), anticipated regret (2), and credible source (2).

Qualitative Results

Maintenance. A thematic analysis of the interviews highlighted 3 main themes which include awareness, advocacy, and knowledge. Table 3 shows the themes and their definitions with exemplar quotes. All participants interviewed felt their knowledge of BI in IPV improved from taking the online course. For example, when asked about how the course had affected their knowledge of IPV-caused BI, one participant said "I did not realize how prevalent it was until I took that course." Another participant said BIs in women who experience IPV are often "mistaken as addiction or mental health" and, since taking the course she is "more vigilant about that fact that. . . what a woman's going through might be part of a brain injury." The online training also helped staff to feel "more comfortable and confident" when asking clients if they have "thought about this maybe being a brain injury." For staff who were already aware of IPV-caused BI before the training, the training helped to "reaffirm it" and made them "more aware" moving forward.

Multiple participants mentioned they will advocate for their clients with BIs at staff meetings. One participant said, "I will be a better advocate when we are discussing women and like in our staff meetings and stuff, like hey, maybe we should look at this a little closer" and "I think that we should also work under the assumption that the women we work for are concussed." The training even helped a client advocate for herself "She actually brought your website to the clinic and suggested that everybody take this training," mentioned a participant. The participant mentioned her client "felt concussed and she went back and spoke to the doctor who just kind of sent her away at first and said like 'hey, you need to be aware of this information'."

The training has also changed how one participant "speaks to women that are fleeing violence" and thinks about the "information that we may need to ask them that we weren't asking before." This was reinforced by another participant who said "We need to be a bit more proactive around asking those questions" with regards to the possibility that a BI had occurred. Educating clients about BI has also improved. "I would try to educate her a little more around what some of the symptoms are and what she may be expecting. . . and give her time to think about that and work through that." All participants said the training was relevant to their job and

Table 3. Key Themes, Theme Definition, and Representative Quote From Thematic Analysis of Interview Data.

Theme	Theme definition	Quote
Awareness	A greater awareness of the effects of BI and how to support someone with a BI	*"I would say definitely I am more aware and more patient and understanding. Often times women will miss their appointments or will forget to take their bedtime meds or something and I won't be like "ohh I wonder what's up with her" you know what I mean, it's more of an understanding, like a deeper understanding I guess."*
Advocacy	A desire to teach others about BI in IPV and help their clients receive better care for their BI	*"I sent the training to our safe home providers and the women's center in our rural community that I work with. When I participate in staff meetings if, you know, we're feeling like a woman is, you know, maybe really struggling or maybe not really doing much, I will present the case, that she could be concussed and maybe we should have her assessed for that or maybe, you know, be more accommodating around that, I've just been more of a voice within our team, like, hey, slow down maybe we should look for a concussion."*
Knowledge	An increased knowledge of BI in IPV	*"I think at the shelter we would consider brain injury when it was a very serious physical assault and we would be like okay we should be mindful of this but the training kind of made me realize that almost all of the women, if not all of them might be experiencing that."*

they would recommend it to anyone that works with women who experience IPV.

Discussion

The purpose of this study was to (i) measure the impact of the CATT-WSW using the reach, effectiveness, and maintenance components of the RE-AIM framework; and (ii) use BCT to evaluate the CATT-WSW content. Using such approaches provides a systematic means by which to characterize the effectiveness and utility of tools developed to provide support for knowledge users and allow for comparisons across interventions.[15,18] The results demonstrated that the CATT-WSW led to significant improvements in knowledge of BIs in IPV, which helped women's shelter staff feel more confident and mindful in talking about BI and be better advocates in supporting their clients.

Analysis of reach demonstrated the participants who completed the study represented 2% of the estimated total number of women's shelters workers in Canada. More broadly, since its release, the CATT-WSW module has been completed by approximately 12% of the estimated total number of women's shelters workers in Canada. Given that IPV-caused BI is starting to be recognized as an important issue, there are, unsurprisingly, no previous studies with which to compare these results directly. There are, however, a number of studies which have examined reach for efforts designed to engage with and inform knowledge users in related contexts—including injury prevention and neurotrauma. For example, Richmond et al[29] demonstrated that 5% of users who accessed a newly-developed web-based resource designed to raise knowledge and awareness of ways to reduce injury risk in sport and recreational activity went on to complete a survey asking them about their experience. Furthermore, Sweet et al[30] showed that 28% of the intended audience was reached for a knowledge mobilization activity with the objective of developing solutions to translating research into practice in the spinal cord injury community. Thus, the current findings for the CATT-WSW are in the same broad range of reach metrics from similar applications in injury prevention and neurotrauma contexts.

The CATT-WSW was effective at increasing knowledge of IPV-caused BIs. Results from the knowledge questionnaire show staff demonstrated some understanding of BIs before the online training, however; lacked knowledge with regards to the intersection of BI in IPV. The CATT-WSW was effective at significantly improving the knowledge of this intersection of BI and IPV. Increasing the knowledge of staff about the intersection of BI and IPV is an important and necessary first step to improving care for survivors of IPV. However, since behavior is a multi-dimensional construct, increased knowledge alone likely will not result in changed behavior.[31]

Findings from the behavioral analysis using TDF data showed a reduction in perceived barriers with regards to talking about BI among clients after participating in the CATT-WSW. Our findings suggest that the intervention may have helped address staff's knowledge, skills, beliefs about capability, environmental context and resources, and social influences. Nicol et al[12] demonstrated that staff may not screen for BI in women who experience IPV because they are nervous, lack skills, resources, and capabilities to screen, and are influenced by how their clients will react to screening. Our findings suggest that the CATT-WSW targeted and reduced these perceived barriers of the lack of skills, resources, and capabilities to screen. This can help create the foundation for a better understanding of IPV-caused BIs among staff and clients, and as a result, presumably more identified BIs in clients.

Our interview findings suggest that the CATT-WSW influenced how shelter staff respond to survivors of IPV who may have experienced BI, even 6 months after taking the

course. Three themes were constructed from the interviews with staff: mindfulness, advocacy, and knowledge. Staff are willing to be more patient and understanding with their clients after learning about the consequences of IPV-caused BIs. The CATT-WSW has allowed them to advocate more for their clients. Staff are willing to suggest to other staff their client may be suffering from a BI. Furthermore, staff feel they have more knowledge and a better understanding of IPV-caused BIs. All participants in the interview felt more confident in talking to clients about BI and felt the training was relevant to their job. Taken together, these findings imply that staff will be in a better position to advocate for their clients in helping them seek appropriate BI-informed supports both within the shelter setting and with other agencies.

Analysis of the BCTT-WSW module content revealed the most frequent BCTs were related to instructions on how to perform aspects of screening and accommodation for IPV-caused BI. This makes sense given that our understanding of BI due to IPV is in its infancy and it has been shown that front-line staff at women's shelters have relatively little knowledge of the issue and generally do not screen for BI in their clients because they feel unprepared to recognize common signs and symptoms.[9-12] The content of the CATT-WSW reflects this context and incorporates both foundational information on the characteristics of BI and how to ask questions which will help in determining if one or more previous BIs have occurred. Moreover, given healthcare workers in Canada also have a general lack of awareness of IPV-caused BI and, as a result, appropriate healthcare pathways for survivors of IPV-caused BI are not currently in place,[32] the module content related to accommodations within shelter settings is appropriate. Until healthcare pathways are implemented that incorporate both trauma—(eg, providing space and staffing so the survivor can meet with healthcare providers without the alleged perpetrator present) and BI-informed (eg, including assessments of head impacts and/or strangulation and the resulting signs and symptoms at intake and follow-up care) supports for survivors of IPV are in place, shelters might be best positioned to adapt their practices to accommodate the fact that many of their clients may be affected by BI resulting from their experiences. As discussed above, this was reflected in the assessment of maintenance which showed that staff had altered aspects of their day-to-day practice as a result of taking the CATT-WSW module.

Strengths and Limitations

There are many strengths to this study. First, this study sampled from a national representation of staff at women's shelters and the module was offered in both English and French. Secondly, this study used intervention recommendations from Nicol et al[12] developed through behavior change theory and integrated knowledge translation. Thirdly, both quantitative and qualitative data were used to gain a better understanding of the impacts of the CATT-WSW. These strengths speak to the fact that the development of the CATT-WSW was theory-driven, evidence-based, and broad in scope and that it was evaluated from different perspectives thereby providing a rich characterization of its effectiveness and impact on daily practice. This study did have some limitations. Firstly, there is not a validated IPV-caused BI knowledge questionnaire. Therefore, the knowledge questionnaire was developed by the research team and community partner. Secondly, we were limited to collecting TDF data through a questionnaire which has not been validated for the context of IPV-caused BIs. Thirdly, we were only able to interview 9 participants, 6 months after they took the CATT-WSW. More interviews may have given a deeper understanding of how the CATT-WSW had impacted the work of staff at women's shelters. Fourthly, most of the participants were white. It would be beneficial to study participants with more diverse ethnic and cultural backgrounds as they may have different experiences in providing support for survivors of IPV-caused BIs.

Conclusion

The CATT-WSW was developed based on the recommendations from Nicol et al,[12] for staff at women's shelters and other agencies supporting women survivors to improve their awareness and knowledge of BI among clients who experience IPV. We found it significantly improved knowledge of BIs in IPV, reduced perceived barriers toward talking about BI with clients, and helped staff be more mindful, better advocates, and more knowledgeable for their clients. The CATT-WSW has the potential to change how staff do their jobs, and ultimately help provide better care and referrals for clients who have suffered a BI from IPV. Taken together, this evidence provides support for the use of the CATT-WSW for anyone who works with women who experience IPV.

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Declaration of Conflicting Interest

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Two of the authors (KM, PvD) are in a personal relationship. The resulting COI is managed with appropriate mitigation measures by UBCO. Otherwise, there are no additional conflicts of interests to declare.

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Ethics and Consent

The study protocol was approved by the Behavioral Research Ethics Board at the University of British Columbia—Okanagan (H17-01143) and all participants provided informed consent prior to taking part.

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Supplemental Material

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