Acupuncture knowledge, attitudes, beliefs and health service needs after traumatic brain injury: a cross-sectional survey

Mark D. Sodders, DAOM[1,2], **Shyam J. Deshpande, MD**[1,3], **Jeffery A. Dusek, PhD**[4], **Ryan Bradley, ND, MPH**[5,6], **Monica S. Vavilala, MD**[1,2]

[1]University of Washington School of Medicine, Department of Anesthesiology and Pain Medicine, Seattle, WA, USA

[2]Harborview Injury Prevention & Research Center, Seattle, WA, USA

[3]University of Washington School of Medicine, Department of Pediatrics, Seattle, WA, USA

[4]University of California Irvine School of Medicine, Susan Samueli Integrative Health Institute, Irvine, CA, USA

[5]National University of Natural Medicine, Helfgott Research Institute, Portland, OR, USA

[6]University of California, San Diego, Herbert Wertheim School of Public Health and Human Longevity Science, La Jolla, CA, USA

Abstract

Background: Acupuncture is a promising treatment for common symptoms after traumatic brain injury (TBI). Our objectives were to explore knowledge, attitudes and beliefs about acupuncture, identify health service needs, and assess the perceived feasibility of weekly acupuncture visits among individuals with TBI.

Methods: We surveyed adults 18 years of age and older with TBI who received care at the University of Washington. Respondents were asked to complete 143 questions regarding acupuncture knowledge, attitudes and beliefs, injury-related symptoms and comorbidities, and to describe their interest in weekly acupuncture.

Results: Respondents (n=136) reported a high degree of knowledge about acupuncture as a component of Traditional Chinese Medicine, needle use and safety, but were less knowledgeable regarding that the fact that most conditions require multiple acupuncture treatments to achieve optimal therapeutic benefit. Respondents were comfortable talking with healthcare providers about acupuncture (63.4%), open to acupuncture concurrent with conventional treatments (80.6%) and identified lack of insurance coverage as a barrier (50.8%). Beliefs varied, but respondents were generally receptive to using acupuncture as therapy. Unsurprisingly, respondents with a history of acupuncture (n=60) had more acupuncture knowledge than those without such a history (n=66)

and were more likely to pursue acupuncture without insurance (60%), for serious health conditions (63.3%) or alongside conventional medical therapy (85.0%). Half of all respondents expressed interest in participating in weekly acupuncture for up to 12 months and would expect almost a 50% improvement in symptoms by participating.

Conclusion: Adults with TBI were receptive and interested in participating in weekly acupuncture to address health concerns. These results provide support for exploring the integration of acupuncture into the care of individuals with TBI.

Keywords

acupuncture; neurology; complementary medicine

INTRODUCTION

Traumatic brain injury (TBI) is a significant public health concern worldwide.[1] Over 2.7 million Americans are evaluated in emergency care or are hospitalized annually with TBI,[2] and it is estimated that approximately 3 to 5 million individuals in the United States are living with a TBI-related disability.[3–5] Rehabilitation efforts aim to restore self-care skills (including sleep quality) and motor, cognitive and social functioning.[3,6] However, gaps remain in current rehabilitation methods and require individually tailored programs and innovative treatments to address the health effects that manifest after injury.[3] Innovative approaches with considerable but largely unexplored potential include dietary supplements, novel uses of pharmaceuticals, mind-body practices, music therapy, and acupuncture.[7]

Acupuncture is increasingly popular in the United States but utilization remains low.[8–10] Barriers to its use include low recommendations from healthcare providers and a general lack of familiarity.[11–13] Additionally, a lack of insurance benefits for acupuncture might prohibit its utilization.[3,14] Insurance coverage for acupuncture varies worldwide, with some countries offering coverage by both government entities and private insurance (e.g. Brazil) and other countries offering no insurance coverage at all (e.g. the Philippines).[15] Differences in the recognition and regulation of acupuncture as a medical specialty might contribute to this variation. Specifically in the United States, how acupuncture is regulated varies state-to-state, ranging from oversight from its own medical quality board, having representation on inter-disciplinary medical boards, being included within the statutes governing other professions, or having oversight from within non-medical agencies— variations likely to affect insurance coverage, and therefore access.[16] While acupuncture is increasingly becoming a reimbursable service in the United States, nearly half of visits with acupuncturists had no insurance coverage as of 2018.[17]

Acupuncture may have promise in TBI. For example, animal studies on TBI have demonstrated that acupuncture can decrease neuro-inflammation and scarring,[18–20] increase synaptic plasticity,[21] increase cerebral blood flow,[22] and stimulate neuronal proliferation and differentiation.[23–26] Although there is a paucity of research examining the effects of acupuncture in humans with TBI, acupuncture is a promising treatment in other populations for many symptoms that occur post-injury, such as headache,[27] depression,[28,29] and cognitive difficulties.[30–32]

Based on the current gaps in rehabilitation and the promise of acupuncture as a viable treatment post-TBI, the purpose of this study was to better understand and characterize knowledge, attitudes and beliefs about acupuncture and health service needs in those with TBI. The specific objectives were to: (1) assess the knowledge, attitudes and beliefs about acupuncture among persons who have sustained TBI; (2) identify their health service needs based on TBI-related symptoms and comorbidities; and (3) determine their potential interest in participating in weekly acupuncture. We then compared differences in acupuncture knowledge, attitudes and beliefs between those with pre-existing acupuncture experience and those without a personal history of acupuncture.

METHODS

Study design and study sample

We conducted a cross-sectional survey in a convenience sample of adults who had sustained TBI at age 18 or older and were evaluated or treated within the University of Washington health system. ICD-10 codes beginning with S06 were used to identify those individuals with a TBI diagnosis. Individuals who could not speak or read English, or made two or more errors on the Six-Item Screener for Cognitive Functioning,[33] were excluded. The survey was open from 1 August 2020 through 30 April 2021, and all participants provided written informed consent. The Institutional Review Board at the University of Washington Human Subjects Division approved this study.

Survey information

The survey was comprised of seven data collection instruments. Respondents were asked to respond with information about their most recent injury and current symptomatology. All questions were voluntary and respondents could skip questions or withdraw from the survey at any time. Study data were collected and managed using Research Electronic Data Capture (REDCap),[34] hosted through the Institute of Translational Health Sciences (ITHS) at the University of Washington, Seattle, WA.

Demographics and context.—Respondents were queried about their gender, age, race, ethnicity and education. Frequency of poverty was based on federal poverty guidelines and calculated based on the number of persons in each household and household income. We also collected information on the duration of hospitalization after injury and whether the individual was discharged to home, to inpatient rehabilitation or to an assisted living facility. Respondents also provided information on prior acupuncture use.

Acupuncture experience.—For the individuals reporting acupuncture use, we asked about the frequency of acupuncture treatment, the reasons for the treatment, and whether the reasons were for personal wellness or for specific health concerns. The remaining respondents were asked to examine how likely they were to get acupuncture based on their current knowledge.

Acupuncture knowledge, attitudes and beliefs.—All three of the knowledge, attitudes and beliefs surveys included the option "do not know enough about acupuncture

to answer." Responses for knowledge questions were "true" and "false" (n=9). We then categorized these true/false responses into answers that were accurate and answers that were inaccurate. The option for "do not know enough about acupuncture to answer" was grouped with the inaccurate responses. Responses for attitudes used Likert-type scales[35] with 1 = "strongly agree," 2 = "agree," 3 = "disagree," 4 = "strongly disagree" (n=8). These were then collapsed into the following categories: "agree/strongly agree," "disagree/strongly disagree," and "do not know enough about acupuncture to answer." Similarly, responses for beliefs also used Likert-type scales with 1 = "somewhat likely," 2 = "very likely," 3 = "somewhat unlikely," 4 = "very unlikely" (n=7). These were also grouped into three categories: "somewhat likely/very likely," "somewhat unlikely/very unlikely," and "do not know enough about acupuncture to answer."

Concurrent medical conditions.—Respondents were asked if a healthcare provider had informed them that they had or have any of the following: multiple TBIs, post-traumatic stress disorder, a psychological or psychiatric condition, addiction or a neurological condition such as stroke, multiple sclerosis, epilepsy, seizure disorder or Parkinson's disease. Respondents answered this questionnaire by indicating "yes" or "no" to each medical condition.

TBI-related symptoms.—Respondents were asked about current symptoms related to the TBI. The 17-item TBI symptom checklist[36,37] was adapted for use online without an interviewer. This instrument asks about new or worsening symptoms since the most recent TBI. Respondents indicated which of the 17 symptoms they had been experiencing since the injury. For each symptom present, respondents were then asked about the severity (1 = "not a problem," 2 = "mild problem," 3 = "moderate problem," and 4 = "severe problem") and if the symptom was new or was present prior to the most recent injury (1 = "yes," 2 = "no"). If they responded "yes," we asked if the symptom since the most recent injury had changed (1 = "remained the same," 2 = "worsened," or 3 = "better").

Weekly acupuncture.—Respondents were asked to answer ten questions about their ability or interest to attend weekly acupuncture sessions that would require a one-hour appointment for twelve consecutive weeks, independent of insurance coverage or other monetary cost. We posed "yes" or "no" questions about having transportation and asked the respondents to indicate how much time weekly they could travel one-way in minutes (i.e. <15, 16–30, 31–45, >45). We also asked if respondents would consent to have acupuncture in a community-style clinic setting, versus consent to have acupuncture in a private room with only the acupuncturist present. To explore the acceptable total duration of an acupuncture intervention study, we asked what the maximum duration in weeks or months they would be willing to participate for if there were no changes in symptoms experienced, and the maximum duration they would be able to participate (options being four weeks, six weeks, two months, three months, four months, six months, nine months, twelve months). We also asked what degree of improvement would be considered meaningful to continue having weekly acupuncture during the course of treatment (0–100%) and what degree of improvement would be expected overall as a result of having weekly acupuncture (0–100%).

Analysis

Data were analyzed with R Studio version 4.0.3 statistical software.[38] Responses were reported in a descriptive analysis as the percentages of all respondents for categorical variables and the mean ± standard deviation (SD) for continuous variables. We compared the responses for questions about comorbidities, TBI-related symptoms, and knowledge, attitudes and beliefs, between individuals reporting a history of acupuncture use and those who did not report a history of acupuncture use with Chi-square *P* values for categorical variables with values of 10 or more, and Fisher's exact test *P* values for categorical variables that had values less than 10.

RESULTS

Figure 1 details our study flow. We invited 3,513 adults with TBI via telephone and email to participate in the survey. One hundred and thirty-six adults with a history of TBI responded to the survey during the study period. Of the 126 respondents who answered the question regarding acupuncture history, 60 (44.1%) reported having received acupuncture in the past, and 66 (48.5%) reported never having received acupuncture (Table 1).

As shown in Table 1, similar responses between individuals who had a history of receiving acupuncture and those who did not were observed for gender, race, ethnicity, education level, number of persons in the household, poverty and hospital disposition. Respondents reporting an acupuncture history were approximately two years older than respondents reporting no acupuncture history (47.4 ± 13.7 vs. 45.2 ± 18.4 years old, respectively). More individuals with an acupuncture history had been hospitalized for >48 hours compared to those reporting no acupuncture use (55.0% vs. 36.4%, respectively). Compared to respondents without an acupuncture history, more respondents with an acupuncture history reported TBI-related symptoms of headache (76.8% vs. 47.7%, *P*=0.001), anxiety (59.3% vs. 32.3%, *P*=0.003), and irritability/temper (56.9% vs. 33.8%, *P*=0.01).

Among all 136 respondents reporting symptoms related to their TBI, most symptoms had appeared after the injury (Table 2), although a large proportion had pre-existing anxiety (49.2%), sleep issues (44.6%) and/or irritability (41.4%).

Prior acupuncture use

Table 3 details the self-reported use of acupuncture, including the frequency of and indications for treatment, for the 126 respondents who responded to the question. For those with a history of acupuncture, the frequency was most commonly weekly (48.3%), occurring primarily for health concerns (78.3%) but also for personal wellness (48.3%). Eighteen of 66 respondents with no history of acupuncture use (27.7%) reported that they were unlikely to receive acupuncture because of a lack of knowledge about it.

Acupuncture knowledge, attitudes and beliefs

Table 4 displays the acupuncture knowledge, attitudes and beliefs items for the 126 individuals providing a response to the acupuncture history question.

When comparing respondents reporting a history of acupuncture to respondents without an acupuncture history, respondents with a history of acupuncture had higher levels of knowledge about the connection of acupuncture to Traditional Chinese Medicine (96.7% correct), about needle use (80.0% correct), safety (83.3% correct), side-effects (71.2% correct), the fact that most medical conditions require multiple treatments (60.0% correct) and usual indications for treatment (three questions, mean 80.5% correct).

Most respondents indicated they would communicate with their healthcare provider about acupuncture, get acupuncture if there were insurance coverage, and receive acupuncture concurrently with allopathic treatments. When comparing respondents reporting a history of acupuncture to respondents without an acupuncture history, respondents with an acupuncture history felt more favorably about acupuncture, responding they would be more likely to get it in the absence of insurance coverage (60.0% vs. 31.3%, P=0.001), before seeing a health care provider if sick (26.7% vs. 7.6%, P<0.001) and if they had a concerning health condition (63.3% vs. 42.4%, P<0.001). Additionally, respondents with an acupuncture history more often reported that they would be unlikely to stop acupuncture therapy at the recommendation of their doctor (61.7% vs. 40.6%, P=0.01).

Beliefs about acupuncture varied widely over the survey sample. A majority of respondents, however, felt that acupuncture has health benefits and disagreed its use required specific personal or religious beliefs. When comparing respondents reporting a history of acupuncture to respondents without an acupuncture history, respondents with a history of acupuncture were more open to the idea of using it as a medical therapy, including in combination with conventional allopathic therapies, when sick, or even if there is a lack of evidence for its use.

Weekly acupuncture

The 136 respondents in our study sample reported a broad spectrum of requirements to participate in weekly acupuncture (Table 5). Respondents generally had transportation (87.8%). There was wide distribution in travel time one-way, but over half (55.4%) of respondents indicated willingness to travel more than 30 minutes. Over half (61.2%) of respondents would be willing to receive acupuncture in one room where others are receiving acupuncture concurrently, and a majority (97.7%) would be willing to receive acupuncture in a private room. Over three-quarters (84.3%) of respondents were willing to participate in acupuncture for at least 12 weeks, and 53.5% of the respondents were willing to participate in weekly acupuncture up to 12 months. However, there was wide variability in how long respondents would participate in weekly sessions if they had not felt improvement, with 32.0% reporting they would stop before 12 weeks. Notably, respondents reported that they would need to see, on average, a 45.6% improvement in their symptoms to keep going weekly and expected an overall 49.9% improvement in symptoms by participating.

DISCUSSION

The primary purpose of this study was to characterize knowledge, attitudes and beliefs about acupuncture, and assess health service needs in people following a TBI. Overall, this study found that individuals with a prior history of TBI had moderate levels of preexisting

knowledge about acupuncture, were receptive to receiving the therapy, and were open to discussing its use with their health care provider. We also found that individuals with TBI and a prior history of acupuncture had greater knowledge and more positive attitudes and beliefs towards acupuncture. These data provide new information regarding acceptability and feasibility of acupuncture use in individuals with TBI, and indicate that patients are willing and able to participate in an acupuncture study to address post-TBI symptoms.

Results of this study indicate that respondents felt that lack of insurance coverage was a significant barrier to acupuncture use, with no insurance benefits accounting for an almost 50% reduction in willingness to participate in acupuncture post-TBI. While this reduction was not as significant among respondents with prior acupuncture use, lack of insurance coverage is likely a barrier for integration of acupuncture therapy in the United States, as it is common for individuals to self-pay.[17,39] Most chronic conditions require many weeks of acupuncture for sustained therapeutic benefits, and most respondents did not know that multiple acupuncture treatments are typically necessary to establish a full therapeutic benefit. The median cost to a patient ranges from $45 to $150 USD per acupuncture treatment in the absence of insurance coverage.[40] Given the large TBI burden resulting in substantial financial challenges,[41] the cost of acupuncture for the uninsured is prohibitive, even though acupuncture is desired and may be associated with symptom relief post-TBI. Added to this are the costs of time for missed work, transportation and/or caregiver costs. The lack of insurance coverage is likely to prohibit many people with TBI with limited resources from accessing acupuncture, and the lack of access to acupuncture treatment may therefore represent an equity challenge for individuals with TBI.

These results further suggest acupuncture is not only acceptable to individuals with TBI but that referral for acupuncture by their healthcare providers might translate into greater utilization. Collectively, we posit formal research should be conducted in individuals with TBI to examine the utility of acupuncture. Collaboration between acupuncturists and traditional allopathic health care providers would be a means to facilitate the study of acupuncture in TBI recovery, including in the management of ongoing post-TBI symptoms. Additionally, use of acupuncture varies significantly among different regions within the United States, with the greatest use found in the Western regions and the lowest in the Southern regions.[11] These results provide an opportunity for education of healthcare providers in regions where the use of acupuncture is low.

Strengths and limitations

Strengths of this research are its novel focus, assessment of feasibility, acceptability, barriers and facilitators, and detailed characterization of the study sample, including symptoms of individuals with TBI, all of which will inform future research. Limitations include the cross-sectional design and convenience sampling, as well as underrepresentation of non-Whites and Hispanics, which limits generalizability. Data from a recent article using Medical Expenditure Panel Survey (MEPS) survey data from 2010 to 2019 indicates that most acupuncture users in the United States are White.[17] As such, acupuncture use and distinct knowledge, attitudes and beliefs about acupuncture are likely to vary in other ethnic and racial groups, so the frequency of acupuncture use across racial and ethnic groups with TBI

merits future study. Another limitation is that we do not have information on the military service member status of the respondents. Clinical characteristics of TBI in military service members might present differently than individuals who are not military service members. As such, we are unable to draw any conclusions based on military service status. We are also unable to draw any conclusions based on the length of time since injury. A large proportion of respondents reported having had multiple TBIs, and we do not know from our data when each TBI occurred. It is possible that, for some respondents, the initial or early injuries occurred prior to the implementation of the International Classification of Diseases (ICD)-10 coding system. Lastly, ten respondents did not answer the acupuncture use question, and it is possible this exclusion may have biased our results in making comparisons between respondents who reported acupuncture use and respondents who did not report acupuncture use.

Conclusions

This study demonstrates that individuals with TBI are receptive to and able to utilize acupuncture, and many are already receiving it. Patients with TBI should be informed that acupuncture typically requires multiple treatments over many weeks to achieve optimal therapeutic benefit. Future research should examine the effectiveness of acupuncture on various clinical sequelae post-injury in individuals with TBI, especially for symptoms that are common after TBI, such as cognition, balance disorders, impaired sensory input and headache.

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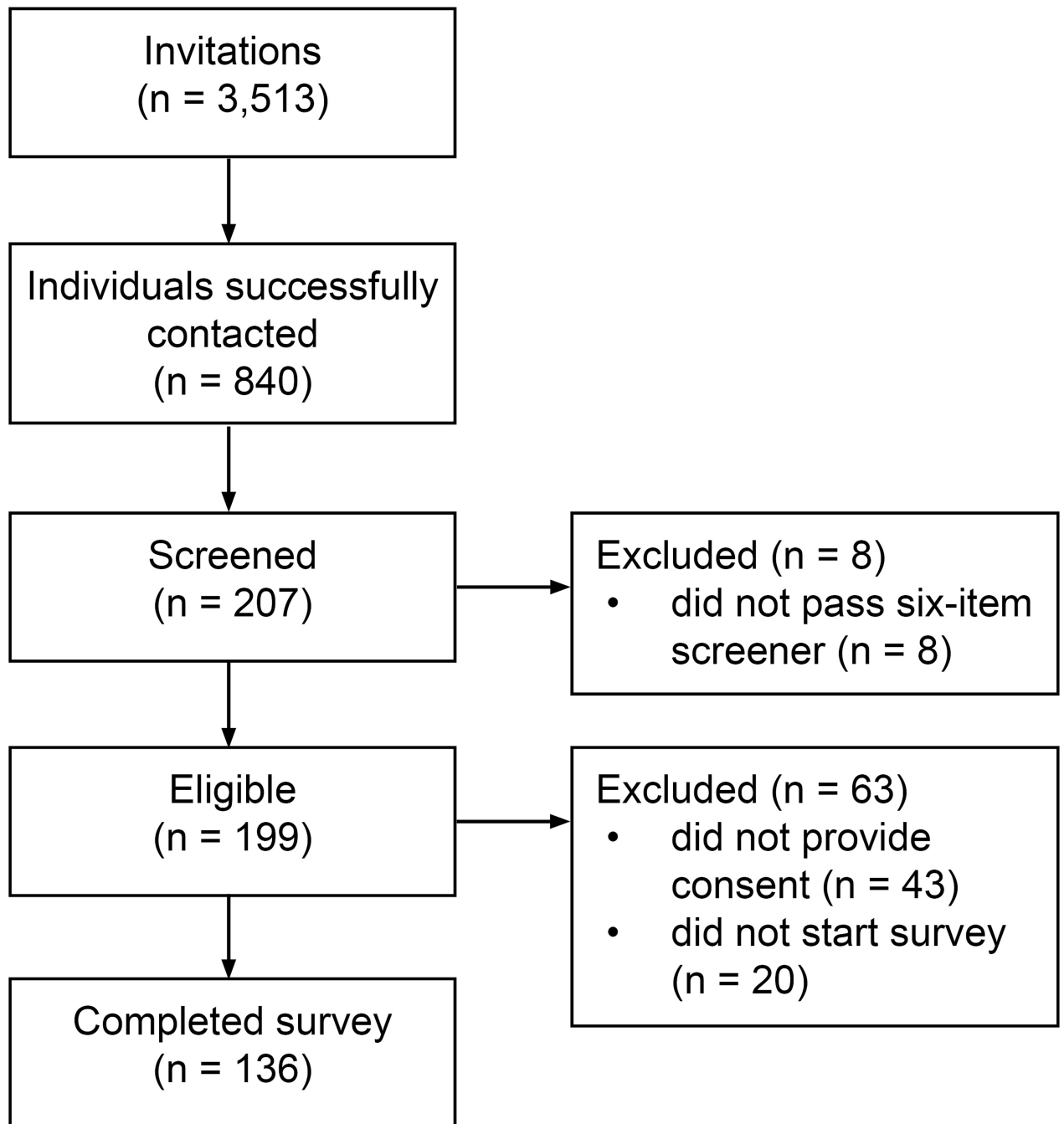
Figure 1.
Study flow

Table 1.

Demographics, clinical characteristics and item response rates

	Study sample (n=136)		Acupuncture use (n=60)		No acupuncture Use (n=66)		
	Responses n (%)	Value	Responses n (%)	Value	Responses n (%)	Value	*P*
Age	122 (89.7)	46.8 ± 16.4	54 (90.0)	47.4 ± 13.7	61 (92.4)	45.2 ± 18.4	—
Gender	128 (94.1)		56 (93.3)		64 (97.0)		—
Female		70 (54.7)		27 (48.2)		39 (60.9)	—
Male		58 (45.3)		29 (51.8)		25 (39.1)	—
Race	128 (94.1)		57 (95.0)		64 (97.0)		—
White		81 (63.3)		33 (57.9)		43 (67.2)	—
Non-White		25 (19.5)		13 (22.8)		12 (18.8)	—
More than one race or unknown		22 (17.2)		11 (19.3)		9 (14.1)	—
Ethnicity	123 (90.4)		55 (91.7)		60 (90.9)		—
Hispanic or Latino		14 (11.4)		7 (12.7)		7 (11.7)	—
Unknown		7 (5.7)		4 (7.3)		2 (3.3)	—
Education	129 (94.9)		57 (95.0)		64 (97.0)		—
High school diploma or less, General equivalency diploma		4 (3.1)		2 (3.5)		2 (3.1)	—
Some college, college, technical college		87 (67.4)		38 (66.7)		45 (70.3)	—
Post-graduate		38 (29.5)		17 (29.8)		17 (26.6)	—
Persons in household	127 (93.4)	2.1 ± 1.0	58 (96.7)	2.1 ± 0.9	62 (93.9)	2.1 ± 1.1	—
Poverty level	129 (94.9)		58 (96.7)		63 (95.5)		—
Below poverty line		1 (0.8)		1 (1.7)		0 (0.0)	—
Maybe below poverty line		13 (10.1)		5 (8.6)		8 (12.7)	—
Above poverty line		95 (73.6)		44 (75.9)		44 (69.8)	—
Did not disclose		20 (15.5)		8 (13.8)		11 (17.5)	—
Hospitalization	136 (100)		60 (100)		66 (100)		—
Did not go to the hospital		27 (19.9)		8 (13.3)		18 (27.3)	—
Less than 24 hours		38 (27.9)		17 (28.3)		16 (24.2)	—
Between 24 and 48 hours		12 (8.8)		2 (3.3)		8 (12.1)	—
More than 48 hours		59 (43.4)		33 (55.0)		24 (36.4)	—
Disposition	113 (83.1)		53 (88.3)		51 (77.3)		—
Home		91 (80.5)		38 (71.7)		44 (86.3)	—
In-patient rehabilitation		20 (17.7)		13 (24.5)		7 (13.7)	—
Assisted living facility		2 (1.8)		2 (3.8)		0 (0)	—
Comorbidities[a]							
Multiple TBIs	134 (98.5)	51 (38.1)	59 (98.3)	26 (44.1)	66 (100)	21 (31.8)	0.17
PTSD, psych	132 (97.1)	67 (50.8)	59 (98.3)	31 (52.5)	66 (100)	32 (48.5)	0.65
Addiction/substance use	126 (92.6)	10 (7.9)	54 (90.0)	4 (7.4)	66 (100)	6 (9.1)	0.80
Epilepsy/seizure	129 (94.9)	14 (10.9)	56 (93.3)	5 (8.9)	66 (100)	7 (10.6)	1.00

	Study sample (n=136)		Acupuncture use (n=60)		No acupuncture Use (n=66)		
	Responses n (%)	Value	Responses n (%)	Value	Responses n (%)	Value	*P*
Stroke	127 (93.4)	7 (5.5)	55 (91.7)	4 (7.3)	66 (100)	3 (4.5)	0.70
Multiple Sclerosis	128 (94.1)	0 (0)	56 (93.3)	0 (0)	66 (100)	0 (0)	1.00
Parkinson's	126 (92.6)	0 (0)	55 (91.7)	0 (0)	65 (98.5)	0 (0)	1.00
Other neurological disorder	130 (95.6)	32 (24.6)	57 (95.0)	18 (31.6)	66 (100)	13 (19.7)	0.12
TBI-related symptoms[a]							
Cognition[b]	132 (97.1)	98 (74.2)	59 (98.3)	46 (78.0)	65 (98.5)	47 (72.3)	0.47
Balance disorders[c]	131 (96.3)	90 (68.7)	59 (98.3)	42 (71.2)	65 (98.5)	44 (67.7)	0.67
Sensory input[d]	130 (95.6)	86 (66.2)	58 (96.7)	43 (74.1)	66 (100)	39 (59.1)	0.08
Headache	128 (94.1)	79 (61.7)	56 (93.3)	43 (76.8)	65 (98.5)	31 (47.7)	**0.001**
Fatigue	131 (96.3)	75 (57.3)	59 (98.3)	39 (66.1)	65 (98.5)	33 (50.8)	0.08
Irritability and temper	131 (96.3)	60 (45.8)	58 (96.7)	33 (56.9)	65 (98.5)	22 (33.8)	**0.01**
Anxiety	130 (95.6)	59 (45.4)	59 (98.3)	35 (59.3)	65 (98.5)	21 (32.3)	**0.003**
Sleep	130 (95.6)	56 (43.1)	58 (96.7)	26 (44.8)	65 (98.5)	25 (38.5)	0.47
Sexual difficulties	127 (93.4)	23 (18.1)	56 (93.3)	13 (23.2)	64 (97.0)	9 (14.1)	0.20

Abbreviations: PTSD, post-traumatic stress disorder. TBI, traumatic brain injury.

[a] Respondents were able to select more than one choice.

[b] Cognition includes memory and concentration.

[c] Balance disorders include dizziness, problems with balance and/or problems with coordination.

[d] Sensory input includes blurred vision, being bothered by noise, being bothered by light, problems with taste and/or problems with smell.

Acupuncture use means self-reported current or past acupuncture treatment. 126 out of 136 answered acupuncture history question (92.6 % response rate). Values presented are number (percentage of respondents) for categorical variables and mean ± standard deviation for continuous variables. Significant p values (p<0.05) are indicated in bold font.

Table 2.

Traumatic brain injury (TBI) symptom checklist (n=136)

	Responses	Had Symptoms	Symptom severity[a]				Present before last injury	Symptom changes[b]		
			Not a problem	Mild problem	Moderate problem	Severe problem		Same	Better	Worse
Headache	128 (94.1)	79 (61.7)	6 (7.6)	28 (35.4)	27 (34.2)	18 (22.8)	25 (31.6)	7 (28.0)	12 (48.0)	6 (24.0)
Fatigue	131 (96.3)	75 (57.3)	4 (5.3)	26 (34.7)	34 (45.3)	11 (14.7)	12 (16.0)	5 (41.7)	5 (41.7)	2 (16.7)
Dizziness[c]	129 (94.9)	72 (55.8)	6 (8.3)	45 (62.5)	17 (23.6)	3 (4.2)	7 (9.7)	4 (57.1)	1 (14.3)	2 (28.6)
Blurred vision	126 (92.6)	40 (31.7)	6 (15.0)	23 (57.5)	10 (25.0)	1 (2.5)	2 (5.0)	1 (50.0)	1 (50.0)	0 (0.0)
Concentration	131 (96.3)	82 (62.6)	4 (4.9)	29 (35.4)	31 (37.8)	18 (22.0)	27 (32.9)	8 (29.6)	18 (66.7)	1 (3.7)
Noise	127 (93.4)	59 (46.5)	5 (8.5)	13 (22.0)	28 (47.5)	13 (22.0)	14 (23.7)	2 (14.3)	10 (71.4)	2 (14.3)
Light	127 (93.4)	60 (47.2)	2 (3.3)	33 (55.0)	15 (25.0)	10 (16.7)	13 (21.7)	3 (23.1)	7 (53.8)	3 (23.1)
Irritability	130 (95.6)	58 (44.6)	2 (3.4)	28 (48.3)	16 (27.6)	12 (20.7)	24 (41.4)	6 (25.0)	16 (66.7)	2 (8.3)
Temper	129 (94.9)	39 (30.2)	4 (10.3)	20 (51.3)	6 (15.4)	9 (23.1)	10 (25.6)	3 (30.0)	4 (40.0)	3 (30.0)
Memory	132 (97.1)	84 (63.6)	2 (2.4)	28 (33.3)	37 (44.0)	17 (20.2)	17 (20.2)	6 (35.3)	10 (58.8)	1 (5.9)
Anxiety	130 (95.6)	59 (45.4)	4 (6.8)	18 (30.5)	26 (44.1)	11 (18.6)	29 (49.2)	10 (34.5)	16 (55.2)	3 (10.3)
Sleep[c]	130 (95.6)	56 (43.1)	2 (3.6)	18 (32.1)	17 (30.4)	18 (32.1)	25 (44.6)	11 (44.0)	11 (44.0)	3 (12.0)
Balance	131 (96.3)	67 (51.1)	8 (11.9)	34 (50.7)	24 (35.8)	1 (1.5)	12 (17.9)	5 (41.7)	4 (33.3)	3 (25.0)
Sexual difficulties	127 (93.4)	23 (18.1)	1 (4.3)	9 (39.1)	8 (34.8)	5 (21.7)	6 (26.1)	2 (33.3)	4 (66.7)	0 (0.0)
Coordination	130 (95.6)	52 (40.0)	7 (13.5)	26 (50.0)	15 (28.8)	4 (7.7)	5 (9.6)	3 (60.0)	2 (60.0)	0 (0.0)
Taste	126 (92.6)	16 (12.7)	0 (0.0)	5 (31.2)	6 (37.5)	5 (31.2)	2 (12.5)	1 (50.0)	1 (50.0)	0 (0.0)
Smell	126 (92.6)	21 (16.7)	2 (9.5)	7 (33.3)	5 (23.8)	7 (33.3)	3 (14.3)	1 (33.3)	1 (33.3)	1 (33.3)

[a]Values are for n (%) of respondents answering each question about the presence of symptoms for each item in the 17-item TBI symptom checklist.[36,37]

[b]Values are for n (%) of respondents reporting the presence of each specific symptom from the 17-item TBI symptom checklist.[36,37]

[c]Dizziness and sleep both had one respondent not complete the questions about symptom severity.

Values presented are number (percentage of respondents)

Table 3.

Acupuncture experience including frequency of and reasons for treatment

	Responses n (%)	Value n (%)
History of acupuncture (n = 60)		
Frequency of treatment	60 (100)	
Only one time		9 (15.0)
A few times per year		7 (11.7)
Once a month		11 (18.3)
Every week		29 (48.3)
More than once weekly		4 (6.7)
Reasons		
Health concerns	60 (100)	47 (78.3)
Personal wellness	60 (100)	29 (48.3)
Health concerns (n=45)	45 (75.0)	
Musculoskeletal complaints		19 (42.2)
Neurologic complaints		11 (24.4)
Other		14 (31.1)
Personal wellness (n=29)	29 (48.3)	
Physical wellness		28 (96.6)
Mental wellness		12 (41.4)
Spiritual wellness		7 (24.1)
Overall health maintenance		19 (65.5)
No history of acupuncture (n = 66)		
Unlikely to get because of a lack of knowledge	65 (98.5)	18 (27.7)

126 out of 136 answered acupuncture history question (92.6% response rate). Values presented are numbers (percentage of respondents).

Table 4.

Responses to acupuncture knowledge, attitudes and beliefs questions, and data completeness

	Study sample (n=136)		Acupuncture use (n=60)		No acupuncture use (n=66)		
	Responses n (%)	Value n (%)	Responses n (%)	Value n (%)	Responses n (%)	Value n (%)	*P*
Acupuncture knowledge							
A medical treatment from traditional Chinese medicine	134 (98.5)		60 (100)		66 (100)		**0.001**
Correct		117 (87.3)		58 (96.7)		51 (77.3)	
Incorrect/DNKE[a]		17 (12.7)		2 (3.3)		15 (22.7)	
Inserts needles through the skin	133 (97.8)		59 (98.3)		66 (100)		1.0
Correct		129 (97.0)		57 (96.6)		64 (97.0)	
Incorrect/DNKE[a]		4 (3.0)		2 (3.4)		2 (3.0)	
Treats more than pain	133 (97.8)		60 (100)		66 (100)		**0.01**
Correct		106 (79.1)		53 (88.3)		46 (69.7)	
Incorrect/DNKE[a]		28 (20.9)		7 (11.7)		20 (30.3)	
Use for overall wellness	134 (98.5)		60 (100)		66 (100)		**0.002**
Correct		96 (72.2)		51 (85.0)		40 (60.6)	
Incorrect/DNKE[a]		37 (27.8)		9 (15.0)		26 (39.4)	
Manages medical symptoms	134 (98.5)		60 (100)		66 (100)		0.85
Correct		87 (64.9)		41 (68.3)		40 (60.6)	
Incorrect/DNKE[a]		47 (35.1)		19 (31.7)		26 (39.4)	
Does not use medicine on the needles	134 (98.5)		60 (100)		66 (100)		**0.004**
Correct		93 (69.4)		48 (80.0)		37 (56.1)	
Incorrect/DNKE[a]		41 (30.6)		12 (20.0)		29 (43.9)	
Uses single-use needles	134 (98.5)		60 (100)		66 (100)		**<0.001**
Correct		90 (67.2)		50 (83.3)		34 (51.5)	
Incorrect/DNKE[a]		44 (32.8)		10 (16.7)		32 (48.5)	
Does not have many side-effects	133 (97.8)		59 (98.3)		66 (100)		**0.02**
Correct		82 (61.7)		42 (71.2)		33 (50.0)	
Incorrect/DNKE[a]		51 (38.3)		17 (28.8)		33 (50.0)	
Multiple treatments are usually needed	134 (98.5)		60 (100)		66 (100)		**<0.001**
Correct		59 (44.0)		36 (60.0)		19 (28.8)	
Incorrect/DNKE[a]		75 (56.0)		24 (40.0)		47 (71.2)	
Acupuncture attitudes							
Talk to HCP about getting	134 (98.5)		60 (100)		66 (100)		0.1
Likely		85 (63.4)		42 (70.0)		37 (56.1)	
Unlikely		46 (34.3)		18 (30.0)		26 (39.4)	
DNKE		3 (2.2)		0 (0.0)		3 (4.5)	

	Study sample (n=136)		Acupuncture use (n=60)		No acupuncture use (n=66)		
	Responses n (%)	Value n (%)	Responses n (%)	Value n (%)	Responses n (%)	Value n (%)	P
Get with insurance	134 (98.5)		60 (100)		66 (100)		0.1
Likely		117 (87.3)		56 (93.3)		54 (81.8)	
Unlikely		14 (10.4)		4 (6.7)		10 (15.2)	
DNKE		3 (2.2)		0 (0.0)		2 (3.0)	
Get with no insurance	132 (97.1)		60 (100)		64 (97.0)		**0.001**
Likely		59 (44.7)		36 (60.0)		20 (31.3)	
Unlikely		67 (50.8)		24 (40.0)		39 (60.9)	
DNKE		6 (4.5)		0 (0.0)		5 (7.8)	
Tell HCP if receiving	134 (98.5)		60 (100)		66 (100)		0.15
Likely		120 (89.6)		52 (86.7)		60 (90.9)	
Unlikely		12 (9.0)		8 (13.3)		4 (6.1)	
DNKE		2 (1.5)		0 (0.0)		2 (3.0)	
Use at same time as regular treatments	134 (98.5)		60 (100)		66 (100)		0.36
Likely		108 (80.6)		51 (85.0)		50 (75.8)	
Unlikely		18 (13.4)		7 (11.7)		10 (15.2)	
DNKE		8 (6.0)		2 (3.3)		6 (9.1)	
Get before seeing HCP if sick	134 (98.5)		60 (100)		66 (100)		**<0.001**
Likely		26 (19.4)		16 (26.7)		5 (7.6)	
Unlikely		97 (72.4)		44 (73.3)		50 (75.8)	
DNKE		11 (8.2)		0 (0.0)		11 (16.7)	
Get with a serious health condition	134 (98.5)		60 (100)		66 (100)		**<0.001**
Likely		72 (53.7)		38 (63.3)		28 (42.4)	
Unlikely		47 (35.1)		21 (35.0)		24 (36.4)	
DNKE		15 (11.2)		1 (1.7)		14 (21.2)	
Stop if asked by HCP to quit, even if feeling better	132 (97.1)		60 (100)		64 (97.0)		**0.01**
Likely		52 (39.4)		22 (36.7)		29 (45.3)	
Unlikely		69 (52.3)		37 (61.7)		26 (40.6)	
DNKE		11 (8.3)		1 (1.7)		9 (14.1)	
Acupuncture beliefs							
Must believe in acupuncture for it to work	134 (98.5)		60 (100)		66 (100)		**.004**
Agree		22 (16.4)		10 (16.7)		11 (16.7)	
Disagree		94 (70.1)		48 (80.0)		40 (60.6)	
DNKE		18 (13.4)		2 (3.3)		15 (22.7)	
Have improved outcomes if combined with conventional treatment	134 (98.5)		60 (100)		66 (100)		**<0.001**
Agree		84 (62.7)		46 (76.7)		32 (48.5)	
Disagree		18 (13.4)		10 (16.7)		8 (12.1)	

	Study sample (n=136)		Acupuncture use (n=60)		No acupuncture use (n=66)		
	Responses n (%)	Value n (%)	Responses n (%)	Value n (%)	Responses n (%)	Value n (%)	*P*
DNKE		32 (23.9)		4 (6.7)		26 (39.4)	
Should not use concurrently with conventional treatment	134 (98.5)		60 (100)		66 (100)		**0.002**
Agree		4 (3.0)		1 (1.7)		2 (3.0)	
Disagree		96 (71.6)		51 (85.0)		39 (59.1)	
DNKE		34 (25.4)		8 (13.3)		25 (37.9)	
Limited benefits for a serious medical condition	134 (98.5)		60 (100)		66 (100)		**<0.001**
Agree		12 (9.0)		3 (5.0)		8 (12.1)	
Disagree		83 (61.9)		47 (78.3)		30 (45.5)	
DNKE		39 (29.1)		10 (16.7)		28 (42.4)	
Hesitant to have because of a lack of evidence	133 (97.8)		60 (100)		66 (100)		**0.003**
Agree		19 (14.3)		4 (6.7)		14 (21.2)	
Disagree		102 (76.7)		55 (91.7)		41 (62.1)	
DNKE		12 (9.0)		1 (1.7)		11 (16.7)	
Requires a religious belief	134 (98.5)		60 (100)		66 (100)		0.25
Agree		0 (0.0)		0 (0.0)		0 (0.0)	
Disagree		130 (97.0)		60 (100)		63 (95.5)	
DNKE		4 (3.0)		0 (0.0)		3 (4.5)	
Should only be used when feeling well	134 (98.5)		60 (100)		66 (100)		0.26
Agree		6 (4.5)		3 (5.0)		3 (4.5)	
Disagree		115 (85.8)		54 (90.0)		54 (81.8)	
DNKE		13 (9.7)		3 (5.0)		9 (13.6)	

Acupuncture use means self-reported current or past acupuncture treatment. 126 out of 136 answered acupuncture history question (92.6% response rate). Values number (percentage of respondents). *P*-values are for comparison between the two groups reporting a history of acupuncture or no history of acupuncture. Significant p values (p<0.05) are indicated in bold font.

Abbreviations: DKNE, "do not know enough about acupuncture to answer"; HCP, healthcare provider.

[a] Incorrect category includes responses for "do not know enough about acupuncture to answer."

Table 5.

Ability of respondents to attend weekly acupuncture treatments (n=136)

	Responses n (%)	Value
Has transportation	131 (96.3)	115 (87.8)
Travel time one-way	130 (95.6)	
< 15 minutes		13 (10.0)
16–30 minutes		45 (34.6)
31– 45 minutes		26 (20.0)
> 45 minutes		46 (35.4)
Would be treated in one room where other individuals are also receiving treatments at the same time	129 (94.9)	79 (61.2)
Would be treated in a private room alone	131 (96.3)	128 (97.7)
Willingness to attend: duration with improvement	127 (93.4)	
4 weeks		9 (7.1)
6 weeks		3 (2.4)
2 months		8 (6.3)
3 months		11 (8.7)
4 months		9 (7.1)
6 months		16 (12.6)
9 months		3 (2.4)
12 months		68 (53.5)
Willingness to attend: duration with no improvement	128 (94.1)	
4 weeks		16 (12.5)
6 weeks		13 (10.2)
2 months		12 (9.4)
3 months		21 (16.4)
4 months		12 (9.4)
6 months		23 (18.0)
9 months		2 (1.6)
12 months		29 (22.7)
Degree of improvement to keep attending (mean, SD)	125 (91.9)	45.6 (24.8)
Degree of expected overall (mean, SD)	123 (90.4)	49.9 (23.6)

Values are presented as number and percent of response rate for categorical variables, and the mean, standard deviation for continuous variables where noted.