A Cross-Sectional Survey of Use, Experiences, and Expectations of Complementary Health Approaches: Associations with Subconscious Connectedness

How is subconscious connectedness associated with the use, positive experience, and expectation of benefit from psychological and combined psychological/physical complementary and integrative health approaches?

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Abstract

Background: This project examines the association between subconscious connectedness (SC) and engagement with psychological or combined psychological/physical complementary health approaches (PC-CHA) among U.S. adults. SC represents the strength of communication between subconscious and conscious thoughts as measured by the Thought Impact Scale (TIS). PC-CHA comprises a set of non-traditional health practices that employ primarily psychological or blended psychological–physical approaches such as meditation, hypnosis, tai chi, and yoga.

Aims: The primary aims of this study are to assess whether higher TIS scores are associated with increased utilisation of PC-CHA, positive experiences with PC-CHA, and higher expectations of PC-CHA benefits.

Methods: Logistic and linear regression models examined participants' TIS score quartiles as a predictor of three outcome variables measuring engagement with PC-CHA while controlling for demographic, socioeconomic, psychological, and health-related covariates. The outcome variables included the prevalence of PC-CHA usage, ratings of previous experiences with PC-CHA, and reports of the expected benefit of PC-CHA,

Results: Higher TIS scores were positively associated with greater odds of using PC-CHA and higher expectations of benefit from PC-CHA but are not associated with a more favourable rating of experience with PC-CHA.

Conclusions: SC affects healthcare decisions and interactions. Awareness of this effect could enable healthcare providers to deliver more patient-centred care. It could also lead to further investigations on improving clinical interactions, patient counselling, care coordination, cost, safety, efficacy, and health policy.

Lay Summary

This project investigated whether people with more subconscious connectedness (SC) use and respond to psychological and combined psychological/physical complementary health approaches (PC-CHA) differently than those with lower amounts of SC. People with higher SC have more active or intense connections between their subconscious and conscious mental processes, and the Thought Impact Scale (TIS) can measure this. PC-CHA treatments, such as meditation, hypnosis, or yoga, depend on psychological function, so SC may be a factor in how people participate in those treatments. This study used data from a representative sample of 3013 US adults to determine whether people with greater SC (higher TIS scores) had more use, positive experiences, and higher expectations of PC-CHA. It showed that people with higher TIS scores are more likely to use PC-CHA. They also expected greater benefits from those treatments but did not report more favourable experiences with the PC-CHA they had used. This result shows that SC affects the types of treatments people choose and their expectations of those treatments. This contributes to knowledge of how psychological traits influence healthcare interactions and could help healthcare providers and policymakers be more responsive to individual patient circumstances and population preferences. Patient preferences for treatments influence the overall cost of healthcare, and patient expectations can strongly affect the outcomes of each treatment. Greater sensitivity to the effects of psychological traits in clinical and population-based care could improve patient satisfaction and outcomes through a more patient-centred approach.

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List of Abbreviations

CAM – Complementary and alternative medicine

CI – Confidence interval

CHA – Complementary health approaches

GED – General educational development/high school equivalent

IOM – Institute of Medicine

MHLC-A –Multidimensional Health Locus of Control Form A scale

N – Number of subjects

NCCHA – National Center for Complementary and Integrative Health

OR – Odds ratio

PECOT – Population, Exposure, Comparator, Outcome, Timing

PC-CHA – Psychological and combined psychological/physical complementary health approaches

PC-CHA-F – Favourability of experience with PC-CHA

PC-CHA-H – Expectation of helpfulness of PC-CHA

PC-CHA-U – Use of any PC-CHA

PHQ-4 – Patient Health Questionnaire 4-question screening tool

PR – Prevalence ratio

SC – Subconscious connectedness

SIWB – Spiritual Index of Well-Being scale

Q1 – First or lowest quartile

Q2 – Second or second to lowest quartile

Q3 – Third or second to highest quartile

Q4 – Fourth or highest quartile

TIS – Thought Impact Scale

US – United States

1. Introduction

1.1 Overview of the Study

This is an analysis of data from a cross-sectional survey of US adults that gathered information about demographics, socioeconomic status, healthcare status, healthcare use, psychological traits, and healthcare attitudes. Linear and logistic regression methods were used to investigate the relationship between a psychological trait termed subconscious connectedness (SC) (Palsson, 2020a) and the use, experience, and expectations of complementary health approaches (CHA). The intention was to understand how a person's psychology influences their engagement with healthcare systems. This improved understanding may lead to future improvements in experience and outcomes from such engagement.

1.2 Research Question

The 3-part research question for this study is as follows. Are people with higher subconscious connectedness, as measured by the Thought Impact Scale (TIS), more likely to have used psychological and combined psychological/physical CHA (PC-CHA) in the past year, more likely to have had a favourable experience with PC-CHA in the past year, and more likely to express positive expectations of PC-CHA?

1.3 Hypotheses

There were three study hypotheses.

Hypothesis 1: Individuals in the highest quartile of TIS scores, compared to individuals in the lowest quartile of TIS scores, will be more likely to report having used PC-CHA in the past year.

Hypothesis 2: Among subjects who have used PC-CHA in the past year, individuals in the highest quartile of TIS scores will demonstrate a significantly higher mean score favourability rating of their experience with PC-CHA compared to individuals in the lowest quartile of TIS scores.

Hypothesis 3: Among subjects who have not used PC-CHA in the past year, individuals in the highest quartile of TIS scores will have a significantly higher mean score rating of the potential helpfulness of PC-CHA compared to individuals in the lowest quartile of TIS scores.

1.4 PECOT – Population, Exposure, Comparator, Outcome, and Timing

The PECOT elements of this project are presented in Table 1.1.

Table 1.1. PECOT elements of the project.

PECOT Element	Description
Population	US adults aged 18 or older
Exposure	SC as measured by the TIS score
Comparator	Top quartile on the TIS compared to the lowest quartile
Outcomes	Prevalence of PC-CHA use Favourability of experience with PC-CHA Expectation of the helpfulness of future PC-CHA use
Timing	Previously existing data from an online cross-sectional survey performed from February to March 2024

1.5 Boundaries and Constraints

This study was limited to analysing pre-existing data from a cross-sectional survey conducted by an online research firm among registered subjects. While the survey was quota-controlled to be representative of the US adult population, the results are limited in generalisability to other populations, including people under age 18 and non-US populations. The sampling method was practical but may be subject to bias due to the non-random methodology. The respondents were representative of the target population in terms of age, sex, ethnicity, education, and

region of the country. The variables within the dataset for analysis were limited to those collected for the original survey.

2. Background

2.1 Rationale

Enhanced quality of care is a persistent goal of healthcare providers and organisations. Understanding how patients' psychological characteristics influence their treatment choices and their responses to those treatments could contribute to achieving the goal of higher-quality care. The consideration of psychological traits may allow for more tailored and individualised patient interactions and the establishment of healthcare policies that are more responsive to the perceived needs and expectations of the population. SC is one such trait that may drive patient choices, actions, and responses. This study examines SC and its relationship to complementary health approaches (CHA).

A focus on SC was selected for this study because high scores on this trait have been shown in two studies to be related to an increased tendency to seek hypnosis treatment, heightened interest in such treatment, and more positive attitudes in general toward hypnosis (Palsson, 2020; Palsson et al., 2022). Furthermore, high SC scores are associated with absorption, openness, and intuitive cognitive style, three characteristics reported in previous research correlated with greater CHA use and interest (Galbraith et al., 2018). These findings suggest that high SC scores help identify individuals who are more interested and willing than others to seek complementary rather than conventional health approaches and who are more likely to have positive attitudes and expectations about CHA.

More specifically, the study examines how SC is associated with CHA categorised by the National Institute of Health (NIH) as "Psychological" or "Combined Psychological/Physical" (PC-CHA). This includes methods such as meditation, yoga, tai chi, and hypnosis (CAIH, Accessed 1 May 2024).

According to the most recent NIH data from 2012, US adults spent $28.3 billion on CHA in one year. This represents 1.1% of total spending and 9.2% of out-of-pocket spending on healthcare. (Clarke *et al.*, 2015). CHA is often used with conventional methods such as prescription medication or surgery (Clarke *et al.*, 2015). Knowing how SC is associated with these PC-CHA outcomes may lead to more effective discussions and decision-making regarding healthcare choices. This section reviews the rationale for analysing the relationship between TIS and PC-CHA outcomes.

2.2 Patient-Centred Care and Quality

The Institute of Medicine and the World Health Organization (WHO) promote patient-centred care as a core aim of healthcare improvement (*Crossing the Quality Chasm*, 2001; *People-centred health care*, 2007). Patient-centred care, which recognises and respects individual patient needs, preferences, and values concerning clinical interactions and decisions, is one of the six domains of healthcare quality. It is widely recognised as a principle of intrinsic value in healthcare (*Crossing the Quality Chasm*, 2001). Beyond its inherent value, such care has improved health, social, and economic outcomes (Kuipers et al., 2019; NEJM Catalyst, 2017; Stewart et al., 2021). Understanding how patient characteristics influence health choices and responses to care options is an intrinsic component of patient-centred care. This preliminary study will advance this core quality goal by increasing knowledge of the relationship between SC and PC-CHA engagement and by potentially stimulating further research.

2.3 Thought Impact Scale (TIS)

The TIS is the psychometric tool designed to measure SC. SC is 'the degree to which nonconscious mental functions spontaneously interact with, and are accessible to, conscious awareness in

everyday life' (Palsson, 2020). Though the construct of SC is related to hypnotisability, it is more broadly representative of psychological function in everyday life, overlapping with other psychological constructs, including suggestibility, absorption, automaticity of behaviour, creativity, and emotional empathy (Palsson, 2020a). Palsson hypothesised that people with more SC would be more likely to seek out treatment with hypnosis and may be more responsive to that treatment (Palsson, 2020).

Two studies have applied the TIS in research on representative samples of U.S. adults and tested its association with hypnosis (Palsson, 2020; Palsson, Ballou and Walker, 2022). The TIS showed Cronbach's alphas of 0.93 and 0.95, indicating good internal consistency, and a normal distribution. Females scored approximately 6 points higher on average than males. The TIS score correlated inversely to age (Palsson, 2020; Palsson, Ballou and Walker, 2022). No significant associations existed between TIS scores and educational level, race/ethnicity, or geographic location. In both studies, when compared to those who scored in the bottom half of the TIS, subjects in the upper half were 2.3 to 2.6 times more likely to report utilising hypnosis treatment (7.2% vs 3.2% and 9.9% vs 4.0%, respectively, $p < .0001$) (Palsson, 2020; Palsson, Ballou and Walker, 2022). Among people who had not received hypnosis treatment, high TIS scorers were likelier than low scorers to express willingness to consider such treatment (67.0 vs 41.3%, $p < .0001$) (Palsson, Ballou and Walker, 2022). Whether or not the TIS predicts the therapeutic response to hypnosis is unknown. (Palsson, Ballou and Walker, 2022). There have been no previous studies on the association of TIS scores with treatment methods other than hypnosis.

2.4 Complementary Health Approaches (CHA)

2.4.1 Definitions of CHA and PC-CHA

Which methods comprise complementary or alternative health approaches varies by time and place (Bishop and Lewith, 2010; Clarke *et al.*, 2015; Bryden and Browne, 2016). The current project uses a definition of PC-CHA from the National Center for Complementary and Integrative Health (NCCHA) that represents those CHA methods used in the US (CAIH, Accessed: 1 May 2024). The term CHA is used in this study when referring to the entire group of these treatment methods. In contrast, PC-CHA is used to refer collectively to those CHA types categorised by the NCCHA as primarily "Psychological" or "Combined Psychological/Physical" (CAIH, Accessed: 1 May 2024). Table 2.1 lists the specific CHAs polled for this study's dataset and their categorisation into four sub-types of CHA consistent with NCCHA nomenclature. The terms "complementary and alternative medicine" (CAM), "traditional complementary and alternative medicine" (TCAM), and "traditional complementary and integrative medicine" (TCIM) are used equivalently to CHA within several of the references cited. The categories of concern for this analysis are the PC-CHA approaches.

Table 2.1 Complementary Health Approaches (CHA) grouped by NCCIH category.

Nutritional CHA	Psychological CHA	Combined Psychological/Physical CHA	Physical CHA
Dietary supplements (all types) Special diet prescribed by a doctor Special diet not prescribed by a doctor Visit to an herbalist Visit to a homoeopath Visit to a naturopath	Visit to a spiritual healer Prayer Mindfulness or spiritual practices other than prayer Shamanic journeys Hypnotherapy Self-hypnosis Art, music, or dance	Deep breathing exercises Meditation Progressive relaxation Biofeedback Guided imagery Visit to an acupuncturist Yoga Tai chi or qi gong Movement therapies other than yoga, tai chi, or qi gong	Visit to a chiropractor Osteopathic manipulation Massage therapy

(CAIH, Accessed: 1 May 2024)

2.4.2 CHA Prevalence

A 2012 study reported that the prevalence of CHA use varied from 9.8% to 76% across multiple countries (Harris *et al.*, 2012). A later multi-country survey reported a prevalence ranging from 24.6% to over 50% for individual types of CHA (Peltzer and Pengpid, 2018). The most recent large-scale NIH survey of the US found that five of the top 10 most common CHAs fell into the category of PC-CHA (see Table 2.2) (Clarke *et al.*, 2015).

Table 2.2. Prevalence of use in the past year of the top 10 CHA methods among US adults in 2012 *(Clarke et al., 2015).*

Type of CHA	**% Prevalence of use in past year**
Non-vitamin, non-mineral dietary supplements	17.7
Deep-breathing exercises*	10.9
Yoga, tai chi, or qi gong*	10.1
Chiropractic or osteopathic manipulation	8.4
Meditation*	8.0
Massage	6.9
Special diets	3.0
Homeopathy	2.2
Progressive relaxation*	2.1
Guided imagery*	1.7

** Denotes an approach falling within the designation of PC-CHA.*

The most recent report from NCCIH compared use over time for a limited number of CHA in the US. Use of all seven types of CHA surveyed increased between 2002 and 2022 including acupuncture, chiropractic, guided imagery, massage therapy, meditation, naturopathy and yoga (Nahin et al., 2024).

2.4.3 Demographic Characteristics and CHA Use

Several systematic reviews have found CHA use is more prevalent in middle age and among females (Berna et al., 2019; Bishop and Lewith, 2010). The most extensive U.S. study on the demographics of CHA use reported variations across types of CHA based on sex, age, and ethnicity. These variations did not follow linear relationships by age or consistent relationships to sex and ethnicity across types of CHA (Clarke *et al.*, 2015). Meanwhile, a study by Clarke *et al.* found that CAM use in the US increased between 2002 and 2007 but levelled off between 2007 and 2012. During this period, use increased for Hispanic adults but decreased for White and Black adults (Clarke *et al.*, 2015).

2.4.4 Socioeconomic Factors and CHA Use

Social factors identified with CHA use include the expectation of benefit, dissatisfaction with conventional medicine, the perception of CHA safety, influence from the user's social network, and affordability (Tangkiatkumjai, Boardman and Walker, 2020). Reasons for non-use of CHA are satisfaction with conventional medicine, dissatisfaction with CHA, lack of information, lack of trust, high cost, and unavailability (Tangkiatkumjai, Boardman and Walker, 2020). Moreover, using CHA providers has been associated with lower educational attainment, a lack of religious affiliation, a larger household size, the absence of health insurance, and poor ability to pay for medical treatment (Berna *et al.*, 2019). The patterns of CAM use differ between modalities that require a visit to a practitioner and those that do not (Sharp *et al.*, 2018). CHA use in the US has varied according to geography, socioeconomic status, education level, gender, ethnicity, and ability to pay or insurance status. These variations form complex patterns depending on the specific demographic characteristics and the CHA method being considered (Clarke *et al.*, 2015).

2.4.5 Psychological Characteristics and CHA Use

Personality traits are associated with CHA therapies and may be more congruent with the ability to benefit from those therapies. These include positive affect, absorption, and a greater sense of well-being (Owens, Taylor and Degood, 1999). A 2018 systematic review found the psychological traits of openness and absorption positively correlated with CHA use or belief in its efficacy (Galbraith *et al.*, 2018). Subjects with higher absorption scores may be more attuned to mind-body effects and be more attracted to treatments utilising those effects (Owens et al., 1999). These subjects may be both more attuned and attracted to CHA use based on their affinity to

mind/body effects and be more susceptible to the adverse impacts of stress and somatisation, further driving the use of CHA.

Openness is a personality trait related to an individual's receptivity to novel ideas, new experiences, and changes to their circumstances. Absorption is a psychological construct related to an individual's ability to become fully engaged, or 'absorbed', in their mental and perceptual processes. Both traits are associated with SC (Palsson, 2020): Absorption correlates strongly (r=0.70) with SC scores, and high TIS scorers report greater openness to novel experiences than low scorers. Other studies have found that CHA users are likelier to demonstrate "intuitive thinking" and hold magical or holistic health beliefs (Lindeman, Keskivaara and Roschier, 2000; Hyland, Lewith and Westoby, 2003; Aarnio and Lindeman, 2004; Bryden and Browne, 2016). Greater use of CHA was reported among subjects describing themselves as more frequently unhappy or depressed in one extensive multi-country survey (Peltzer and Pengpid, 2018). People with an internal locus of control, i.e., harbouring the belief that healthcare outcomes are related to one's actions or efforts, also report more CAM use in Western populations (Tangkiatkumjai, Boardman and Walker, 2020).

2.4.6 Psychological Characteristics and Medical Outcomes

Greater provider awareness of patients' psychological characteristics can improve patient-provider communication. This can influence how well patients understand health information, adhere to treatment recommendations, and perceive health outcomes (Ammi et al., 2023). Different personality types are associated with different preferred communication and decision-making styles, indicating that clinicians may need to adjust their discussions and counselling to the patient's preferred methods (Flynn and Smith, 2007). Conscientiousness is associated with

reduced prevalence of many physical and mental disorders, while neuroticism increases risk (Goodwin and Friedman, 2006). Personality traits predict overall mortality and a variety of clinical outcomes (Fang et al., 2019; Müller et al., 2008; Turiano et al., 2015).

2.4.7 Patient Expectations and Medical Outcomes

Meeting patient expectations effectively improves adherence to treatment plans and improves patient satisfaction. When patient expectations are not met, patient trust is diminished, resulting in lower adherence satisfaction (Berhane and Enquselassie, 2016; Berkowitz, 2016). Higher expectations of benefit may mobilise an increased placebo effect just as lower expectations create a nocebo reaction (Laferton et al., 2017). Meeting patient expectations and matching care to those expectations reflects a more patient-centred approach sensitive to patient preferences and values (Berkowitz, 2016; “What Is Patient Experience?”, Accessed: 19 August 2024). Improved communication may prevent unnecessary or potentially harmful interventions. Recognition of patient expectations fosters improved communication and results in greater satisfaction, adherence, and positive outcomes.

2.4.8 Health Status and CHA

Patients with more numerous health concerns or more severe health problems are more likely to use CHA. Patients lacking serious health concerns are less likely to use CHA (Tangkiatkumjai, Boardman and Walker, 2020). A diagnosis of cardiovascular disease increases the likelihood of using CHA (AOR 1.14, 95% CI 1.06, 1.23) (Sirois et al., 2018). CHA prevalence is high among pain patients and increases with the number of health conditions reported by the subject (Feinberg et al., 2018).

2.4.9 TIS and CHA Use

Two previous studies have reported an association between TIS scores and the use of CHA in the form of hypnosis (Palsson, 2020; Palsson et al., 2022). In both cases, investigators found a higher prevalence of hypnosis use among individuals in the highest quartile of TIS scores compared to those in the lowest quartile (9.9% vs 4.0% and 7.9% vs 2.5%). Respondents in the top 50% of the TIS score distribution reported using hypnosis at a rate of 7.2%, while only 3.2% of those in the bottom 50% did so. Individuals in the upper half were 2.3 times more likely to use hypnosis treatment compared to those in the lower half ($p < .001$) (Palsson, Ballou and Walker, 2022). These findings demonstrate that people seeking hypnosis treatment have a higher degree of SC as measured by the TIS. They also suggest a possible link between TIS scores and the use of other CHA, particularly those in the psychological or combined psychological/physical NCCHA categories. Notably, there have been no studies of the association between TIS scores and other CHA methods.

Palsson also found a strong correlation ($r = 0.70$) between TIS scores and absorption (Palsson, 2020). This high correlation suggests that absorption could serve as a surrogate for TIS in understanding its influence on the use of CHA and PC-CHA. Hypnotisability is also highly correlated with absorption and may be considered a surrogate measure of SC (Palsson, 2020). Absorption has been found to correlate positively with CHA use and belief (Galbraith *et al.*, 2018). One study identified a higher average level of hypnotisability among patients of a traditional Nepali healing practice compared to Ayurvedic and Western medicine clinics in the same areas of Nepal (Biswas *et al.*, 2000). These correlations point to a potential positive association between TIS and PC-CHA, which has not been investigated in a US sample.

2.4.10 TIS and CHA Favourability of Experience

Two studies (Palsson, 2020; Palsson et al., 2022) have assessed the relationship between therapeutic response to hypnosis and TIS scores. The first study found a significantly higher percentage of people in the upper vs lower half of TIS scores (53.8% vs. 20.8%; $p = .004$) to have at least moderate treatment response, whereas the same comparison was not statistically significant in the second study (58.6% vs. 40.9%, $p = .12$). High TIS scorers showed a significantly higher mean score than low scorers on the Brief Hypnotic Experiences Scale (BHES; $M = 25.6$, $SD = 7.6$ vs $M = 19.5$, $SD = 6.5$, $p < .0005$) which measures the degree of subjective response during hypnosis treatment (Palsson, Ballou and Walker, 2022). Further investigation is needed to understand how the TIS functions as a predictor of response to and utilisation of hypnosis and other psychologically based treatments (Palsson, Ballou and Walker, 2022).

2.4.11 TIS and CHA Expectation of Benefit

There is no previous data on the TIS score and the expectation of benefit from CHA.

2.5 Quality of Previous Literature

Quality assessments of the only two previous studies that investigated the relationship between TIS and PC-CHA are provided in Appendix C (Palsson, 2020; Palsson et al., 2022). Both were high-quality cross-sectional studies with some limitations related to the sampling method and their focus on scale development. Despite the limitations, the reported relationships between TIS and PC-CHA experience are likely valid measures of the association. This literature review was intended to cast a broad net to identify potential covariates for the intended regression analyses that may be present in the dataset. It employed a low threshold for

including potential covariates in the models as an exploratory analysis. As such, a rigorous analysis of the quality of each of the studies did not help decide which covariates to include.

3. Methods

3.1 Ethics Approval

This project involved the analysis of previously collected anonymous data within the US. The data did not originate from the British National Health Service, and no biological samples were involved. The data could not be traced back to an individual by anyone on the research team. Therefore, by the policy of the Central University Research Ethics Committee, ethics approval was not required through the University of Oxford (Where and how to apply for ethical review, Accessed: 10 January 2024). The original data set was collected by researchers at Campbell University, Buies Creek, North Carolina, US, following a determination by its Institutional Review Board for the project title 'A national U.S. survey of personal characteristics and health behaviours, experiences, and beliefs'. After considering the study's methods, the project submission was determined not to meet the definition of human subjects research as defined by 45 Code of Federal Regulations 46.102(e). The first page of the online survey described the project, and subjects were required to either consent to proceed or exit the survey. This project received no financial support.

3.2 Choice of Research Methodology

This study employed data from a previous online cross-sectional survey of U.S. adults because the dataset included the elements necessary to test the hypotheses. The analysis could be completed promptly, and no additional financial resources were required. Therefore, this method was both a practical and ethical research approach. The approach of establishing best practices and reporting guidelines for cross-sectional studies was followed to the extent that this was possible

while using data that had been previously collected (see Appendix C) (Elm *et al.*, 2007; Vandenbroucke *et al.*, 2007; Downes *et al.*, 2016).

3.3 Target Population and Sampling Strategy

The target population was US adults (age 18 years or more). The sample frame was a panel of Qualtrics registered survey respondents. Qualtrics, LLC is an online research company that makes panels of qualified respondents who have previously agreed to answer online surveys available to investigators. Demographic quota controls matched the sample to the US population. All subjects within the qualified Qualtrics panels were eligible to complete the study within the quota constraints. This was practical and efficient for completing the survey while minimising the likelihood of sampling bias. The methodology of the Internet survey closely resembled the approach utilised in two previous studies involving the TIS (Palsson, 2020; Palsson, Ballou and Walker, 2022).

3.4 Data Collection

Qualtrics Panels, a division of Qualtrics, LLC, recruited 3013 subjects from their panel of registered survey-takers to complete the questionnaire. Qualtrics delivered only fully completed records. The number of eligible subjects who did not elect to complete the survey or provided partial data was not available. The investigators had no direct communication or interactions with the subjects, and their identities remained anonymous to the research team. The survey software was configured with an "anonymise" setting to ensure the exclusion of any indirect identifiers. The dataset included no personal information that could reveal subjects' identities, such as computer IP addresses, names, or geolocation data.

The survey sample was quota-controlled to match the US population, as noted in Table 3.1. (*U.S. Census Bureau QuickFacts*, Accessed: 1 May 2024; *Regional distribution of the U.S. population from 2021*, Accessed: 1 May 2024).

Table 3.1. Quotas for respondents to the Psychological Characteristics and Health Behaviours Survey in the US, 2024.

Demographic characteristic	**Target Percent**
Sex at birth	
Female	50.0
Male	50.0
Age (years), N (%)	
18 to 34	30.0
35 to 49	24.5
50 to 64	25.0
65 and above	20.5
Ethnicity, N (%)	
Asian or Pacific Islander	6.0
White/Caucasian	75.0
Black/African American	13.0
Hispanic	18.0
American Indian, Alaskan Native, and all additional categories	6.0
Region of US	
East	17.2
Midwest	20.8
South	38.3
West	23.8
Educational level	
Undergraduate college degree or higher	No more than 35.0

The survey included two attention-test questions to exclude subjects who responded carelessly or without reading the questions. Respondents who failed to provide the appropriate responses to these questions – for example, by failing to enter "Rarely" as instructed by the prompt “To make sure you are reading the questions in this survey carefully, please enter "Rarely" as a response to this statement” – were disqualified, and their data was excluded.

3.5 Sample Size

3.5.1 Calculation Based on Comparison of Proportions

The required sample size based on a comparison of proportions was determined using the data from the previous reports of hypnosis use by quartile of the TIS score (Palsson, 2020; Palsson et al., 2022). In these studies, the prevalence of hypnosis in the highest vs lowest quartile of the TIS score was 9.9% vs 4.0% and 7.9% vs 2.5%, respectively. Using these figures as surrogates for PC-CHA use, the required sample sizes to compare prevalence between the highest and lowest quartiles would be 1,164 and 1,060, respectively, at 80% power and alpha of 5% (Brooks, Accessed: 1 May 2024). This study employed the aggregate use of PC-CHA as the dependent variable. Therefore, the prevalence of PC-CHA was expected to exceed that of hypnosis alone. The sample size of 3,000 was likely to provide sufficient statistical power to demonstrate a difference in the prevalence of CHA use between the two quartiles if such a difference was present.

3.5.2 Sensitivity Analysis of Sample Size

The tables below present a sensitivity analysis of the sample size estimate based on comparing ratios between the first and fourth TIS score quartiles (Q1 and Q4) under varying conditions of PC-CHA prevalence and prevalence ratios between the two quartiles. The sample size estimates in Table 3.2 are based on hypothesis 1, the difference in prevalence of PC-CHA use between the highest and lowest quartile of TIS score calculated for varying PC-CHA prevalence and prevalence ratios.

Table 3.2. The quartile sample size required for varying Prevalence Ratios (PR) of PC-CHA use between the first and fourth TIS score quartiles (Q1 and Q4), with alpha .05, power .80.

Q4Pr N	Q4Pr (required sample size for each quartile)							
Q1Pr	PR = 1.1	PR =1.2	PR = 1.3	PR = 1.4	PR = 1.5	PR = 2.0	PR = 2.5	PR = 3.0
.001	.0011 (1,646,533)	.0012 (431,213)	.0013 (200,351)	.0014 (117,591)	.0015 (78,390)	.0020 (23,511)	.0025 (12,187)	.003 (7,833)
.005	.0055 (327,922)	.006 (85,862)	.0065 (39,885)	.007 (23,405)	.0075 (15,599)	.010 (4,673)	.0125 (2,420)	.015 (1,553)
.010	.011 (163,095)	.012 (42,693)	.013 (19,827)	.014 (11,631)	.015 (7,750)	.020 (2,319)	.025 (1,199)	.030 (769)
.025	.0275 (64,199)	.030 (16,792)	.0325 (7,792)	.035 (4,567)	.0375 (3,041)	.040 (2,193)	.0625 (466)	.075 (298)
.050	.055 (31,234)	.060 (8,158)	.065 (3,780)	.070 (2,213)	.075 (1,471)	.100 (435)	.125 (222)	.150 (141)
.075	.0825 (20,246)	.090 (5,280)	.0975 (2,443)	.105 (1,428)	.1125 (948)	.150 (278)	.1875 (141)	.225 (88)
.100	.110 (14,751)	.12 (3,842)	.13 (1,774)	.14 (1,035)	.150 (686)	.200 (199)	.250 (100)	.300 (62)
.125	.1375 (11,455)	.150 (2,978)	.1625 (1,373)	.175 (800)	.1875 (529)	.250 (152)	.3125 (76)	.375 (46)
.150	.165 (9,257)	.180 (2,402)	.195 (1,106)	.210 (643)	.225 (424)	.300 (121)	.375 (59)	.450 (36)
.175	.1925 (7,687)	.210 (1,991)	.2275 (915)	.245 (531)	.2625 (350)	.350 (99)	.4375 (48)	.525 (28)
.200	.220 (6,510)	.240 (1,683)	.260 (772)	.280 (447)	.300 (294)	.400 (82)	.500 (39)	.600 (23)
.250	.275 (4,862)	.300 (1,251)	.325 (571)	.350 (329)	.375 (215)	.500 (58)	.625 (27)	.750 (15)
.300	.330 (3,763)	.360 (963)	.390 (437)	.420 (250)	.450 (163)	.600 (42)	.75 (19)	.900 (<5)

Q1Pr = prevalence of PC-CHA use in the lowest TIS score quartile
Q4Pr = prevalence of PC-CHA use in the highest TIS score quartile
PR = prevalence ratio Q4Pr/Q1Pr
Yellow = conditions sufficiently powered for N=3,000
Blue = conditions sufficiently powered for N=6,000
Green = conditions sufficiently powered for N=9,000
Calculations were performed with the https://www.stat.ubc.ca/~rollin/stats/ssize/b2.html ("Power/Sample Size Calculator," Accessed: 1 May 2024).
Yellow

In Table 3.2, conditions highlighted in yellow are sufficiently powered with a quartile sample size of 750 or N = 3,000 for the overall study. A sample size of 6,000 would have added the conditions highlighted in blue to those sufficiently powered, while a study size of 9,000 would have added those highlighted in green. A sample size of 3,000 provides sufficient power to explore the

relationships between TIS score and overall PC-CHA use. Differences in prevalence across TIS score quartiles may not have been detected across the conditions not highlighted in yellow.

Tables 3.3 and 3.4 represent the power of the study to detect a difference in prevalence of use between Q1 and Q4 over varying conditions of Q1 prevalence and prevalence ratios between Q4 and Q1 for studies of 3,000 and 6,000 subjects, respectively.

Table 3.3. Power of study comparing Prevalence Ratios (PR) of PC-CHA Use between the first and fourth TIS score quartiles, with N = 3,000 (750 per quartile) and alpha .05.

	Q4Pr (power)							
Q1Pr	PR = 1.1	PR =1.2	PR = 1.3	PR = 1.4	PR = 1.5	PR = 2.0	PR = 2.5	PR = 3.0
.001	.0011 (.03)	.0012 (.03)	.0013 (.04)	.0014 (.04)	.0015 (.05)	.0020 (.07)	.0025 (.10)	.003 (.14)
.005	.0055 (.03)	.006 (.04)	.0065 (.06)	.007 (.07)	.0075 (.09)	.010 (.20)	.0125 (.34)	.015 (.49)
.010	.011 (.04)	.012 (.06)	.013 (.08)	.014 (.11)	.015 (.14)	.020 (.36)	.025 (.60)	.030 (.79)
.025	.0275 (.05)	.030 (.09)	.0325 (.14)	.035 (.20)	.0375 (.28)	.040 (.37)	.0625 (.94)	.075 (.99)
.050	.055 (.06)	.060 (.13)	.065 (.24)	.070 (.37)	.075 (.52)	.100 (.96)	.125 (>.99)	.150 (>.99)
.075	.0825 (.08)	.090 (.18)	.0975 (.34)	.105 (.53)	.1125 (.70)	.150 (>.99)	.1875 (>.99)	.225 (>.99)
.100	.110 (.09)	.12 (.23)	.13 (.44)	.14 (.66)	.150 (.83)	.200 (>.99)	.250 (>.99)	.300 (>.99)
.125	.1375 (.11)	.150 (.29)	.1625 (.54)	.175 (.77)	.1875 (.92)	.250 (>.99)	.3125 (>.99)	.375 (>.99)
.150	.165 (.12)	.180 (.35)	.195 (.64)	.210 (.86)	.225 (.96)	.300 (>.99)	.375 (>.99)	.450 (>.99)
.175	.1925 (.14)	.210 (.40)	.2275 (.72)	.245 (.92)	.2625 (.98)	.350 (>.99)	.4375 (>.99)	.525 (>.99)
.200	.220 (.16)	.240 (.46)	.260 (.79)	.280 (.95)	.300 (.99)	.400 (>.99)	.500 (>.99)	.600 (>.99)
.250	.275 (.19)	.300 (.58)	.325 (.89)	.350 (.99)	.375 (>.99)	.500 (>.99)	.625 (>.99)	.750 (>.99)
.300	.330 (.24)	.360 (.70)	.390 (.96)	.420 (>.99)	.450 (>.99)	.600 (>.99)	.75 (>.99)	.900 (>.99)

Q1Pr = prevalence of PC-CHA use in the lowest TIS score quartile
Q4Pr = prevalence of PC-CHA use in the highest TIS score quartile
N = number of subjects in the overall study
PR = prevalence ratio Q4Pr/Q1Pr
Yellow = conditions sufficiently powered for N=3,000
Calculations performed with https://www.stat.ubc.ca/~rollin/stats/ssize/b2.html (Power/Sample size calculator, Accessed: 1 May 2024*).*
Conditions highlighted in yellow are sufficiently powered with N = 3,000.

Table 3.4. Power of study comparing Prevalence Ratios (PR) of PC-CHA use between the first and fourth TIS score quartiles, with N = 6,000 (1,500 per quartile) and alpha .05.

	Q4Pr (power)							
Q1Pr	PR = 1.1	PR =1.2	PR = 1.3	PR = 1.4	PR = 1.5	PR = 2.0	PR = 2.5	PR = 3.0
.001	.0011 (.03)	.0012 (.04)	.0013 (.04)	.0014 (.04)	.0015 (.06)	.0020 (.11)	.0025 (.16)	.003 (.23)
.005	.0055 (.04)	.006 (.06)	.0065 (.08)	.007 (.011)	.0075 (.14)	.010 (.35)	.0125 (.60)	.015 (.79)
.010	.011 (.05)	.012 (.08)	.013 (.12)	.014 (.17)	.015 (.23)	.020 (.62)	.025 (.88)	.030 (.97)
.025	.0275 (.06)	.030 (.13)	.0325 (.23)	.035 (.36)	.0375 (.50)	.040 (.64)	.0625 (>.99)	.075 (>.99)
.050	.055 (.09)	.060 (.22)	.065 (.42)	.070 (.64)	.075 (.81)	.100 (>.99)	.125 (>.99)	.150 (>.99)
.075	.0825 (.12)	.090 (.32)	.0975 (.59)	.105 (.82)	.1125 (.94)	.150 (>.99)	.1875 (>.99)	.225 (>.99)
.100	.110 (.14)	.12 (.42)	.13 (.73)	.14 (.92)	.150 (.99)	.200 (>.99)	.250 (>.99)	.300 (>.99)
.125	.1375 (.17)	.150 (.51)	.1625 (.83)	.175 (.97)	.1875 (>.99)	.250 (>.99)	.3125 (>.99)	.375 (>.99)
.150	.165 (.20)	.180 (.60)	.195 (.90)	.210 (.99)	.225 (>.99)	.300 (>.99)	.375 (>.99)	.450 (>.99)
.175	.1925 (.23)	.210 (.68)	.2275 (.95)	.245 (>.99)	.2625 (>.99)	.350 (>.99)	.4375 (>.99)	.525 (>.99)
.200	.220 (.27)	.240 (.75)	.260 (.97)	.280 (>.99)	.300 (>.99)	.400 (>.99)	.500 (>.99)	.600 (>.99)
.250	.275 (.34)	.300 (.87)	.325 (>.99)	.350 (>.99)	.375 (>.99)	.500 (>.99)	.625 (>.99)	.750 (>.99)
.300	.330 (.42)	.360 (.94)	.390 (>.99)	.420 (>.99)	.450 (>.99)	.600 (>.99)	.75 (>.99)	.900 (>.99)

Q1Pr = prevalence of PC-CHA use in the lowest TIS score quartile
Q4Pr = prevalence of PC-CHA use in the highest TIS score quartile
N = number of subjects in the overall study
PR = prevalence ratio Q4Pr/Q1Pr
Yellow = conditions sufficiently powered for N=3,000
Calculations performed with https://www.stat.ubc.ca/~rollin/stats/ssize/b2.html (Power/Sample size calculator, Accessed: 1 May 2024*).*
Conditions highlighted in yellow are sufficiently powered with N = 6,000.

The cost of survey-based studies using this methodology is directly proportional to the number of subjects recruited. Relatively few additional conditions would have attained sufficient power by doubling or tripling the size and cost of the study. The time and expense involved in collecting a dataset larger than N=3,000 would go up linearly with the number of subjects and, as indicated by Tables 3.2 to 3.4, would be unlikely to yield much additional benefit for detecting true measures of association.

3.6 Online Recruitment

Using the nationwide US Qualtrics panel allowed for an efficient research process with good data quality, including attention checks and minimisation of missing data. Potential survey participants were invited only based on their demographic characteristics and excluded based on inaccurate completion of attention questions and lack of survey completion.

3.7 Coverage Error

Members of the Qualtrics respondent panel may not accurately reflect the U.S. population. In aggregate, they may diverge from the general population concerning demographic characteristics other than those that were quota controlled, psychological characteristics, use of healthcare, health status, attitudes towards healthcare, and perceived benefit from healthcare.

3.8 Sampling Error

Representative sampling of the self-selected panel of respondents may lead to a sampling error; this is a limitation of the study.

3.9 Measurement Error

The forms of the questions in the original online questionnaire were chosen to elicit accurate responses. The scales utilised within the questionnaire were well-recognized and validated measurement tools for the assessed constructs. A full description of the items from the questionnaire related to this project is provided in Appendix A.

Confusion among respondents regarding the definition of some of the CHA approaches has been an area of particular concern in previous surveys of CHA use (Quandt et al., 2009). The prevalence and types of CHA approaches and the accepted names for different CHA approaches may vary

widely across geographic areas, cultural and linguistic groups, and other demographic characteristics (Hyland, Lewith and Westoby, 2003; Quandt *et al.*, 2009; Re, Schmidt and Güthlin, 2012; Bryden and Browne, 2016; Druart and Pinsault, 2018; Jędrzejewska *et al.*, 2023). For this reason, several attempts have been made to standardise the collection of CHA prevalence data, including recommendations for constructing questions that will elicit accurate and consistent responses (Hyland, Lewith and Westoby, 2003; Quandt *et al.*, 2009; Re, Schmidt and Güthlin, 2012; Bryden and Browne, 2016; Druart and Pinsault, 2018; Jędrzejewska *et al.*, 2023). The dataset employed in this analysis was derived from a questionnaire that followed these recommendations, with the notable exception that it presented respondents with a compound question regarding the prevalence of use and a rating of previous experiences. This may have led to an overestimation of the prevalence of PC-CHA use.

Survey methodology related to the definitions of CHA in extensive US-based surveys has varied over time (Bishop and Lewith, 2010; Clarke *et al.*, 2015; Bryden and Browne, 2016). The currently available definitions and categorisations of CHA from the NCCHA were used to collect this data, reflecting current and accepted definitions and practices within the US (CAIH, Accessed: 1 May 2024). Recall bias was minimised by asking about experiences only within the past year.

3.10 Consent

This project involved the analysis of pre-existing, anonymised data. There was no personally identifiable information, ensuring the individuals from whom data was collected could not be identified directly or through linked identifiers. Before collecting this data, the subjects provided their consent during their participation in the online survey. The data was pre-existing and did

not involve any new data collection from individuals, and the researcher had no contact with the subjects. Therefore, there was no requirement for additional consent.

3.11 Data Security

The data used in this analysis was previously collected anonymously online using Qualtrics software. The investigators had no direct communication or interactions with the subjects, and their identities remained anonymous. Only a study identification number within the dataset identified each subject's data. No personal information that could reveal their identity, such as computer IP addresses, names, or geo-location data, was included. The data was securely stored and accessed only by authorised personnel. All data handling procedures adhered to stringent data security protocols designed to prevent unauthorised access, alteration, disclosure, or destruction of data and ensured that the integrity and confidentiality of the data were maintained throughout the analysis process.

3.12 Study Variables

3.12.1 Variable Selection

The variables from the dataset relevant to this investigation were selected based on their potential influence on PC-CHA use, as indicated in previously published literature. The list of study variables, their descriptions, and data types are noted in Table 3.5.

Table 3.5. Variables for PC-CHA analysis.

Variables used for investigating the relationship between score on the Thought Impact Scale (TIS) and use of, favourability of experience with, and expectation of the positive benefits of psychological and psychological/physical complementary health approaches (PC-CHA), selected from the Psychological Characteristics and Health Behaviours Survey in the US (2024 data).

Variable	**Description**	**Type**
Dependent variables		
PC-CHA use	Use of at least one of the PC-CHA within the past year (yes, no)	Binary categorical
PC-CHA experience	Average of favourability of experience with PC-CHA use for those types used within the past year, graded on a 6-point Likert scale	Continuous
PC-CHA expectation	Average of expectation of helpfulness of PC-CHA use for those types not used in the past year, graded on a 6-point Likert scale	Continuous
Independent variable		
TIS score	Quartile of 17-question TIS scale score, with each item scored 0–4. Quartile boundaries were: Q1=0-22, Q2=23-30, Q3=31-38, and Q4=39-68.	Categorical
Covariate variables		
Basic demographics		
Sex	Male or female	Categorical
Age	Age range in years: 18–34, 35–49, 50–64, 65+	Categorical
Ethnicity	Asian or Pacific Islander; White/Caucasian; Black/African American; Hispanic; Alaskan Native, American Indian, and all additional categories; did not wish to respond	Categorical
Socioeconomic		
Education	Level of education: up to high school or GED, between high school and undergraduate college degree, or undergraduate college degree and above	Categorical
Employment	Not working for pay, working part-time for pay, working full-time for pay	Categorical
Income	Above or below poverty level	Binary Categorical
Insurance status	Uninsured, public, or private	Categorical

Relationship status	Single; committed relationship; married; divorced, separated, or widowed while not in a committed relationship	Categorical
Region of the US	U.S. census region – East, Midwest, South, West	Categorical
Community size	City; town; small town; village or countryside	Categorical
Psychological characteristics		
Neuroticism	Neuroticism scale from Big Five Inventory	Continuous
Openness	Openness scale from Big Five Inventory	Continuous
Internal locus of control	Health-related internal locus of control	Continuous
Spiritual Index of Well-Being	A well-being index	Continuous
Health status		
Health-related quality of life	Scale of overall mental and physical well-being	Continuous
Possible depression or anxiety	Likely neither; one or other likely; likely both	Categorical
Healthcare attitudes		
Satisfaction with conventional medicine	Overall satisfaction with conventional medicine rated as satisfied, neutral, or dissatisfied	Categorical
Perceived safety of unconventional medicine	Overall perceived safety of unconventional medicine rated as unsafe, neutral, or safe	Categorical

Abbreviations include GED – general educational development/high school equivalent, TIS – Thought Impact Scale, and PC-CHA – psychological and psychological/physical complementary and integrative health approaches. Q1, Q2, Q3, and Q4 represent the lowest through highest quartile.

3.12.2 Outcome Variables

The outcome variable, PC-CHA use, is a binary categorical variable indicating the use of at least one PC-CHA within the past year. Favourability of experience was rated by each subject on a 6-point Likert item ranging from 'completely unfavourable' to 'completely favourable' for each type of PC-CHA they had used within the past year. The expected helpfulness of each CHA health approach, if it were to be used to treat or manage a health condition in the future, was similarly rated on a 6-point Likert item for CHA methods that subjects had not used within the past year

(from ‘completely unhelpful’ to ‘completely helpful’). To account for each subject's rating of multiple CHA methods, mean values of the favourability and helpfulness ratings of the PC-CHA methods were derived for each subject for use as the outcome measures.

These mean scores provided a practical and feasible method of analysing subject opinions, wherein each subject rated multiple CHA methods. These ratings could be interpreted intuitively concerning the original scales and compared across TIS score quartiles. Analysing 6-point Likert items in this fashion is unlikely to impair the validity of the results (Norman, 2010; Willits, Theodori and Luloff, 2016). This method of analysis is likely to be robust and valid because subject opinions on PC-CHA are likely to represent a “continuous” underlying construct, the Likert item includes a sufficient number of choices, the sample size is relatively large, and parametric methods of analysis are likely to be robust even if assumptions of normality are violated (Norman, 2010; Willits, Theodori and Luloff, 2016).

3.12.3 Primary Independent or Exposure Variable

The primary independent or exposure variable of interest is the TIS. Previously cited studies have reported a normal distribution of TIS scores in US national surveys of sizes similar to the current dataset (Palsson, 2020; Palsson, Ballou and Walker, 2022). The previous similar analyses in those studies found differences in hypnosis use between the highest and lowest quartiles of TIS (Palsson, 2020; Palsson et al., 2022). A categorical form of TIS by quartile (see Table 3.5) was selected for analysis based on this previous work and the practicality of this categorical form. The difference between high and low scorers is intuitive, easy to interpret, and provides clear communication among clinicians and policymakers.

3.12.4 Covariates

The covariates selected for analysis were grouped into five categories for inclusion as blocks in the planned logistic and linear regression models. The magnitude, direction, and robustness of the effect of the TIS score on the outcome variables across the various modelling conditions were of primary concern, more so than the significance of the effect of individual covariates. The basic demographic characteristics were sex, age, and ethnicity. Sex was determined by the reported assigned sex at birth. Age was treated as categorical by the ranges specified by quotas in the original survey to match U.S. Census Bureau figures for the U.S. population (*U.S. Census Bureau QuickFacts,* Accessed: 1 May 2024*)*. A categorical approach was also deemed appropriate based on previous studies demonstrating potential non-linear relationships between age and CHA use (Bishop and Lewith, 2010; Clarke *et al.*, 2015; Berna *et al.*, 2019). The ethnic categories used were those available within the original dataset. The socioeconomic covariates were all categorical as per the original dataset, comprising education level, employment status, income (above or below the poverty level), insurance status, relationship status, region of the US, and community size. The categories for each covariate are specified in Table 3.4.

The available psychological characteristics selected as covariates were neuroticism, openness, internal locus of control, and Spiritual Index of Well-Being score. Neuroticism, openness, and internal locus of control were expected to be associated with more use of CHA and greater expectations of benefit (Owens et al., 1999). The Spiritual Index of Well-Being was selected as exploratory as it might correlate with happiness or depression. All are validated measures of these psychological constructs. Neuroticism and openness are two components of the Big Five Inventory determined by six 5-level Likert-style items (Soto and John, 2017). Six items relating to

"internality" from the Multidimensional Health Locus of Control Form A scale (MHLC-A) determine the internal locus of control. MHLC-A is a validated 18-item scale measuring health-related locus of control. It is divided into three six-question subscales that may be used independently. For brevity, the "internality" questions are utilised here in a six-level Likert format as suggested by the developers (*Wallstonk | projects | School of Nursing | Vanderbilt University*, Accessed: 1 May 2024). The Spiritual Index of Well-Being (SIWB) is a reliable, validated 12-question instrument appropriate for health-related quality-of-life studies. It provides one of the better available measures of a person's current "spiritual state" (Daaleman *et al.*, 2002; Daaleman and Frey, 2004; Monod *et al.*, 2011). These are all appropriately analysed as continuous variables (Sullivan and Artino, 2013).

Health status is characterised within the dataset as referring to each participant's overall health-related quality of life and the existence of likely depression or anxiety. Generic health-related quality of life was measured by the PROMIS Global-10 scale, a well-validated and widely used questionnaire. It measures and may provide mental and physical health summary scale scores and the overall measure (Hays *et al.*, 2009). The potential presence of anxiety and depression was indicated by the Patient Health Questionnaire (PHQ-4). PHQ-4 is a non-diagnostic four-question scale that assesses the subject's current prevalence of emotional distress symptoms (Kroenke *et al.*, 2009). It contains two questions on anxiety and two on depression. Responses reflect the subject's experience over the past two weeks on a 4-point frequency scale from "Not at all" to "Nearly every day". PHQ-4 is a screening tool that measures whether anxiety and depression are likely or not likely to be present.

Satisfaction with conventional medicine was assessed by a single question in which subjects rated their level of satisfaction with conventional medicine on a 5-point Likert item (very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied). The safety of unconventional medicine was assessed by a single question in which subjects rated their perception of the safety of unconventional medicine on a 5-point Likert item (very safe, somewhat safe, neither safe nor unsafe, somewhat unsafe, very unsafe).

3.13 Data Analysis

SPSS Statistics 29.0 was employed for the data analysis.

3.13.1 Descriptive Analysis

All study variables were analysed using descriptive statistics. Continuous variables were summarised using means, standard deviations, minimum and maximum values, and frequency distributions. Frequencies and percentages were calculated for all categorical variables (at the nominal/ratio level). The dependent variable of interest, the TIS score, was summarised as a continuous variable before being divided into quartiles for further analysis. Use of any PC-CHA (PC-CHA-U) was examined as a categorical variable. Favourable experience with PC-CHA (PC-CHA-F) and the level of expectation for PC-CHA (PC-CHA-E) were treated as continuous variables.

Distributions of all categorical variables across sex and TIS score quartiles were examined and reported descriptively without significance tests. Means and standard deviations of all continuous variables were similarly reported across sex and TIS score quartiles. No statistical tests of significance were employed for the stratified analyses of variables not included in the primary study hypotheses. Pearson Chi-square was calculated to infer the relationship between the explanatory variable, TIS score quartile, and the categorical dependent variable, PC-CHA-U.

Independent sample *t*-tests were used to infer the relationship between the TIS score quartile and the continuous dependent variables, PC-CHA-F and PC-CHA-H. A threshold of $p < .050$ was used to determine the statistical significance of the results. All covariates included in the multivariate analysis were based on theory and previously reported associations with CHA outcomes.

3.13.2 Multivariate Analysis

A binary logistic regression model was employed to model PC-CHA-U as a function of the TIS score quartile, while linear regression was used to model both PC-CHA-F and PC-CHA-H as a function of the TIS quartile. Each of the three models was run in an unadjusted form without any covariates and then in an adjusted form, controlling for the basic demographic characteristics of sex, age, and ethnicity. Four additional forms of each model were then tested, adding each of the four additional blocks of covariates one at a time to the model containing basic demographics: socioeconomic factors, psychological traits, health status, and attitudes towards healthcare. Finally, a complete form of each model included all the covariates. Comparison of the ORs for the adjusted models provides a sensitivity analysis of the TIS as a predictor of the outcomes under varying conditions. The odds ratios, 95% confidence intervals, and p-values for PC-CHA-U were calculated for each form of the logistic regression model using the lowest TIS score quartile as the reference category. Regression coefficients, 95% confidence intervals, and p-values were calculated for each form of the linear regression models, including PC-CHA-F and PC-CHA-H, using the lowest TIS score quartile as the reference category. Hypothesis 1 was tested by comparing the odds of PC-CHA-U in the highest versus the lowest TIS score quartile in the complete model, controlling for all covariates. Hypotheses 2 and 3 were tested by comparing the regression

coefficients for the full models' highest and lowest TIS score quartiles, controlling for all other covariates.

Necessary test assumptions were examined regarding the following:

- Normality – confirming that skewness and kurtosis did not exceed three times the standard error for each value.
- Multicollinearity – checking that variance inflation factors were less than 2.5, as inflated standard errors and unstable estimates can occur when predictor variables are highly correlated.
- Linearity – using the Box-Tidwell procedure for continuous explanatory variables with the categorical dependent variables. The assumption of a linear relationship between variables was confirmed when the test produced a logit interaction term with a p-value greater than 0.05.

There were no outlier scores for the categorical variables. Continuous variables were not adjusted for outliers, given that they were all scale variables, with all values representing legitimate scores within the limits of the scale range. Observations in this dataset did not originate from repeated measurements or matched data and were assumed to be independent of each other. Independence is necessary for the statistical methods employed to be valid and reliable. The only missing data was for the 127 subjects not reporting income. This represented less than 1% of the total sample of 3,013, and these subjects were excluded from the models that used income as a covariate. The psychometric properties of the composite scales used in the questionnaire were also assessed to confirm reliability within this sample. A criterion of Cronbach’s alpha greater than 0.65 was considered to determine whether each scale exhibits an

acceptable internal consistency and reliability level (Tavakol and Dennick, 2011; “Using and Interpreting Cronbach’s Alpha | UVA Library,” Accessed: 17 July 2024).

3.13.3 Sensitivity Analysis

The multivariate models, which incorporated all covariates, were used to test the three study hypotheses. The results were then compared to other models that included different sets of covariates, serving as sensitivity analyses for the primary findings.

4. Results

4.1 Descriptive Analysis

4.1.1 Total Sample Stratified by Gender

Table 4.1 presents a descriptive analysis of the study sample (N=3,013), stratified by sex, confirming that the sample was quota-matched to be representative of the U.S. population.

The primary independent variable, TIS score, was categorised into quartiles: lowest = 0 to 22, second lowest = 23 to 30, second highest = 31 to 38, and highest = 39 to 68. Distribution across quartiles varied by sex, with females constituting fewer subjects in the lower quartiles and more subjects in the higher quartiles. PC-CHA-U was higher among females (N=1,426, 94%) than males (N=1,357, 90.7%) and was 92.4% (N=2,783) overall. The mean favourability of experience with PC-CHA was 4.6 (SD 1.0) among females, 4.4 (SD 1.0) among males, and 4.5 (SD 1.0) overall. The expected benefit of PC-CHA was 2.9 (SD 1.3) for females, 2.7 (SD 1.3) for males, and 2.8 (1.3) overall. Favourability of experience and expectation of benefit were rated on 6-point scales, with 1 to 3 being negative and 4 to 6 being positive. Subjects had net positive experiences with PC-CHA that they used in the past and net negative expectations of PC-CHA that they had not used in the past year.

Table 4.1 includes the frequencies for the categorical variables and the means and standard deviations for the continuous variables. Distributions across sexes were balanced for most variables, although some variation was observed. As noted previously, no tests of statistical significance were performed for the covariate variables.

Table 4.1. Characteristics of the total sample stratified by sex of 3013 adults from the Psychological Characteristics and Health Behaviours Survey in the US, 2024.

	Female	Male	Total
Basic demographic characteristics			
Sex at birth, N (%)	1517 (50.3)	1496 (49.7)	3013 (100)
Age (years), N (%)			
18 to 34	438 (28.9)	455 (30.4)	893 (29.6)
35 to 49	400 (26.4)	339 (22.7)	739 (24.5)
50 to 64	398 (26.2)	361 (24.1)	759 (25.2)
65 and above	281 (18.5)	341 (22.8)	622 (20.6)
Ethnicity, N (%)			
Asian or Pacific Islander	43 (2.8)	95 (6.4)	138 (4.6)
White/Caucasian	841 (55.4)	1023 (68.4)	1864 (61.9)
Black/African American	161 (10.6)	161 (10.8)	322 (10.7)
Hispanic	400 (26.4)	143 (9.6)	543 (18.0)
American Indian, Alaskan Native, and all additional categories	62 (4.1)	61 (4.1)	123 (4.1)
Declined to answer	10 (0.7)	13 (0.9)	23 (0.8)
Socioeconomic characteristics			
Educational level (respondents over 25), N (%)			
Did not finish high school, high school graduate, or GED	511 (33.7)	539 (36.0)	1050 (34.8)
Some college, technical school, or Associate degree	660 (43.5)	597 (39.9)	1257 (41.7)
Undergraduate college degree or higher	346 (22.8)	360 (24.1)	706 (23.4)
Employment, N (%)			
Not working for pay	820 (54.1)	729 (48.7)	1549 (51.4)
Working part-time for pay	264 (17.4)	195 (13.0)	459 (15.2)
Working full-time for pay	433 (28.5)	572 (38.2)	1005 (33.4)
Economic status, N (%)			
Below poverty line	461 (31.7)	317 (22.1)	778 (27.0)
Above poverty line	993 (68.3)	1115 (77.9)	2108 (73.0)
Insurance status, N (%)			
Uninsured	168 (11.1)	158 (10.6)	326 (10.8)
Public	767 (50.6)	671 (44.9)	1438 (47.7)
Private	582 (38.4)	667 (44.6)	1249 (41.5)
Relationship status, N (%)			
Single	420 (27.7)	553 (37.0)	973 (32.3)
In a committed relationship	313 (20.6)	236 (15.8)	549 (18.2)
Married	472 (31.1)	520 (34.8)	992 (32.9)
Divorce, separated or widowed and not in a committed relationship	312 (20.6)	187 (12.5)	499 (16.6)
Region of U.S., N (%)			
East	251 (16.5)	160 (17.4)	511 (17.0)
Midwest	254 (16.7)	377 (25.2)	631 (20.9)
South	660 (43.5)	493 (33.0)	1153 (38.3)
West	352 (23.2)	366 (24.5)	718 (23.8)
Residence (number of people), N (%)			

City (>50,000)	770 (50.8)	735 (49.1)	1505 (50.0)
Town (2,500 to 50,000)	480 (31.6)	469 (31.4)	949 (12.6)
Small town or Village (< 2,500), and Countryside, not part of a city, town, or village	267 (17.6)	292 (19.5)	559 (18.6)
Psychological characteristics			
Neuroticism, mean (SD)	18.3 (5.9)	15.4 (5.5)	16.9 (5.9)
Openness, mean (SD)	21.2 (4.3)	21.2 (4.4)	21.2 (4.4)
Internal locus of control, mean (SD)	24.2 (5.7)	25.1 (5.6)	24.7 (5.7)
Spiritual Index of well-being, mean (SD)	41.8 (10.8)	43.0 (10.8)	42.4 (10.8)
Health status			
Health related quality of life, mean (SD)	28.9 (7.2)	30.9 (7.3)	29.9 (7.3)
Possible depression or anxiety, N (%)			
Neither likely	820 (54.1)	956 (63.9)	1776 (58.9)
One or the other likely	297 (19.6)	249 (16.6)	546 (18.1)
Both likely	400 (26.4)	291 (19.5)	691 (22.9)
Health care attitudes			
Satisfaction with conventional medicine, N (%)			
Satisfied	901 (59.4)	1044 (69.8)	1945 (64.6)
Neutral	410 (27.0)	312 (20.9)	722 (24.0)
Dissatisfied	206 (13.6)	140 (9.4)	346 (11.5)
Perceived safety of unconventional medicine, N (%)			
Unsafe	134 (8.8)	146 (9.8)	280 (9.3)
Neutral	606 (39.9)	512 (34.2)	1118 (37.1)
Safe	777 (51.2)	838 (56.0)	1615 (53.6)
Primary independent variable			
Quartile of TIS, N (%)			
Lowest	338 (22.3)	403 (26.9)	741 (24.6)
Second lowest	385 (25.4)	365 (24.4)	750 (24.9)
Second highest	363 (23.9)	377 (25.2)	740 (24.6)
Highest	431 (28.4)	351 (23.5)	782 (26.0)
Study outcome variables			
PC-CHA Use, N (%)	1426 (94.0)	1357 (90.7)	2783 (92.4)
PC-CHA Favourability of experience, mean (SD)	4.6 (1.0)	4.4 (1.0)	4.5 (1.0)
PC-CHA Expectation of benefit, mean (SD)	2.9 (1.3)	2.7 (1.3)	2.8 (1.3)

N=3013 for all variables except economic status, where some subjects chose not to report, N=2886.
Percentages reported are for females, males, and the total sample.
Abbreviations include GED – general educational development/high school equivalent, TIS – Thought Impact Scale, PC-CHA – psychological and psychological/physical complementary and integrative health approaches), and SD – standard deviation).

4.1.2 Total Sample Stratified by Quartile of Thought Impact Scale (TIS)

Table 4.2 presents the sample characteristics stratified by quartile of TIS. The distribution of TIS varies slightly by quartile because of the varying frequency of scores at and around the quartile cut points. The covariates' variation across the TIS quartile may be observed in the table. Several covariates appear to vary by quartile of TIS score, but this must be interpreted with the caveat that no tests of statistical significance were performed as these relationships were not subject to an a priori hypothesis. Pearson Chi-square and ANOVA results are presented for the study outcome variables in relation to the quartile of the TIS score, as those relationships are the subjects of the study hypotheses.

The study outcome variable of PC-CHA use is distributed across quartiles of TIS in a statistically significant fashion (Pearson Chi-square, $p<.001$). There is a decreased representation of non-users in the top quartile (N=27, 11.7%) compared to the lowest quartile (N=110, 47.8%) and an increased representation of users in the top quartile (N=755, 27.1%) compared to the lowest quartile (N=631, 22.7%). The favourability of experience with PC-CHA does not vary across quartiles statistically significantly (ANOVA, $p>.050$). The expectation of helpfulness of PC-CHA increases monotonically from the lowest to the highest quartile of TIS in a statistically significant fashion (ANOVA, $p<.001$) from a mean (SD) of 2.46 (1.28) in the lowest quartile to 3.14 (1.32) in the highest quartile. The stratified analysis of the study outcome variables shows that subjects scoring in the highest quartile of TIS are more likely to have used PC-CHA in the past year. They also have a greater expectation of benefit from PC-CHA that they have not used in the past year compared to subjects in the lowest quartile of TIS. The reported favourability of experience with PC-CHA used in the past year is similar by quartile of TIS.

Table 4.2. Characteristics of the total sample stratified by quartile of the Thought Impact Scale (TIS) score of 3013 adults from the Psychological Characteristics and Health Behaviours Survey in the US, 2024.

N (%)	**TIS Quartile**				**Total**
	1 - lowest	2	3	4 - highest	
Total sample, N (%)	741 (24.6)	750 (24.9)	740 (24.6)	782 (26.0)	3013 (100)
Basic demographic characteristics					
Sex at birth, N (%)					
Female	338 (22.3)	385 (25.4)	363 (23.9)	431 (28.4)	1517 (50.3)
Male	403 (26.9)	365 (24.4)	377 (25.2)	351 (23.5)	1496 (49.7)
Age (years), N (%)					
18 to 34	102 (11.4)	177 (19.8)	262 (29.3)	352 (39.4)	893 (29.6)
35 to 49	139 (18.8)	180 (24.4)	179 (24.2)	241 (32.6)	739 (24.5)
50 to 64	244 (32.1)	220 (29.0)	165 (21.7)	130 (17.1)	759 (25.2)
65 and above	256 (41.2)	173 (27.8)	134 (21.5)	59 (9.5)	622 (20.6)
Ethnicity, N (%)					
Asian or Pacific Islander	30 (21.7)	32 (23.2)	39 (28.3)	37 (26.8)	138 (4.6)
White/Caucasian	468 (25.1)	474 (25.4)	453 (24.3)	469 (25.2)	1864 (61.9)
Black/African American	83 (25.8)	87 (27.0)	72 (22.4)	80 (24.8)	322 (10.7)
Hispanic	125 (23.0)	126 (23.2)	137 (25.2)	155 (28.5)	543 (18.0)
American Indian, Alaskan Native, and all additional categories	23 (18.7)	26 (21.1)	37 (30.1)	37 (30.1)	123 (4.1)
Declined to answer	12 (52.2)	5 (21.7)	2 (8.7)	4 (17.4)	23 (0.8)
Socioeconomic characteristics					
Educational level, N (%)					
Did not finish high school, high school graduate, or GED	278 (26.5)	258 (24.6)	258 (24.6)	256 (24.4)	1050 (34.8)
Some college, technical school, or Associate degree	289 (23.0)	319 (25.4)	312 (24.8)	337 (24.8)	1257 (41.7)
Undergraduate college degree or more	174 (24.6)	173 (24.5)	170 (24.1)	189 (26.8)	706 (23.4)
Employment status, N (%)					
Not working for pay	475 (30.7)	401 (25.9)	365 (23.6)	308 (19.9)	1549 (51.4)
Working part-time for pay	89 (19.4)	98 (21.4)	124 (27.0)	148 (32.2)	459 (15.2)
Working full-time for pay	177 (17.6)	251 (25.0)	251 (25.0)	326 (32.4)	1005 (33.4)
Economic status, N (%)					
Below poverty line	174 (22.4)	199 (25.6)	206 (26.5)	199 (25.6)	778 (27.0)
Above poverty line	526 (25.0)	527 (25.0)	498 (23.6)	557 (26.4)	2108 (73.0)
Insurance status, N (%)					
Uninsured	84 (25.8)	70 (21.5)	72 (22.1)	100 (30.7)	326 (10.8)
Public	362 (25.2)	371 (25.8)	362 (25.2)	343 (23.9)	1438 (47.7)
Private	295 (23.6)	309 (24.7)	306 (24.5)	339 (27.1)	1249 (41.5)
Relationship status, N (%)					
Single	214 (22.0)	232 (23.8)	247 (25.4)	280 (28.8)	973 (32.3)
In a committed relationship	83 (15.1)	112 (20.4)	164 (29.9)	190 (34.6)	549 (18.2)
Married	294 (29.6)	252 (25.4)	226 (22.8)	220 (22.2)	992 (32.9)

Divorced, separated or widowed and not in a committed relationship	150 (30.1)	154 (30.9)	103 (20.6)	92 (18.4)	499 (16.6)
Region of US, N (%)					
East	128 (25.0)	114 (22.3)	135 (26.4)	134 (26.2)	511 (17.0)
Midwest	160 (25.4)	140 (22.2)	155 (24.6)	176 (27.9)	631 (20.9)
South	296 (25.7)	314 (27.2)	263 (22.8)	280 (24.3)	1153 (38.3)
West	157 (21.9)	182 (25.3)	187 (26.0)	192 (26.7)	718 (23.8)
Residence (number of people), N (%)					
City (>50,000)	366 (24.3)	358 (23.8)	363 (24.1)	418 (27.8)	1505 (50.0)
Town (2,500 to 50,000)	217 (22.9)	222 (23.4)	259 (27.3)	251 (26.4)	949 (12.6)
Small town or village (< 2,500), and countryside	158 (28.3)	170 (30.4)	118 (21.1)	113 (20.2)	559 (18.6)
Psychological characteristics					
Neuroticism, mean (SD)	14.2 (5.6)	16.7 (5.7)	17.9 (5.3)	18.6 (5.9)	16.9 (5.9)
Openness, mean (SD)	19.8 (4.3)	20.6 (4.1)	21.4 (4.1)	22.9 (4.3)	21.2 (4.4)
Internal locus of control, mean (SD)	23.7 (5.9)	24.3 (5.3)	24.6 (5.3)	25.9 (5.9)	24.7 (5.7)
Spiritual Index of well-being, mean (SD)	45.8 (10.2)	42.8 (9.8)	41.4 (10.1)	39.6 (11.8)	42.4 (10.8)
Health status					
Health related quality of life, mean (%)	31.8 (7.2)	30.0 (6.9)	30.0 (7.0)	28.7 (7.6)	29.9 (7.3)
Possible depression or anxiety, N (%)					
Neither likely	591 (33.3)	494 (27.8)	388 (21.8)	303 (17.1)	1776 (58.9)
One or the other likely	79 (14.5)	135 (24.7)	158 (28.9)	174 (31.9)	546 (18.1)
Both likely	71 (10.3)	121 (17.5)	194 (28.1)	305 (44.1)	691 (22.9)
Health care attitudes					
Satisfaction with conventional medicine, N (%)					
Satisfied	499 (25.7)	501 (25.8)	479 (24.6)	466 (24.0)	1945 (64.6)
Neutral	180 (24.9)	166 (23.0)	180 (24.9)	196 (27.1)	722 (24.0)
Dissatisfied	62 (17.9)	83 (24.0)	81 (23.4)	120 (34.7)	346 (11.5)
Perceived safety of CHA, N (%)					
Unsafe	73 (26.1)	57 (20.4)	62 (22.1)	88 (31.4)	280 (9.3)
Neutral	318 (28.4)	285 (25.5)	281 (25.1)	234 (20.9)	1118 (37.1)
Safe	350 (21.7)	408 (25.3)	397 (24.6)	460 (28.5)	1615 (53.6)
Study outcome variables					
PC-CHA Use, N (%)*					
No	110 (47.8)	54 (23.5)	39 (17.0)	27 (11.7)	741 (24.6)
Yes	631 (22.7)	696 (25.0)	701 (25.2)	755 (27.1)	750 (24.9)
PC-CHA Favourability of experience, mean (SD) [NS]	4.57 (.98)	4.47 (.97)	4.48 (1.00)	4.68 (.94)	4.5 (1.0)
PC-CHA Expectation of benefit, mean (SD)**	2.46 (1.28)	2.67 (1.20)	2.90 (1.31)	3.14 (1.32)	2.8 (1.3)

N=3013 for all variables except economic status, where some subjects chose not to report, N=2886.
Percentages reported are for the quartile of TIS and the total sample for each demographic characteristic.

Abbreviations include GED – general educational development/high school equivalent, TIS – Thought Impact Scale, PC-CHA – psychological and psychological/physical complementary and integrative health approaches, and SD – standard deviation.
**Pearson Chi-Square significance p<.001*
***ANOVA significance p<.001*
NS – ANOVA not significant p>.050
Significance was reported only for outcome variables in relation to the TIS quartile, the primary study dependent variable.

4.2 Reliability of Scales Used in the Analysis

Table 4.3 reports the Cronbach's alphas for the scales used in this analysis. All levels are in a commonly accepted range of .65 to .95 (Tavakol and Dennick, 2011; "Using and Interpreting Cronbach's Alpha | UVA Library," Accessed: 17 July 2024). This indicates good internal consistency of the scales in the study population and supports their validity for this analysis.

Table 4.3. Reliability of the psychological scale variables among 3013 adults from the Psychological Characteristics and Health Behaviours Survey in the US, 2024.

Scale	Number of items	Cronbach's alpha
Likely depression and anxiety	4	.89
Neuroticism	6	.84
Openness	6	.67
Internal locus of control	6	.78
Spiritual Index of Well-being	12	.92
Health-related quality of life	9	.88
Thought impact scale	17	.91

All scales are specified in Appendix A.

4.3 TIS and Use of PC-CHA

Table 4.4 reports the results of the logistic regression models with odds ratios (OR) and 95% confidence limits for using PC-CHA in each quartile of TIS compared to the lowest quartile. Respondents in the highest quartile of TIS had 4.88 (3.16, 7.52) times the odds of using PC-CHA compared to respondents in the lowest quartile of TIS in the unadjusted model. A consistent elevation in the odds across the second lowest and second highest quartiles compared to the

lowest quartile was also observed, with corresponding ORs of 2.25 (1.59, 3.17) and 3.13 (2.14, 4.59), respectively. The same statistically significant pattern of increasing ORs with an ascending quartile of TIS was observed for all models tested, including the complete model. None of the 95% CIs crossed 1.0. The OR for the highest quartile of the complete model was 3.98 (3.32, 6.81).

Table 4.4. Odds Ratios for PC-CHA use by TIS quartiles.

Unadjusted and multivariate-adjusted odds ratios (OR) and 95% confidence intervals (95% CI) for the use of psychological and psychological/physical complementary and integrative health approaches (PC-CHA) comparing each quartile of the Thought Impact Scale (TIS) score with the lowest quartile in 3013 adults from the Psychological Characteristics and Health Behaviours Survey in the US, 2024.

OR (95% CI) ***p***	**OR (95% CI) and p-value for use of PC-CHA**			
Exposure, quartile of TIS score	**Lowest quartile (reference)**	**Second lowest quartile**	**Second highest quartile**	**Highest quartile**
Unadjusted [a] (N=3013)	1.00	2.25 (1.59,3.17) <.001	3.13 (2.14,4.59) <.001	4.88 (3.16,7.52) <.001
Adjusted for basic demographics [b] (N=3013)	1.00	2.19 (1.55,3.10) <.001	3.10 (2.10,4.55) <.001	4.59 (2.93,7.17) <.001
Adjusted for basic demographics and socioeconomic factors [c] (N=2886)	1.00	2.11 (1.48,3.02) <.001	3.17 (2.10,4.78) <.001	5.17 (3.16,8.47) <.001
Adjusted for basic demographics and psychological characteristics [d] (N=3013)	1.00	2.12 (1.48,3.02) <.001	2.81 (1.87,4.21) <.001	3.84 (2.38,6.20) <.001
Adjusted for basic demographics and health status [e] (N=3013)	1.00	2.16 (1.55,3.07) <.001	2.97 (2.00,4.40) <.001	4.28 (2.70,6.79) <.001
Adjusted for basic demographics and health care attitudes [f] (N=3013)	1.00	2.10 (1.48,2.98) <.001	2.98 (2.02,4.40) <.001	4.13 (2.63,6.47) <.001
Adjusted for all factors [g] (N=2886)	1.00	2.04 (1.40,2.96) <.001	2.74 (1.77,4.23) <.001	3.98 (2.32,6.81) <.001

Abbreviations: CI, confidence interval; OR, odds ratio; PC-CHA – psychological and psychological/physical complementary and integrative health approaches; TIS: thought impact scale.
p values are estimated using the Wald test under the null hypothesis that each odds ratio equals 1.
[a] The unadjusted model includes only the quartile of TIS and the use of PC-CHA
[b] Basic demographic variables include sex, age, and race
[c] Socioeconomic variables include education, employment, economic status, insurance status, relationship status, geographic region, and type of community.
Psychological characteristics include neuroticism, openness, locus of control, and spiritual index of well-being

Health status includes health-related quality of life and likelihood of depression or anxiety
[f] Health care attitudes include satisfaction with conventional medicine and perceived safety of unconventional medicine
[g] Includes all variables in categories b to f.

4.3 TIS and Favourability of Experience with PC-CHA

Table 4.5 reports the findings of the linear regression models examining the relationship between the quartile of TIS and the favourability of experience with PC-CHA. The regression coefficients reported (also with 95% confidence limits and p values) represent the difference in score on the 6-point Likert item used to assess favourability for each quartile compared to the lowest quartile. The coefficients for the highest quartiles are not statistically significant (95% CIs that touch or cross zero) for the unadjusted model, the model adjusting for basic demographics, the model including psychological characteristics, and the complete model. They are significant for the models, including basic demographics with socioeconomic factors or health status. The coefficients for the middle two quartiles are statistically insignificant for all models.

Table 4.5. Regression coefficients for PC-CHA favourability by TIS quartiles.

Unadjusted and multivariate-adjusted estimates and 95% confidence intervals for the regression coefficients predicting favourability of experience with past use of psychological and psychological/physical complementary and integrative health approaches (PC-CHA) according to the quartile of the Thought Impact Scale (TIS) score, with the lowest quartile as the reference category, in 3013 adults from the Psychological Characteristics and Health Behaviours Survey in the US, 2024.

Beta (95% CI) ***p***	**Linear Regression coefficient (95% CI) and p-value by Quartile of TIS**			
Exposure, quartile of TIS score	**Lowest quartile (reference)**	**Second lowest quartile**	**Second highest quartile**	**Highest quartile**
Unadjusted [a] (N=3013)	1.0	-.10 (-.21,.00) .060	-.09 (-.20,.01) .089	.11 (.00,.21) .044
Adjusted for basic demographics [b] (N=3013)	1.0	-.11 (-.22,-.01) .038	-.08 (-.19,.02) .117	.11 (.00,.21) .046
Adjusted for basic demographics and socioeconomic factors [c] (N=2886)	1.0	-.09 (-.20,.01) .086	-.06 (-.17,.05) .293	.15 (.04,.26) .007
Adjusted for basic demographics and psychological characteristics [d] (N=3013)	1.0	-.09 (-.19,.01) .074	-.07 (-.17,.03) .172	.05 (-.05,.16) .344

Adjusted for basic demographics and health status [e] (N=3013)	1.0	-.05 (-.16,.05) .298	.03 (-.08,.13) .629	.25 (.14,.35) <.001
Adjusted for basic demographics and health care attitudes [f] (N=3013)	1.0	-.13 (-.23,-.02) .016	-.10 (-.20,.01) .071	.08 (-.02,.19) .124
Adjusted for all factors [g] (N=2886)	1.0	-.07 (-.17,.03) .160	-.04 (-.14,.07) .460	.10 (-.01,.21) .066

Models in bold type show a significant difference between the highest and lowest quartiles.
Abbreviations: CI, confidence interval; PC-CHA – psychological and psychological/physical complementary and integrative health approaches; TIS, thought impact scale.
Favourability of experience with PC-CHA is rated on a 6-point scale: completely unfavourable, moderately unfavourable, slightly unfavourable, slightly favourable, moderately favourable, completely favourable.
p values are estimated using the Wald test under the null hypothesis that each coefficient equals 1.
[a] *The unadjusted model includes only the quartile of TIS and the use of PC-CHA*
[b] *Basic demographic variables include sex, age, and race*
[c] *Socioeconomic variables include education, employment, economic status, insurance status, relationship status, geographic region, and type of community.*
Psychological characteristics include neuroticism, openness, locus of control, and spiritual index of well-being
Health status includes health-related quality of life and likelihood of depression or anxiety
[f] *Health care attitudes include satisfaction with conventional medicine and perceived safety of unconventional medicine*
[g] *Includes all variables in categories b to f.*

4.4 TIS and Expectation of Benefit from PC-CHA

Table 4.6 reports the findings of the linear regression models examining the relationship between the TIS quartile and PC-CHA's expected helpfulness. The regression coefficients reported (also with confidence limits and p values) represent the difference in score on the 6-point Likert item used to assess the expectation of helpfulness for each quartile compared to the lowest quartile. The coefficients increase monotonically, moving from the first to the fourth quartile for all models. With just two exceptions (see Table. 4.6), the confidence intervals for the coefficients do not cross zero. The coefficient for the highest quartile of the complete model is .46 (.31,.62). The 95% CIs for the fourth quartile of all other models also do not cross zero.

Table 4.6. Regression coefficients for expected benefits of PC-CHA by TIS quartiles.

Unadjusted and multivariate-adjusted estimates and 95% confidence intervals for the regression coefficients predicting the expectation of benefit from the use of psychological and psychological/physical complementary and integrative health approaches (PC-CHA) according to the quartile of the Thought Impact Scale (TIS) score, with the lowest quartile as the reference category, in 3013 adults from the Psychological Characteristics and Health Behaviours Survey in the US, 2024.

Beta (95% CI) **p**	**Linear Regression coefficient (95% CI) and p-value by Quartile of TIS**			
Exposure, quartile of TIS score	**Lowest quartile (reference)**	**Second lowest quartile**	**Second highest quartile**	**Highest quartile**
Unadjusted [a] N=3013	1.0	.21 (.08,.35) .002	.45 (.31,.59) <.001	.68 (.54,.81) <.001
Adjusted for basic demographics [b] N=3013	1.0	.19 (.06,.33) .006	.42 (.29,.56) <.001	.62 (.49,.76) <.001
Adjusted for basic demographics and socioeconomic factors [c] N=3013	1.0	.17 (.03,.31) .018	.41 (.26,.55) <.001	.58 (.44,.73) <.001
Adjusted for basic demographics and psychological characteristics [d] N=3013	1.0	.17 (.04,.31) .014	.39 (.25,.53) <.001	.52 (.37,.67) <.001
Adjusted for basic demographics and health status [e] N=3013	1.0	.23 (.09,.37) <.001	.50 (.37,.64) <.001	.74 (.60,.89) <.001
Adjusted for basic demographics and health care attitudes [f] N=3013	1.0	.14 (.00,.27) .046	.38 (.24,.51) <.001	.56 (.42,.70) <.001
Adjusted for all factors [g] N=3013	1.0	.11 (-.03,.25) .125	.34 (.20,.49) <.001	.46 (.31,.62) <.001

Abbreviations: CI, confidence interval; PC-CHA – psychological and psychological/physical complementary and integrative health approaches; TIS, thought impact scale.
Expectation of benefit from PC-CHA is rated on a 6-point scale: completely unhelpful, moderately unhelpful, slightly unhelpful, slightly helpful, moderately helpful, completely helpful.
p values are estimated using the Wald test under the null hypothesis that each coefficient equals 1.
[a] The unadjusted model includes only the quartile of TIS and the use of PC-CHA
[b] Basic demographic variables include sex, age, and race
[c] Socioeconomic variables include education, employment, economic status, insurance status, relationship status, geographic region, and type of community.
[d] Psychological characteristics include neuroticism, openness, locus of control, and spiritual index of well-being
[e] Health status includes health-related quality of life and likelihood of depression or anxiety
[f] Health care attitudes include satisfaction with conventional medicine and perceived safety of unconventional medicine
[g] Includes all variables in categories b to f.

5. Discussion

5.1 Primary Findings

This study examined the association between TIS score and the prevalence of PC-CHA use by analysing a pre-existing dataset. It also explored the relationship between TIS score, the favourability of experience with PC-CHA, and the expectation of benefit from PC-CHA. The dataset broadly represented the U.S. population in terms of demographic variables, and the relevant covariates were present for analysis. This analysis focused on testing three pre-specified study hypotheses, each of which included a comparison of the relevant outcome variable in the highest versus lowest quartiles of the TIS score, first with bivariate analysis and finally within regression models adjusted for all covariates. Sensitivity analysis of the findings consisted of comparing the results for the complete model with the results of the other models fitted. The effect of including varying blocks of covariates within the multivariate models provided a test of how constant the relationships were over varying conditions. The results were that higher TIS was associated with greater use of PC-CHA and higher expectations of benefit from PC-CHA (supporting hypotheses 1 and 3). Contradictory to hypothesis 2, the TIS score was not associated with the favourability of experience with PC-CHA.

5.2 TIS and PC-CHA Use

The pre-determined analysis for this relationship was to compare PC-CHA use in the highest quartile of TIS to the lowest quartile, adjusting for all available covariates. The OR for this condition was 3.98 (2.32, 6.81), supporting the hypothesis of increased use in the highest TIS quartile. The other models all support this overall finding, with consistently significant results across quartiles and different conditions using varying blocks of the covariates within the models.

Subjects scoring in the highest quartile of TIS were significantly more likely to have used some form of PC-CHA within the past year than subjects in the lowest quartile. The relationship between the quartile of TIS and the use of PC-CHA showed a trend of increasing prevalence of PC-CHA use from the lowest to the highest quartile of TIS. This overall pattern supports a positive relationship between the ascending TIS quartile and PC-CHA use, such that users in the top quartile have roughly four times the odds of using TIS in the past year compared to users in the lowest quartile. Users in the second-lowest quartile had approximately two times the odds, and users in the second-highest quartile had just under three times the odds.

The only two previous studies of the relationship between TIS and use of CHA demonstrated a prevalence of use of hypnosis of 7.9% compared to 2.5% (N=1500, p<.001) and 9.9% compared to 4.0% (N=1000, P<.0010) between the highest and lowest quartiles of TIS (Palsson, 2020; Palsson, Ballou and Walker, 2022). These correspond to unadjusted ORs of 3.34 and 2.64, respectively. The ORs of the two previous studies for hypnosis use are similar to the OR = 3.98 (2.32, 6.81) estimated by the model adjusted for all factors in this analysis. Building on the previous studies of hypnosis, this study has now shown that TIS predicts the aggregate use of the forms of psychological and mind/body therapies included within PC-CHA (spiritual healing, prayer, mindfulness, shamanic journeys, art/music/dance, deep breathing, meditation, progressive relaxation, biofeedback, guided imagery, acupuncture, yoga, tai chi, qi gong, and other movement therapies). The analysis did not examine the individual CHA methods or conventionally-based psychological treatments such as psychotherapy.

Palsson validated the TIS as a measure of subconscious connectedness (SC) and proposed that the trait of SC is related to other psychological tendencies, including hypnotisability or

suggestibility, absorption, creativity, and emotional empathy (Palsson, 2020). The possibility that patients exhibiting a higher level of these traits seek out and respond more strongly to PC-CHA methods underlies this study's hypotheses. Indeed, individuals with higher levels of SC appear to seek treatments congruent with this characteristic. Future studies could investigate the interactions of these various similar psychological traits to refine the understanding of the TIS and PC-CHA association.

This evidence of a positive association between TIS and PC-CHA use contributes to the growing body of knowledge about psychological constructs that affect patient healthcare preferences. This includes effects on patients' choice of treatment (Russo *et al.*, 2019) and preferences for the type of relationship with doctors (Braman and Gomez, 2004). Future studies could investigate the interactions of these various psychological traits to refine the understanding of the TIS and PC-CHA association. Better knowledge of these personality characteristics and their effect on health care may allow for more individualised and patient-centred care (Flynn and Smith, 2007).

5.3 TIS and Favourability of Experience with PC-CHA

The predetermined test of this association was to compare the favourability of experience with PC-CHA in the highest versus lowest quartile of the TIS score, adjusting for all covariates. The resulting beta coefficient for this condition was not significant (.10, 95% CI -.01 to .21). Therefore, the hypothesis that subjects in the highest quartile of TIS will have had a more favourable experience with PC-CHA is not supported. The fourth quartile coefficients were significant for the unadjusted model, the model with only basic demographics, the model with basic demographics plus socioeconomic factors, and the model with basic demographics plus health status. The models with basic demographics plus psychological characteristics and basic demographics plus

healthcare attitudes produced non-significant fourth-quartile coefficients. Overall, the rating of experience with PC-CHA within the past year did not show a significant relationship with the quartile of the TIS score, and there was no dose-response-like trend across the TIS quartiles. This suggests that future investigations of the effect of patient characteristics on response to treatments should include assessments of personality characteristics as predictor variables to control for potential confounding by these characteristics. It may also be helpful to consider more detailed evaluation of the patient experience.

No previous studies have examined the relationship between TIS and favourability of experience with PC-CHA methods other than hypnosis. The initial survey of Palsson reported that subjects in the highest versus lowest quartile of TIS were more likely to report benefit from hypnosis. However, the subsequent results did not confirm this relationship (Palsson, 2020; Palsson, Ballou and Walker, 2022). In the current study, subjects in all quartiles of TIS reported favourable experiences with PC-CHA, with an overall mean of 4.5 out of 6. However, there was no significant difference between the quartiles. The magnitude of the effect, a movement of .1 on a 6-point scale, represents a minimal difference between quartiles that is not likely meaningful for clinicians or policymakers even if it had attained statistical significance. That is, higher levels of SC lead people to seek mind/body or psychologically-based treatments more often, but they do not seem to enhance their experience with those treatments. This association was examined only for the aggregate use of PC-CHA for all possible medical conditions. It was not analysed for the individual PC-CHA methods or their use for specific health problems. A single question assessed experience and may not have fully captured all aspects of patient engagement with their treatment.

5.4 TIS and Expectation of Benefit from PC-CHA

The predetermined test of this association was to compare the expected helpfulness of PC-CHA in the highest versus lowest quartile of the TIS score, adjusting for all covariates. Subjects scoring in the highest quartile of TIS rated their expectations of benefit from future use of PC-CHA significantly higher than subjects in the lowest quartile ($p<.001$). Users in the top quartile rated the expectation of benefit roughly half a point (.46, 95% CI .31 to .62) higher on a 6-point scale than users in the lowest quartile based on the complete model. Expectations of PC-CHA use increased from the lowest to the highest quartile, and the test comparing the highest and lowest quartile was significant ($p<.001$) for all models. The only non-significant coefficient was for the second-lowest quartile in the complete model (see Table 4.6). This overall pattern supports a positive relationship between the ascending TIS quartile and expectations.

The only previous study of TIS and CHA expectations concerned hypnosis. It reported that subjects in the top quartile of TIS were approximately twice as likely to report a positive view of hypnosis compared to those in the lowest quartile (57.1% vs 25.0%, $P<.001$) (Palsson, 2020). In the current study, the overall mean expectation of PC-CHA was negative at 2.8 (1.3) on the 6-point scale, with all quartiles rating their views in the overall unhelpful range (see Table 4.2). Subjects scoring higher on the TIS had a somewhat less negative expectation of PC-CHA on average.

The higher TIS scorers expected more significant benefits from PC-CHA and sought it out as a treatment more often but did not report more favourable experiences with it. Further investigation might reveal more about this underlying difference between expectation and experience. As with the results for use and favourability of experience, further investigation is

needed to determine if the findings for the expectation of benefit hold for the individual CHA methods included within PC-CHA and for other forms of psychologically based treatments such as psychotherapy. The aggregate findings for PC-CHA may deviate from the subjects' experience with the methods in particular circumstances. The higher expectation of benefit is consistent with a greater prevalence of use. It is, again, a potentially helpful association to understand concerning patient-centred care and the economic and policy implications of health behaviours influenced by personality characteristics.

5.5 Strengths and Limitations

This study analysed data gathered from a large sample (N=3013) that was quota-controlled to represent the U.S. population for demographic and socioeconomic factors. There were nearly no missing data due to automated completion monitoring and enforcement of responding by the survey software. The only missing data was for 127 subjects who checked 'I prefer not to answer' regarding their household income. The variables employed in the analysis represented all the major demographic and socioeconomic factors previously identified in the literature as potentially influencing the PC-CHA experience. This included some, but not all, of the potentially related social and psychological traits. Data related to all individual types of PC-CHA commonly used in the US were available, making the aggregation of overall PC-CHA results possible. All the scale variables utilised, including the primary predictor variable TIS, demonstrated good internal consistency within the study population.

The pre-specified hypotheses were rigorously tested using analytic methods described in the research protocol. The underlying relationships studied were examined in crosstabs and multivariate models, controlling for multiple potential confounding factors. The results

supporting hypotheses 1 and 3 are likely generalisable. The a priori power analysis indicated that the sample size was more than sufficient, and it is highly likely that the sample size would have uncovered a significant finding for hypothesis 2 if such an association had been present.

The data collection method allowed a large sample with little missing data. Still, it did not provide information about the number of non-completers or potential subjects who chose not to participate. Selection bias resulting from the sampling method could result in findings not being generalisable to the broader population, potentially skewing the relationship between subconscious connectedness and CHA use. This may have occurred if individuals with interests or experiences in CHA or subconscious connectedness were more or less inclined to participate. The direction in which this potential selection bias may skew the measure of association is unclear.

Several psychological constructs previously measured about patient preferences for care were not included, although these have not been explicitly reported in relation to PC-CHA (Russo *et al.*, 2019). They included self-efficacy, resilience, specific treatment-related beliefs, health literacy, decision-making style, and risk propensity (Russo *et al.*, 2019). Only "specific treatment-related beliefs" were previously identified as a PC-CHA engagement determinant. These concepts were captured at least partially with the variables representing satisfaction with conventional medicine and perceived safety of alternative CHA, but additional data points could strengthen the results. The length and complexity of the questionnaires required to assess many psychological constructs limit how many may be feasible to include in a single online survey. Their significance to the results presented here is unknown.

Reliance on self-reported data through an online survey introduces the possibility of recall bias, where participants may need to accurately remember or report their experiences with

complementary and integrative health (CHA) approaches. The potential for recall bias was limited but not eliminated by asking respondents to recall experiences only within the past year. Recall bias may influence the result for the prevalence of use if recall varies systematically across one or more predictor variables. It might lead to overestimation or underestimation of the use and perception of CHA approaches, but this potential bias's directionality is unclear. For example, subjects might recall only more favourable or more unfavourable experiences. They may also confuse or conflate recollections of different modalities if they used more than one PC-CHA, the recollection of one experience altering the recollection of other experiences.

The structure of the original questions may also impact the meaning and robustness of the results. A single question about the favourability of experience may not accurately reflect multiple dimensions of engagement with multiple forms of PC-CHA and the heterogeneity of people's experiences. A similar difficulty exists for the single-question measure of expectation of benefit. The analysis of single Likert items for experience and expectation as continuous variables could be strengthened by including more detailed multiple-item measures of these concepts.

Although it was designed to be representative, the sample may not have captured the full diversity of the U.S. population, particularly regarding socioeconomic status, education levels, and access to healthcare services. The sample broadly reflected the demographics of the US population. Still, the practical constraints of the quota control method of data gathering resulted in a non-random sample with very few members of ethnic and gender groups that occur in small numbers in the target population. Non-binary subjects constituted 31 or 1.0% of the 3013 respondents, but this small number was unlikely to change the results of the analysis based on "sex assigned at birth". Several less common ethnic groups were combined within categories, and the association within

these groups remains unknown. Understanding the associations between TIS and PC-CHA within these demographic groups would require additional investigation that oversampled these groups or sampled specifically within the groups of interest. The direction of effect on the measures of association of this bias is also unknown. Still, the sample size and representativeness are crucial for generalising the findings. Any limitations here could restrict the applicability of the results to broader contexts.

Despite the limitations, the associations found in this analysis of pre-existing data are likely to represent a true measure of association in the general population based on the modelling results controlling for many covariates and the consistency of the findings across groups. With these limitations, this study provided insight into the relationship between subconscious connectedness and patient engagement with PC-CHA.

5.6 Implications of the Findings

This is a preliminary study in an area with little previous research, so these results are not expected to change medical practice or policy immediately. Insights gained from the survey shed light on the relationship between SC and healthcare choices regarding PC-CHA and further validate the construct of SC as a predictor of attitudes and behaviour. The current findings related to PC-CHA may extend to other CHA methods and conventional psychologically-based treatments as well—this new knowledge of potential SC effects on healthcare advances understanding of an emerging area of interest. Further investigation of TIS and other psychological traits could inform healthcare providers, patients, and policymakers about factors influencing the patterns and quality of care, allowing for improved clinical interactions and policy decisions. For example, the observation in this study that high TIS scorers are, on average, nearly twice as likely as low scorers

to be dissatisfied with conventional medicine (34.7% vs. 17.9%) could potentially lead to research using the TIS questionnaire to identify ways to enhance satisfaction with medical care for that substantial segment of the patient population.

The prevalence data included in this analysis could help identify healthcare trends and patterns. It may also help researchers monitor changes over time and compare the use of complementary health approaches across different populations and regions. This information could inform clinical practice, public health initiatives, educational campaigns, and policy development to promote health and well-being.

5.7 Future Directions

This project sheds light on patient attitudes and experiences that may help guide future studies on the safety, efficacy, and cost of PCA and other psychologically based treatments. Studying the prevalence of and experience with CHA could inform resource allocation in the healthcare system and more optimal care coordination. A more in-depth and nuanced investigation of patient experience and expectations could be performed with more detailed questioning (Laferton et al., 2017). A significant portion of the population is utilising these approaches. Allocating resources and funding to support training in and integrating these practices into mainstream healthcare services could improve patient experience. This study also provides preliminary information on the clinical implications of patient psychological traits, further examination of which may help provide more safe, effective, and coordinated patient care and health policy concerning both conventional and non-conventional treatments.

Future studies could include a more diverse population beyond U.S. adults to understand if the findings hold across different cultures and societies. The effects of other social networks and

economic systems could be explored, including different costs and treatment barriers. The role of psychological traits in influencing health choices and preferences for the type of relationship with doctors could also be examined in more detail (Braman and Gomez, 2004). The potential impact of subconscious connectedness on patients' adherence to treatment plans and overall satisfaction with healthcare services could be investigated. Future studies might consider exploring this in more detail to understand the processes involved and to tease out potential differences in measures of favourability, benefit, and, potentially, satisfaction, as these concepts are not entirely the same. The reasons behind any observed differences in TIS scores across demographic variables are also interesting.

Prospective studies with more specifically or uniformly delineated PECOTs could investigate the association with TIS and healthcare engagement for more precise patient populations, health conditions, and CHA treatments, both individually and in aggregate. Similar analyses of conventional psychological therapies could be performed. Validated clinical outcome measures could be used to assess the effectiveness of different health treatments across varying levels of TIS score. This would provide more reliable and objective data than self-reported experiences and expectations. A larger sample size would increase the statistical power of future studies and allow more definitive conclusions about the usefulness of the TIS. Prospective study designs could reduce recall bias from poor or altered recollection of treatment experiences. Future studies could also investigate the potential of the TIS to predict clinical outcomes for hypnosis and other treatments. These results require additional validation in prospective analytic studies and further investigation into potential mechanisms of the relationship between TIS and PC-CHA before establishing causal relationships.

6. Conclusions

6.1 Primary Findings

This study investigated the relationship between subconscious connectedness (SC) and the use of complementary and integrative health (CHA) approaches among U.S. adults. Higher scores on the Thought Impact Scale (TIS) were associated with a greater likelihood of individuals seeking CHA treatments and expecting more significant benefit. TIS scores were not associated with whether respondents reported their experiences with PC-CHA favourably. The study's significance lies in its potential to contribute to evidence-based health care. It provides insights into how psychological traits like SC may affect health choices and CHA utilisation.

6.2 Potential Benefit

This preliminary project elucidated one of the drivers of the use of complementary health approaches, providing insight into the healthcare choices made by individuals and their experiences of those choices. This improved understanding can facilitate more effective delivery of healthcare services by enabling practitioners to anticipate their patients' needs, expectations, and responses as they recommend treatment approaches (El-Haddad, Hegazi and Hu, 2020). Knowing which patients may respond more positively and which may respond more negatively or require additional support in pursuing particular therapeutic approaches will strengthen treatment recommendations and patient engagement, leading to improved outcomes (Krist *et al.*, 2017). Complementary and integrative approaches are often utilised alongside conventional medicine (Berna *et al.*, 2019). Understanding the pattern of use can contribute to evidence-based healthcare by helping to guide healthcare professionals in recommending appropriate treatments and interventions tailored to individuals. Reducing

unnecessary costs and adverse events in relation to CHA could potentially result. It may also enhance patient satisfaction and other clinical outcomes.

A potential benefit of understanding the relationship between psychological traits and healthcare preferences is the ability to tailor care better to meet each patient's needs through more patient-centred care. A deeper understanding of patients may improve satisfaction, care engagement, and treatment plan adherence. Matching clinicians' counselling styles and suggestions to patients' preferred decision-making processes could result in more satisfying healthcare choices, better patient-provider collaboration, and reduced stress related to healthcare processes. Attention to the psychological drivers of healthcare choices may also allow providers to mitigate health disparities among different patient populations through better communication. A deeper understanding of the impact of psychological traits could also stimulate further research into their influence on healthcare delivery systems.

6.3 Summary

This study aimed to expand on the knowledge of how the psychological traits of patients influence healthcare choices, interests, and experiences. It found that among a representative sample of 3013 US adults, higher levels of SC, as measured by the TIS, were associated with increased use of PC-CHA and greater expectation of benefit from PC-CHA. It found no relationship between SC and favourability of experience with PC-CHA. This is an early study of SC, and the results are not likely to change medical practice. These results contribute to the growing knowledge of how psychological traits affect patient engagement with healthcare. They may raise awareness of SC as a construct that can contribute to a deeper understanding of

healthcare experiences and preferences. This knowledge may assist clinicians and policymakers in advancing patient-centred healthcare environments that improve the quality of care.

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Appendices

Appendix A – Contents of the Original Data Collection Questionnaire Used in the Analyses

a. [SEX] male or female

b. [AGE] in years

c. [ETHNICITY]

   a. White/Caucasian

   b. Hispanic

   c. Black/African,

   d. Asian or Pacific Islander

   e. American Indian, Alaskan Native and all additional categories

   f. Declined to answer

d. [EDUCATION]

   a. Did not finish high school, high school graduate, or GED

   b. Some college or technical school, technical school degree, or associate degree

   c. Undergraduate college degree, some graduate school, graduate college degree

e. [EMPLOYM].

   a. Not working for pay (includes being a student, homemaker, unemployed or being retired)

   b. Working part-time for pay

   c. Working full-time for pay

f. [INCOME]

    a. Below poverty line

    b. Above poverty line

g. [INSURANCE]

    a. Uninsured

    b. Public insurance, all forms

    c. Private insurance, all forms

h. [RELATIONSHIP]

    a. Single

    b. In a committed relationship

    c. Married

    d. Divorced, separated or widowed and not in a committed relationship

i. [REGION] – East, Midwest, South, West

j. [COMMTYPE] – Type/size of community

    a. City (>50,000 people)

    b. Town (2,500 to 50,000 people)

    c. Small town or village (<2500 people) or countryside

k. The Thought Impact Scale (TIS) is a valid and reliable measure of Subconscious Connectedness (Palsson, 2020; Palsson, Ballou and Walker, 2022). In the TIS questionnaire, participants rate the frequency of their experiences using a five-point scale ranging from "Never" to "Rarely," "Sometimes," "Often," and "Most times or Always." The study used the 17-question short form of the questionnaire (TIS-SF). [TIS-SF*] For each statement, please indicate how often you experience what is

described.

	Never	Rarely	Sometimes	Often	Most Times or Always
1. When I replay important conversations in my mind, they are so vivid and clear that I almost hear them in my head.	❍	❍	❍	❍	❍
2. Without any reminders, I suddenly remember things that I had not been thinking about at all, exactly when I need them - such as forgotten appointments.	❍	❍	❍	❍	❍
3. When people say something very nice about me, or when they say very mean things about me, I feel a physical reaction.	❍	❍	❍	❍	❍
4. My mind spontaneously turns rhythmic noises, such as machine sounds, into music in my head.	❍	❍	❍	❍	❍
5. When I imagine something I'm going to do, I feel later like I have already done it even though this is not the case.	❍	❍	❍	❍	❍
6. When people tell me about an experience they had that was very upsetting or very exciting to them, I feel emotional reactions almost like it happened to me personally.	❍	❍	❍	❍	❍
7. When I imagine something, I don't just see it in my mind, but I also experience it mentally in other senses - hear sounds, feel things with my sense of touch, or taste tastes.	❍	❍	❍	❍	❍

8. When something stimulates my imagination, it takes over in my thoughts and makes it hard for me to concentrate on my everyday tasks.	❍	❍	❍	❍	❍
9. When I am driving or traveling in a vehicle and something important or exciting is on my mind, I can travel for a long time without any awareness of where I am or what I am doing.	❍	❍	❍	❍	❍
10. Certain places or situations give me a strong mystical or spiritual feeling, even if they do not have any obvious spiritual connection.	❍	❍	❍	❍	❍
11. Useful fully formed and detailed ideas, which I did not come up with through any conscious reasoning, just pop up in my mind.	❍	❍	❍	❍	❍
12. When I think of something that strongly captures my imagination, even for just a few moments, I lose track of what I was doing or saying.	❍	❍	❍	❍	❍
13. Very beautiful images strongly affect me emotionally.	❍	❍	❍	❍	❍
14. When I hear certain songs played that I have heard before, it brings me in my mind back to a different situation so strongly that it distracts me from the present.	❍	❍	❍	❍	❍
15. Thinking of physical sensations such as a fly landing on the back of my hand, tasting a lemon, or a tickle in my throat, makes me instantly feel corresponding reactions in my body.	❍	❍	❍	❍	❍

16. In personal situations that turn out to be bad, I sense clearly that something is wrong long before I see any evidence of it that I can pinpoint.	❍	❍	❍	❍	❍
17. At times when something important is on my mind, I complete minor routine daily tasks successfully without being aware of it or even remembering afterward that I have done them.	❍	❍	❍	❍	❍

l. Neuroticism and Openness Scales. These questions assess two of the Big Five personality dimensions. Each personality facet is measured with a six-question subscale of the Big Five Inventory (Soto and John, 2017).

[BFI1_*] Please indicate how much you agree or disagree with each statement.

I am someone who...

	Disagree Strongly	Disagree a little	Neutral	Agree a little	Agree Strongly
Worries a lot	❍	❍	❍	❍	❍
Tends to feel depressed, blue	❍	❍	❍	❍	❍
Is emotionally stable, not easily upset	❍	❍	❍	❍	❍
Is fascinated by art, music or literature	❍	❍	❍	❍	❍
Has little interest in abstract ideas	❍	❍	❍	❍	❍
Is original, comes up with new ideas	❍	❍	❍	❍	❍

[BFI2_*] Please indicate how much you agree or disagree with each statement.

I am someone who...

	Disagree Strongly	Disagree a little	Neutral	Agree a little	Agree Strongly
Is relaxed, handles stress well	❍	❍	❍	❍	❍
Feels secure, comfortable with self	❍	❍	❍	❍	❍
Is temperamental, gets emotional easily	❍	❍	❍	❍	❍
Has few artistic interests	❍	❍	❍	❍	❍
Is complex, deep thinker	❍	❍	❍	❍	❍
Has little creativity	❍	❍	❍	❍	❍

m. Internal Locus of Control. This includes six items relating to “internality” from the Multidimensional Health Locus of Control Form A scale (MHLC-A). MHLC-A is a validated 18-item scale measuring health-related locus of control. It is divided into three 6-question subscales that may be used independently. (“wallstonk | projects | School of Nursing | Vanderbilt University,” Accessed: 1 May 2024) For brevity, the “internality” questions are utilised here in a six-level Likert format as suggested by the developers.

[MHLC*] How much do you agree or disagree with each statement?

	Strongly disagree	Moderately disagree	Slightly disagree	Slightly agree	Moderately agree	Strongly agree
If I get sick, it is my own behaviour which determines how soon I get well again.	❍	❍	❍	❍	❍	❍
I am in control of my health.	❍	❍	❍	❍	❍	❍
When I get sick, I am to blame.	❍	❍	❍	❍	❍	❍
The main thing which affects my health is what I myself do.	❍	❍	❍	❍	❍	❍
If I take care of myself, I can avoid illness.	❍	❍	❍	❍	❍	❍
If I take the right actions, I can stay healthy.	❍	❍	❍	❍	❍	❍

n. [SPIRITIWB] Spiritual Index of Well-Being (SIWB). This 12-question scale is a valid and reliable instrument. It provides one of the better measures of a person's spiritual state (Daaleman *et al.*, 2002; Daaleman and Frey, 2004; Monod *et al.*, 2011).

[SPIRITIWB] Which response best describes how you feel about each statement?

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree
There is not much I can do to help myself.	❍	❍	❍	❍	❍
Often, there is no way I can complete what I have started.	❍	❍	❍	❍	❍
I can't begin to understand my problems.	❍	❍	❍	❍	❍
I am overwhelmed when I have personal difficulties and problems.	❍	❍	❍	❍	❍
I don't know how to begin to solve my problems.	❍	❍	❍	❍	❍
There is not much I can do to make a difference in my life.	❍	❍	❍	❍	❍
I haven't found my life's purpose yet.	❍	❍	❍	❍	❍
I don't know who I am, where I came from, or where I am going.	❍	❍	❍	❍	❍
I have a lack of purpose in my life.	❍	❍	❍	❍	❍
In this world, I don't know where I fit in.	❍	❍	❍	❍	❍
I am far from understanding the meaning of life.	❍	❍	❍	❍	❍
There is a great void in my life at this time.	❍	❍	❍	❍	❍

o. [PROMIS_P*] PROMIS Global-10 is a well-validated and widely used questionnaire that measures generic health-related quality of life. It measures and may provide mental and physical health summary scale scores (Hays *et al.*, 2009).

p. Patient Health Questionnaire – 4 (PHQ-4**)**. PHQ-4 is a four-question scale that assesses the subject's current level of symptoms of emotional distress (Kroenke *et al.*, 2009). It contains two questions on anxiety and two on depression. Responses reflect the subject's experience over the past two weeks on a four-point frequency scale from "Not at all" to "Nearly every day". PHQ-4 is a screening tool that provides a measure of whether anxiety and depression are likely or not to be present. It is not a diagnostic tool.

[PHQ4_*] Over the last two weeks, how often have you been bothered by the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	❍	❍	❍	❍
2. Not being able to stop or control worrying	❍	❍	❍	❍
3. Little interest or pleasure in doing things	❍	❍	❍	❍
4. Feeling down, depressed, or hopeless	❍	❍	❍	❍

q. [SATISF] Satisfaction with conventional medicine. This is a single question in which subjects rate their satisfaction level with conventional medicine on a five-point Likert scale (Very satisfied, Somewhat satisfied, Neither satisfied nor dissatisfied, Somewhat dissatisfied, Very dissatisfied).

r. [SAFETY] Safety of unconventional medicine. This is a single question in which subjects rate their perceived safety of unconventional medicine on a five-point Likert scale (Very safe, Somewhat safe, Neither safe nor unsafe, Somewhat unsafe, Very unsafe).

s. [USE*] Use of health PC-CHA health approaches. Subjects report whether they have used the approaches listed within the past year (Yes/No). The list of services is a combination of items from the National Health Interview Survey (NHIS) (Clarke *et al.*, 2015), the types of complementary health approaches categorised by the National Center for Complementary and Integrative Health (CAIH, Accessed: 1 May 2024), and the I-CSM-Q, an internationally validated and widely used questionnaire (Quandt *et al.*, 2009; Güthlin *et al.*, 2010; Re, Schmidt and Güthlin, 2012; Bryden and Browne, 2016; Druart and Pinsault, 2018; Jędrzejewska *et al.*, 2023).

The I-CSM-Q contains additional questions regarding the purpose, frequency of use, and satisfaction with use. The standard I-CSM-Q survey was modified for this study to include other items of particular interest to the aims and to eliminate items not contributing to the necessary information. The items mentioned within the NCCHA categorisation of CHA approaches and additional conventional items were added to the questionnaire to suit the purposes of this U.S.-based survey.

This project is concerned with the perceived favourability and helpfulness of the approaches rather than satisfaction, as in the I-CSM-Q. It meets the best practices for studies of CHA prevalence, including providing a definition of CHA and describing the data coding processes (Lee *et al.*, 2022).

Furthermore, the method was recommended in a 2012 systematic review of CAM prevalence studies, including the specification of a geographic region, age group, and 12-month prevalence. The authors also developed a brief quality checklist for studies, including asking for specific therapy, reporting the specific questions employed, piloting the questionnaire, and reporting a sample size calculation or including at least 1000 respondents (Harris *et al.*, 2012).

Have you used any of the following approaches to treating an illness, improving health, or maintaining health in the last year?

	No	Yes
Prescription medications	❍	❍
Over the counter, non-prescription medications	❍	❍
Vitamin or mineral supplements	❍	❍
Dietary supplements or natural products that are not prescription medications, over-the-counter medications, vitamins, or minerals. This includes herbs, medicinal plants, probiotics, prebiotics, phytochemicals, or other any other supplements.	❍	❍
Special diet prescribed by a doctor	❍	❍
Special diet not prescribed by a doctor	❍	❍
Traditional healing systems such as Traditional Chinese medicine, Ayurveda, or from other cultural traditions	❍	❍
Visit to an herbalist	❍	❍
Visit to a homeopath	❍	❍
Visit to a naturopath	❍	❍
Visit to a spiritual healer	❍	❍
Prayer	❍	❍
Mindfulness or spiritual practices other than prayer	❍	❍
Shamanic journeys	❍	❍
Deep breathing exercises	❍	❍
Meditation	❍	❍
Progressive relaxation	❍	❍
Hypnosis with a therapist	❍	❍
Self-hypnosis	❍	❍
Biofeedback	❍	❍
Guided imagery	❍	❍
Art, music, or dance	❍	❍
Visit to an acupuncturist	❍	❍
Yoga	❍	❍
Tai chi or qi gong	❍	❍
Movement therapies other than yoga, tai chi, or qi gong	❍	❍
Light, magnetic, or electrical stimulation other than conventional physical therapy	❍	❍
Other non-conventional devices	❍	❍
Visit to a chiropractor	❍	❍
Osteopathic manipulation	❍	❍
Massage therapy	❍	❍

t. [CHA_F*] Favourability of experience with CHA health approaches. Subjects report overall experience with each health approach listed in the previous question that they have used within the past year. The rating is on a 6-point Likert scale

(completely favourable, mostly unfavourable, slightly unfavourable, slightly favourable, mostly favourable, completely favourable).

u. [CHA_E*] Expected helpfulness of CHA health approaches. Subjects report whether they believe the health approaches they have not used in the past year would be helpful if they tried them in the future. The rating is on a 6-point Likert scale (completely unhelpful, mostly unhelpful, slightly unhelpful, slightly helpful, mostly helpful, completely helpful).

Appendix B – Research Protocol

Protocol for a Cross-Sectional Survey of Use, Experiences, and Expectations of Complementary and Integrative Health Approaches: Associations with Subconscious Connectedness.

Background

Topic

- The relationship between Subconscious Connectedness (SC), as measured by the Thought Impact Scale (TIS), and the use of, favourability of experience with, and expectation of helpfulness of psychologically based or combined psychologically/physically based complementary approaches (PC-CHA).

Subconscious Connectedness (SC)

- A psychological trait representing the linkage between subconscious and conscious mental processes in daily life (Palsson, 2020b).
- Measured by the Thought Impact Scale (TIS)
- Greater SC is associated with greater use of and more profound experiences with hypnosis (Palsson, 2020; Palsson et al., 2022).
- There have been no previous studies of the association of SC with other forms of PC-CHA or conventional psychologically based treatments.

Complementary Health Approaches (CHA)

- PC-CHA is defined by National Center for Complementary and Integrative Health (NCCIH) classification (CAIH, Accessed: 1 May 2024).

Complementary Health Approaches (CHA) grouped by NCCIH category.

Nutritional CHA	**Psychological CHA**	**Combined Psychological/Physical CHA**	**Physical CHA**
Dietary supplements (all types) Special diet prescribed by a doctor Special diet not prescribed by a doctor Visit to an herbalist Visit to a homoeopath Visit to a naturopath	Visit to a spiritual healer Prayer Mindfulness or spiritual practices other than prayer Shamanic journeys Hypnotherapy Self-hypnosis Art, music, or dance	Deep breathing exercises Meditation Progressive relaxation Biofeedback Guided imagery Visit to an acupuncturist Yoga Tai chi or qi gong Movement therapies other than yoga, tai chi, or qi gong	Visit to a chiropractor Osteopathic manipulation Massage therapy

- (CAIH, Accessed: 1 May 2024)

Study Data and Analysis Summary

- Data from a pre-existing cross-sectional survey of US adults gathered information about demographics, socioeconomic status, healthcare status, healthcare use, psychological traits, and healthcare attitudes.
- Linear and logistic regression methods will quantify the relationship between SC and PC-CHA use, experience, and expectations within this sample of US adults.
- Regression models will control for covariates identified in the literature review and that are available in the dataset.

Significance

- It is important to understand how a person's psychology influences their engagement with healthcare interventions.
- CHA use accounts for $28.3 billion, or 9% of out-of-pocket healthcare expenditures in the US (Clarke *et al.*, 2015).
- CHA is often used with conventional methods such as prescription medication or surgery (Clarke *et al.*, 2015).
- Findings may lead to improvements in healthcare experience and outcomes.

Research Questions

Are people with higher subconscious connectedness, as measured by the Thought Impact Scale (TIS), more likely to:

1. have used psychological and combined psychological/physical CHA (PC-CHA) in the past year;
2. more likely to have had a favourable experience with PC-CHA in the past year;
3. more likely to express positive expectations of PC-CHA?

Aims

The study aims to advance knowledge of SC as a predictor of patient behaviour and response to PC-CHA.

Objectives

The objectives of the project are:

1. To understand predictors of CHA use, experience, and expectations through a review of the literature

2. To investigate the relationship between TIS and CHA by analysing a pre-existing dataset.
3. To report results in a dissertation that may later be adapted for publication.

Hypotheses

Hypothesis 1: Individuals in the highest quartile of TIS scores, compared to individuals in the lowest quartile of TIS scores, will be more likely to report having used PC-CHA in the past year.

Hypothesis 2: Among subjects who have used PC-CHA in the past year, individuals in the highest quartile of TIS scores will demonstrate a significantly higher mean score favourability rating of their experience with PC-CHA compared to individuals in the lowest quartile of TIS scores.

Hypothesis 3: Among subjects who have not used PC-CHA in the past year, individuals in the highest quartile of TIS scores will have a significantly higher mean score rating of the potential helpfulness of PC-CHA compared to individuals in the lowest quartile of TIS scores.

PECOT – Population, Exposure, Comparator, Outcome, and Timing

PECOT Element	Description
Population	US adults aged 18 or older
Exposure	SC, as measured by the TIS score
Comparator	Top quartile on the TIS compared to the lowest quartile
Outcomes	Prevalence of PC-CHA use Favourability of experience with PC-CHA Expectation of the helpfulness of future PC-CHA use
Timing	Previously existing data from an online cross-sectional survey performed from February to March 2024

FINER Criteria – Feasible, Interesting, Novel, Ethical, Relevant

Feasibility

- Uses a pre-existing data set derived from a cross-sectional survey of a representative sample of U.S. adults.
- Data includes TIS scores, relevant CIH and PC-CIH outcomes, and a variety of potentially related demographic and psychological characteristics.
- Data includes appropriate measures of exposure, outcomes, and covariates.

Interesting/Novel

- No previous studies on the relationship between TIS and healthcare utilisation have been conducted apart from the previously cited studies on hypnotherapy.

- Will assess previously unexplored relationships between SC and experience with PC-CHA.

Ethical

- Using pre-existing anonymised data from a previous study that received ethical approval from appropriate institutional review boards presents minimal ethical risk.

Relevant/Potential Benefit

- It will elucidate the patterns of use of complementary and integrative approaches.
- A better understanding of the factors that influence people's decisions regarding their health will help healthcare providers and policymakers adapt their services and resources to meet the needs and preferences of the population.
- It may help reduce adverse events related to PC-CIH and conventional care interaction.
- Furthers patient-centred care to enhance patient satisfaction and clinical outcomes.

Boundaries

The project is subject to the following boundaries.

- It is limited to analysing pre-existing data from a cross-sectional survey of US adults.
- Generalisability to other populations may be limited.
- The sampling method is practical but may be subject to bias due to the non-random methodology.
- Respondents were representative of the target population in terms of age, sex, ethnicity, education, and region of the country.
- The variables within the dataset for analysis were limited to those collected for the original survey.

Ethics approval

The original data collection received ethics approval from another institution. According to current policy, ethics approval through the University of Oxford is not required based on the policy of the Central University Research Ethics Committee ("Where and how to apply for ethical review," Accessed: 10 January 2024).

Research method

Data from a previous online cross-sectional survey of U.S. adults will be used to answer the research question. This method of testing the hypotheses can be completed promptly and does not require additional financial resources, making it both a practical and ethical approach to conducting this research.

Target Population

The target population is U.S. adults over the age of 18 years.

Sampling and Recruitment Strategy

Data is from an online sample of survey-takers through Qualtrics, LLC. The survey software was configured with an "anonymise" setting to ensure the exclusion of any direct or indirect identifiers. As the table below notes, the survey sample was quota-controlled to match the US population (*Regional distribution of the U.S. population from 2021*, Accessed: 1 May 2024).

Sample Size

The required sample size based on a comparison of proportions was determined using the hypnosis data from previous reports (Palsson, 2020; Palsson et al., 2022). Using the figures outlined in these studies as surrogates for PC-CHA use, the calculated sample sizes to compare prevalence between the highest and lowest quartiles would be 1,164 and 1,060, respectively, at

80% power and alpha of 5% (Brooks, Accessed: 1 May 2024). The sample size of 3,000 was likely to provide sufficient statistical power to demonstrate a difference in the prevalence of CHA use between the two quartiles if such a difference was present.

Data Analysis Plan

SPSS Statistics 29.0 will be used for the data analysis.

All study variables will be analysed using descriptive statistics. Continuous variables will be summarised using means, standard deviations, minimum and maximum values, and frequency distributions. Frequencies and percentages will be calculated for all categorical variables (at the nominal/ratio level). The dependent variable of interest, the TIS score, will be summarised as a continuous variable before being divided into quartiles for further analysis. Use of any PC-CHA (PC-CHA-U) will be examined as a categorical variable. Favourable experience with PC-CHA (PC-CHA-F) and the level of expectation that PC-CHA (PC-CHA-E) will be treated as continuous variables.

Distributions of all categorical variables across sex and TIS score quartiles will be examined and reported descriptively without significance tests. Means and standard deviations of all continuous variables will be reported across sex and TIS score quartiles. Pearson Chi-square will be calculated to infer the relationship between the explanatory variable, the TIS score quartile, and the categorical dependent variable, PC-CHA-U. Independent sample *t*-tests and ANOVA will infer the relationship between the TIS score quartile and the continuous dependent variables, PC-CHA-F and PC-CHA-H. A threshold of $p < .050$ was used to determine the statistical significance of the results. All covariates found potentially related to PC-CHA outcomes in the literature

review and present in the dataset will be included in the complete multivariate models to test the hypotheses.

A binary logistic regression model will be employed to model PC-CHA-U as a function of the TIS score quartile. Linear regression will be used to model PC-CHA-F and PC-CHA-H as a function of the TIS quartile. Each of the three models will be run in an unadjusted form without any covariates and then in their complete form, adjusting for the appropriate covariates. The odds ratios, 95% confidence intervals, and p-values for PC-CHA-U will be calculated for each form of the logistic regression model using the lowest TIS score quartile as the reference category. This will test hypothesis 1. Regression coefficients, 95% confidence intervals, and p-values will be calculated for each form of the linear regression models, including PC-CHA-F and PC-CHA-H, using the lowest TIS score quartile as the reference category. This will test hypotheses 2 and 3.

Necessary test assumptions will be examined prior to analysis. There will be no adjustment for outlier scores for the categorical variables. Continuous variables will not be adjusted for outliers, given that they were all scale variables, with all values representing legitimate scores within the limits of the scale range. Observations in this dataset did not originate from repeated measurements or matched data. They can be assumed to be independent, which is necessary for the statistical methods to be valid and reliable. The collection method forced the completion of the questionnaire. Therefore, it is not anticipated that missing data will be an issue. The psychometric properties of the composite scales used in the questionnaire will be assessed to confirm reliability within this sample. A criterion of Cronbach's alpha greater than 0.65 will be considered to determine whether each scale exhibits an acceptable internal consistency and

reliability level (Tavakol and Dennick, 2011; “Using and Interpreting Cronbach’s Alpha | UVA Library,” Accessed: 17 July 2024).

Reporting

A study report will be prepared as a dissertation for the MSc in Evidence-Based Health Care degree, and it is planned to be converted to a manuscript for submission to publication.

References

References for the Research Protocol may be found in the References section of the dissertation.

Appendix C – STROBE Statement Guidelines

Checklists for the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for reporting observational studies are reproduced below. They include assessments of the two previous studies on the relationship between TIS and PC-CHA and an assessment of this report (Elm et al., 2007; Vandenbroucke et al., 2007).

Analysis for Palsson 2020

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	198
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	198
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	189-208
Objectives	3	State specific objectives, including any prespecified hypotheses	208-209
Methods			
Study design	4	Present key elements of study design early in the paper	209-215
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	209-215
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	209-211
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Not applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*211-214*
Bias	9	Describe any efforts to address potential sources of bias	209-211
Study size	10	Explain how the study size was arrived at	Not present

Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	215-216
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	215-216
		(*b*) Describe any methods used to examine subgroups and interactions	215-216
		(*c*) Explain how missing data were addressed	Not applicable
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	216-222
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Not reported
		(b) Give reasons for non-participation at each stage	See above
		(c) Consider use of a flow diagram	See above
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	210
		(b) Indicate number of participants with missing data for each variable of interest	210
Outcome data	15*	Report numbers of outcome events or summary measures	210-214
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	216-222
		(*b*) Report category boundaries when continuous variables were categorized	Not reported
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not relevant
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	216-222
Discussion			
Key results	18	Summarise key results with reference to study objectives	219-222

Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	222-226
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	222-226
Generalisability	21	Discuss the generalisability (external validity) of the study results	222-226
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	No reported

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Analysis for Palsson et al. 2022

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	1-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6-7
Methods			
Study design	4	Present key elements of study design early in the paper	7-8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7-8

Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	Not reported
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9
		(*b*) Describe any methods used to examine subgroups and interactions	9-11
		(*c*) Explain how missing data were addressed	7-8
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not reported
		(*e*) Describe any sensitivity analyses	Not reported
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Not reported
		(b) Give reasons for non-participation at each stage	See above
		(c) Consider use of a flow diagram	See above
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10
		(b) Indicate number of participants with missing data for each variable of interest	10
Outcome data	15*	Report numbers of outcome events or summary measures	10-11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-12

		(*b*) Report category boundaries when continuous variables were categorized	11
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not relevant
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	13
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14-17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-17
Generalisability	21	Discuss the generalisability (external validity) of the study results	14-17
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Not reported

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Checklist for this Report

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	i
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	ii
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-15

Objectives	3	State specific objectives, including any prespecified hypotheses	1-2
Methods			
Study design	4	Present key elements of study design early in the paper	2
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	2
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	17-18
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	25-31
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*25-31 and* *Appendix A*
Bias	9	Describe any efforts to address potential sources of bias	23-24
Study size	10	Explain how the study size was arrived at	19-22
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	31-34
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	31-34
		(*b*) Describe any methods used to examine subgroups and interactions	31-34
		(*c*) Explain how missing data were addressed	33
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	19-22, 34
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Report not available in pre-existing dataset.
		(b) Give reasons for non-participation at each stage	See above
		(c) Consider use of a flow diagram	See above
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	35-37, 38-41

		(b) Indicate number of participants with missing data for each variable of interest	33
Outcome data	15*	Report numbers of outcome events or summary measures	35-37, 38-41
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	41-45
		(*b*) Report category boundaries when continuous variables were categorized	35
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not relevant
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	41-45
Discussion			
Key results	18	Summarise key results with reference to study objectives	46
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	51-54
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	46-51, 54-56
Generalisability	21	Discuss the generalisability (external validity) of the study results	51-55
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.