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Yoga Therapy in Practice and Methodology

The Essential Properties of Yoga Questionnaire: Development and Methods

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Abstract

Yoga interventions have considerable heterogeneity, are multi-dimensional, and may impact health in different ways. However, most research reports regarding the effects of yoga on health and wellbeing do not adequately describe the components of the yoga interventions being used. Thus, drawing comparisons across studies or understanding the relative effects of specific aspects of a yoga intervention are rarely possible. To address this problem, we created the Essential Properties of Yoga Questionnaire (EPYQ) Project, an NCCAM-funded set of studies to develop a translational tool for yoga researchers. Here we describe the methods and developmental processes used in the EPYQ Project in detail. The project consists of four main phases. Phase I was designed to gain a comprehensive understanding of the relevant aspects of yoga by conducting a comprehensive systematic literature review and conducting focus groups with stakeholders including a wide variety of yoga teachers and students. In Phase II, a pool of potential questionnaire items was developed for the prototypic questionnaire using information from Phase I. Cognitive interviews were conducted with the preliminary EPYQ items to assess the perceived clarity, meaning, and importance of each item. In Phase III, the prototypic questionnaire was administered to two large samples of yoga students and instructors. Military personnel and veterans who practiced or taught yoga (n = 329) were recruited to participate. Factor analysis and item response theory were used to identify factors and select the final questionnaire items. Phase IV is ongoing and will collect reliability and validity data on the final instrument. Results are expected to be available in 2016. The EPYQ will provide an objective tool for describing the amount of various components of yoga interventions, eventually allowing researchers to link specific yoga components to health benefits, and facilitating the design of yoga interventions for specific health conditions.

Introduction

Data from the National Health Interview Survey (NHIS) Alternative Medicine Supplement indicate that the proportion of respondents using yoga increased from 3.7% of the US population in 1997, to 5.1% in 2002, 6.1% in 2007, and finally to 9.5% in 2012 (Barnes, Bloom, & Nahin, 2008; Barnes, Powell-Griner, McFann, & Nahin, 2004; Clarke, Black, Stussman, Barnes, & Nahin, 2015). Among people dealing with health issues, the percent using yoga may be much higher (Barnes et al., 2008; Birdee et al., 2008). For example, in recent years, yoga has become a core complementary approach sought out by many cancer patients and survivors of all cultural backgrounds (Chaoul, Milbury, Sood, Prinsloo, & Cohen, 2014; Mackenzie, Carlson, Ekkekakis, Paskevich, & Culos-Reed, 2013).

Yoga interventions for treating specific health conditions are being developed and introduced quite rapidly, and the number of randomized controlled trials (RCTs) involving yoga for improving health has risen dramatically since 2004 (Elwy et al., 2014). Despite this surge in larger RCTs, conclusions remain tentative. For example, systematic reviews have concluded that yoga is promising for improving health outcomes in people with chronic low back pain (Groessl, Sklar, & Chang, 2012; Holtzman & Beggs, 2013), depression (Louie, 2014), anxiety (Chugh-Gupta, Baldassarre, & Vrkljan, 2013), hypertension (Tyagi & Cohen, 2014), addiction (Khanna & Greeson, 2013), aging (Patel, Newstead, & Ferrer, 2012), and cancer-related fatigue (Sadja & Mills, 2013) among others, but usually

stop short of recommending yoga because of various limitations in the studies. The limitations include small sample sizes and non-randomized designs, but more recent research increasingly focuses on issues such as the choice of control group and inadequate descriptions of the yoga interventions being studied (Sherman, 2012).

Yoga is a heterogeneous set of activities and different studies implement yoga in very different ways. This heterogeneity, while reflecting the richness and diversity of yogic approaches, also makes the comparison of findings across studies difficult, and limits our ability to understand the mechanisms by which yoga affects physical and mental wellbeing. The purpose of this project was to develop a new measure, the Essential Properties of Yoga Questionnaire (EPYQ), which was designed to: (1) address limitations in the yoga literature due to inadequate descriptions of the yoga interventions being studied (Sherman, 2012; Ward, Stebbings, Cherkin, & Baxter, 2014); and (2) advance research on yoga. The measure developed in this project will allow users to rate the extent to which various dimensions or components are present in yoga interventions. This measure will advance research in yoga interventions by enabling comparisons across studies of yoga, informing adequate control conditions, informing the selection of yoga components for future interventions, determining the relative efficacy of various components of yoga, identifying mechanisms of effect, assessing receptivity in subgroups, and facilitating comparisons of yoga with other CAM interventions. The objective of the present article is to describe the methodology of the EPYQ study in detail.

Methods

Research Aims

The EPYQ is being developed by a team of researchers from three study sites: University of Connecticut (UConn), Boston University, and University of California San Diego (UCSD), with funding from the National Center for Complementary and Integrative Health (NCCIH). The project began in September 2010 with the following research aims: (1) derive a comprehensive list of central dimensions (essential properties) of yoga interventions; (2) develop a questionnaire that can be completed by objective observers, yoga teachers, or yoga students to assess the degree to which these dimensions are present in any specific yoga intervention; and (3) establish the psychometric properties of the questionnaire (i.e., reliability and validity). In 2014, investigators were awarded a supplement from NCCIH to add a military component to the study. As part of this supplement, active duty military personnel and military veterans participated in Phase III of the study (described below). They will also participate in the ongoing Phase IV (described below) and in qualitative interviews designed to better understand how yoga is being used by active duty military and veterans.

Overview of Study Design

The development of the EPYQ includes four phases designed to systematically develop and test a reliable quantitative measure of the primary components of yoga. Phase I was designed to gain a comprehensive understanding of the relevant aspects of yoga and to develop a large pool of potential questionnaire items by conducting both a thorough literature review and focus groups with a wide variety of yoga teachers and students. We used rigorous systematic review methodology to identify gaps in the literature and analyzed focus group transcripts using qualitative methods that identified key conceptual dimensions associated with yoga interventions. In Phase II, a prototypic questionnaire was developed. Information from Phase I was used along with expert opinion from yoga researchers at all three sites to generate items for further testing. Cognitive interviews were then conducted with these preliminary EPYQ items to assess the perceived clarity, meaning, and importance of each item. Phase III administered the item pool using an online survey with yoga students, instructors, and researchers as participants. Factor analysis and item response theory were used to identify factors, select the best items per factor, and to reduce the number of items in the measure. Phase IV is ongoing and will collect data on the final instrument and test the psychometric properties of the questionnaire (i.e., reliability and validity using data collected in Phases III and IV).

For all phases involving human subjects, participants had to be age 18 or over and have participated in at least five yoga classes as either a student or instructor in the two months prior to research participation. Participants also must have been able to speak and understand written and spoken English. All participants provided informed consent before participation. This study was approved and maintains approval at each research site's IRB (University of Connecticut, Boston University, University of California at San Diego).

Phase I

The focus of Phase I was on concept development via a systematic literature review and a series of focus groups with various stakeholders.

Literature Review. A systematic scoping review of the literature was conducted to determine the size and nature of the evidence base for yoga interventions, to help identify gaps in the yoga intervention literature, and to make recommendations for future primary research in this area. A

detailed description of this review has been published (Elwy et al., 2014). In summary, three research questions were addressed: (1) How are yoga interventions characterized in the scientific literature?; (2) Among the yoga intervention studies that were RCTs, what is the methodological quality?; and (3) How well are yoga interventions described in the scientific literature with respect to recommended yoga intervention reporting guidelines (Sherman, 2012)? Yoga intervention studies were defined as interventions consisting of at least one of Patanjali's eight limbs and having been described as "yoga" in the manuscript (Iyengar, 1979).

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for conducting systematic reviews were followed (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). Electronic databases were systematically searched and hand-searching of key journals was also undertaken to identify further literature for review (Elwy et al., 2014). Four criteria were used to select research studies for inclusion: (a) the study included a yoga intervention, consisting of at least one yoga session with outcomes measured at least before and after the intervention; (b) intervention participants were 18 years; (c) an English language version of the study was published; and (d) the full manuscript was available for review.

All studies identified that were RCTs were also reviewed for methodological quality using seven recommended categories for rating the quality of research evidence (US Preventive Services Task Force). Two authors independently rated each RCT on the seven categories and discordant ratings were resolved through discussion until consensus was obtained (Elwy et al., 2014).

The search returned a total of 3,062 studies of which 465 met inclusion criteria. For the frequency of yoga, the interventions ranged from a single yoga session up to two sessions per day. Of the 369 (79%) interventions that mentioned asanas as a component of the yoga intervention, 200 (54%) of these had minimal or no description of which asanas were used. Home practice of yoga was noted in 26% of the interventions. Of the 151 (32%) studies that were RCTs, most were rated as having poor quality. In conclusion, the review highlighted the methodologic limitations and lack of details reported among yoga intervention research published to date.

Focus Groups. Focus groups were conducted with yoga instructors and students to obtain stakeholder views on the important components of yoga. Each of the three study sites conducted three focus groups (two with yoga students and one with yoga instructors) for a total of nine focus groups. Focus groups consisted of 6-8 participants each and lasted approximately 90 minutes. Focus groups were facilitated by a researcher trained in focus group techniques. Facilitators used a semi-structured focus group guide containing broad lead questions and focused follow-up questions to elicit participant responses about their experiences with and perspectives on yoga. The importance participants placed on different dimensions of yoga and the meaning that participants assigned to different dimensions of yoga (e.g., asanas, pranayama, meditation, mindfulness) were also explored. All focus groups were audio-recorded. At the end of each focus group, participants in the yoga student groups received a $20 gift card and participants in the yoga instructor groups received a $50 gift card.

All participants were recruited via recruitment flyers, word of mouth, and announcements made in local yoga classes. Yoga students and teachers who were interested contacted the local site coordinators and were scheduled to attend a focus group. The sample size for this qualitative research reflected an interest in geographic diversity, an attempt to capture the range of yoga teacher and student experience, and "saturation," which was defined as a point where no new information was gleaned and there was convergence across data sources. Participants (n = 69) were 78% female and predominantly non-Hispanic White (77%). A total of 10% of the remaining participants were of Asian background, 4% African-American, 4% Hispanic, and 5% Other/Unknown. Most instructors taught and had studied more than one style of yoga; styles taught included Hatha, Iyengar, Vinyasa, Hot, Restorative, Svaroopa, Indra Devi, Prenatal, Gentle, Children's, and Silver Age Yoga (older adults).

Recordings were transcribed by a professional transcription company via an encrypted online service. Transcriptions were audited to ensure accuracy and proper de-identification and then coded using grounded thematic analysis, based on the principles of grounded theory (Charmaz, 2006). A team of research staff trained in qualitative analyses read through all transcripts and notes to identify emerging themes and to record patterns in the data. A qualitative research software tool (ATLAS.ti) was used to code, categorize, and analyze the frequency of themes. Several additional investigators also analyzed the transcripts to build consensus for the coding framework. Disagreements in the coding were discussed until a consensus was reached.

Phase II

The aims of Phase II were to develop an item pool and prototype measure and to conduct cognitive interviews with participants after they completed the prototype measure to ensure the items were clearly understood and unambiguous.

Item Pool and Prototype Questionnaire. An item pool of 90 items were generated based on information gleaned from the literature review, focus group findings, and

expertise of the study investigators. These items were then organized into a prototype questionnaire that consisted of two sections. Section 1 consisted of 75 items that represented the essential properties/components of yoga that may be objectively observed in a yoga session or intervention. Section 2 initially consisted of 15 descriptive items about the type of yoga that participants engaged in, the physical space in which yoga took place, physicality (for example, number of asanas cycled through), and perspectives on their yoga teacher and his/her style of teaching. The wording and format of each item was developed using established principles of item construction with the goal of constructing clear, concise, and understandable items.(Fowler, 1995)

Cognitive Interviews

Research staff recruited 10-11 participants at each study site for a total of 31 cognitive interviews. The goal of the cognitive interviewing (Forsyth & Lessler, 1991) was to determine if (1) the intended meaning of each EPYQ item was understood by respondents (complexity); (2) each EPYQ item was worded clearly (unambiguous); and (3) each EPYQ item was considered important to the practice of yoga.

Cognitive interview participants were recruited via flyers, word of mouth, and announcements at local yoga studios. The sample consisted of yoga instructors, yoga students, and researchers who practiced yoga and/or were involved in yoga research. Consented participants began by completing the prototype EPYQ questionnaire. The length of time to take the survey was recorded by the interviewer. Participants were then individually interviewed in-person by a research staff member trained in cognitive interviewing methods. All interviews were audio-recorded. The cognitive interview protocol began by asking participants to review the questionnaire and circle any words, phrases, or items that they thought were hard to understand or confusing in any way. The interviewer then asked participants to describe their thought processes behind any areas of confusion. Next, participants were queried about the instructions, length of the questionnaire, formatting, and response options. Each item was then reviewed individually to ascertain participants' understanding of its meaning and to determine if they had any problems responding to it. Next, participants were asked to consider how clearly each item was stated and whether it could have more than one interpretation. Finally, participants were asked how important they felt each element was to the practice of yoga. Cognitive interviews lasted two hours on average and all participants were given a $100 gift certificate for their time and feedback.

Cognitive interview data from each of the three sites were merged for analyses. To address each of the three main questions, four members of the research team rated each participant response on a scale of 0–2. For goal 1, a score of 2 was given if the participant's response indicated that he or she "completely understood" the intended meaning. A score of 1 was given for responses that indicated the participant "partially understood" the intended meaning. A score of 0 was given for responses that clearly indicated that a participant "did not understand at all" the intended meaning of the item. For goal 2, a score of 2 was given if the participant's response indicated the item was "very clear," a score of 1 for responses indicating the item was "somewhat clear," and a score of 0 for responses indicating the item was "not at all clear." For goal 3, a score of 2 was given if the participant's response indicated the item was "very important," a score of 1 was given if the response indicated the item was "somewhat important," and a score of 0 was given if the response indicated the item was "not at all important."

Using the 0–2 scoring system, the mean level of understanding was calculated for each of the EPYQ items. First, for each participant response, the mean rating across the four raters was calculated. Next, the mean score for each item across the 31 interviews was calculated. All items with total mean understanding score, a total mean clarity score, or a total mean importance score of 1.5 or lower were targeted for further review. In addition, the Intraclass Correlation Coefficient (ICC) was calculated to determine inter-rater reliability. The ICC indicated the level of agreement (0-1 scale) of the raters for the three total mean scores. All items with ICCs below .5 were identified for further review by the research team. Further review consisted of teleconferences during which the research team discussed problematic items and proposed the rewording of, elimination of, or addition of items to improve clarity and understanding, and finalized the item pool for further analyses. This resulted in a final item pool of 81 items in Section 1 and 17 items in Section 2.

In an effort to make the questions and the overall measure as objective as possible, the wording of the questions and question stem was discussed at length. The final stem for all questions in Section 1 was "How much did the instructor mention or include…?" This stem was chosen to reduce the impact of temporary state induced feelings or expectations that arise in students or instructors and to emphasize more tangible cues or behaviors including verbal instructions. Example items that complete the stem listed above include "…placing one's focus on the breath?," "…vigorous activity or physical exertion?," and "spiritual readings, quotes, sayings, teachings, or ideas?" The five response categories for each question were "Not at all," "A little," "A moderate amount," "Quite a bit," and "A very large amount."

Section 2 of the measure inquired about a wide variety of information to characterize the intervention covering

four main areas: (a) context and physical space; (b) physicality; (c) facilitation/instruction; and (d) overall intervention. Responses from Section 2 were not mixed with Section 1; section 2 was primarily designed to describe the context and factors beyond the intervention itself, such as room temperature, intervention frequency, duration of sessions, etc.

Phase III

Phase III objectives were to (1) field-test an online version of the EPYQ with yoga students and yoga instructors; and (2) examine underlying factor structure, reduce scale length by eliminating items, and finalize items for the instrument. Two samples were recruited for the study, one for exploratory factor analysis (Sample 1) and one for confirmatory factor analysis (Sample 2). Participants from the military supplement were added to the first sample, resulting in Sample 1a (non-military) and Sample 1b (military) for Sample 1.

Recruitment for Sample 1a. Participants were recruited via announcements and flyers at local yoga studios and other local community partners at each of the three sites. The initial goal of Sample 1a was to recruit 400 participants who were yoga students, instructors, or researchers. Because the EPYQ was intended to be an appropriate tool for all types/styles of yoga, efforts were made to represent a variety of types of yoga styles and diverse geographic regions across the country. A list of 35 common styles of yoga practiced in the United States was compiled (Ananda, Anti-Gravity, Anusara, Ashtanga, Bikram, Chair, Christian, Forrest, Hatha, Integral, Integral Science of Hatha and Tantric Arts, Iyengar, Jivamukti, Kali Ray Tri, Kripalu, Krishnamacharya, Kundalini, Laughter, Moksha, Power, Partner, Restorative, Sahaja, Silver Age, Sivananda, Sudarshan Kriya, Svaroopa, Tantric, Tibetan, Viniyoga, Vinyasa, Vivekananda, White Lotus, Yin, and Yoga Nidra). Sites specializing in each of these 35 styles of yoga were identified using a combination of search engines and directories including general Google search, Yoga Directory (*Yoga Journal*), Yoga Alliance directory, and Yoga Finder. Our aim was to seek out those studios/centers that self-reported a particular style of yoga or otherwise indicated reasonable affiliation and adherence with respect to each tradition (e.g., affiliation between the center and a central organization, the description or name of the class, and certification of instructor). Classes must also have been active and scheduled on a regular basis to demonstrate continuity and provide reasonable evidence of a community of learners. For each of the 35 styles of yoga listed above, three sites were selected for further contact, from different geographical regions across the U.S., for a total of 105 yoga studios. These centers were then sent recruitment emails and flyers with the survey link.

Recruitment for Sample 1b. Sample 1b consisted of U.S. active duty military and veterans who met eligibility criteria. To meet the goal of recruiting 100 active duty military and 100 veterans, several recruitment methods were used: word of mouth, posting recruitment flyers in yoga studios near military bases; Craigslist ads; Facebook announcements; *Military Press* advertisement; Google searches of the terms "yoga for veterans" and "yoga for military" in order to identify yoga studios and instructors to contact to obtain a sample of active duty military and veterans who practice yoga; and announcements in the national Yoga Alliance newsletter.

Recruitment for Sample 2. Yoga Alliance was contacted and agreed to announce the field-testing of the EPYQ to yoga instructors in their national and international newsletter. A global sample of over 600 participants was obtained.

Procedure. Recruitment materials directed participants to a website to complete an online survey. After consenting to participate, eligible participants were asked 11 demographic items from the General Social Survey (National Opinion Research Center) followed by the 81 items in Section 1 of the prototype EPYQ concerning components of yoga present in the last yoga session they attended; and lastly, 17 items in Section 2 that pertained to the general context, type of yoga, facility, mode of teaching, and other intervention-related items. Identifying information was not collected. After the survey was completed, participants were directed to click on a separate secure web link to a separate online survey in order to provide a mailing address to receive compensation. This method ensured that participants' survey answers and identifying information were not linked. The full survey took approximately 15-20 minutes to complete. Participants in Sample 1a were given $10 for completing the survey. Participants in Sample 1b initially received $10, but the incentive was increased to $25 to facilitate more rapid recruitment. Participants in Sample 2 were volunteers and did not receive compensation.

Analyses. Factor analyses were conducted to refine the items and scales for the final EPYQ measure. Prior to conducting the factor analyses, standard statistical techniques were used to screen for data normality and items that did not have sufficient variance. Participants had to complete 80% of the items to be included in the analyses. First, exploratory factor analysis using SPSS was conducted with pooled data (n = 810) from samples 1a (n = 481) and 1b (n = 329). Scales were developed based on factor loadings from the exploratory factor analysis, reliability analysis of proposed scales, and expert opinion of the authors based on the originally hypothesized scales. The hypothesized domains and associated items were further examined with confirmatory factor analysis (Joreskog & Sorbom, 1993) using

AMOS software and Item Response Theory (Rizopoulos, 2006) and Rasch analysis (Tennant, McKenna, & Hagell, 2004) using the R statistical package and Winsteps. (Linacre, 2014)

Confirmatory factor analyses were then run with sample 2 (n = 491). Items were allowed to have non-zero estimates on only one factor. The chi-square test for this structure was examined along with other measures of the quality of fit of the factor structure to the data, such as the Adjusted Goodness of Fit Index (AGFI) and the Root Mean Square Error of Approximation (RMSEA). It has been suggested that a RMSEA value of .05 indicates a close fit and values up to .08 represent reasonable errors of approximation (Joreskog & Sorbom, 1993).

Item Response Theory analysis was used to further establish a number of important properties for each subscale/domain including invariance of items across the domain, item discrimination, and residual fit statistics for each item. Scale characteristics were explored with the one-parameter polytomous Partial Credit Model (Masters, 1982) and the two-parameter polytomous Generalized Partial Credit Model (Muraki, 1992). Model fit was tested in a validation sample as well as relevant primary subsamples such as military personnel or gender groups. While yoga students and instructors or military and non-military participants may rate a yoga session differently, their group membership at any given level of the trait should not influence how they score. Differential item functioning analysis allows for the detection of instrumentation bias. Items identified as demonstrating significant differential functioning were removed from the final measure.

Phase IV

The objective of Phase IV is to test the psychometric properties of the Essential Properties of Yoga Questionnaire (EPYQ), including interrater, internal, and test-retest reliability, and concurrent and predictive validity. Because this questionnaire is a measure of *process* (i.e., what a particular yoga session or intervention consists of, rather than an outcome), we will establish reliability and validity appropriate for process measures. This phase is ongoing.

Each of the three research sites will host three individual yoga classes at community partner facilities. The UC San Diego site will hold three additional classes with military/veterans. Within each site, efforts will be made to use differing styles of yoga, different instructors, and different yoga studios/centers when possible. Only research participants will be allowed to attend these classes. These classes will be held as usual classes at usual locations but will be held at a day/time not regularly scheduled so that participants will know that the class is a special research-related class. Yoga classes will be video-recorded and independent observers will rate the video-recorded sessions, thus providing ratings from students, teachers, and more objective observers. Recruitment will be similar to other phases, primarily occurring through announcements, flyers, and word of mouth at local community partner yoga studios/centers. Data from Phase III for the items retained in the final version of the EPYQ will also be used in Phase IV analyses.

Measures. We initially identified four instruments that we expect will correlate with specific yoga components. These include measures of exercise exertion, state mindfulness, therapist warmth, and exercise-induced feelings. We will administer these instruments along with standard demographics and the EPYQ instrument (developed in Phase III). Exercise exertion will be assessed with the **Borg centiMax (CR100) Scale** (Borg & Kaijser, 2006), an analog scale assessing the extent to which the participant found the class physically taxing. The Borg scale has excellent psychometric properties (Borg & Kaijser, 2006). The **Therapist Warmth and Friendliness Subscale of the Vanderbilt Psychotherapy Process Scales** (VPPS) (O'Malley, Suh, & Strupp, 1983) will be used to assess the yoga instructor's (therapist's) display of friendliness, warmth, and personal involvement. It consists of five items (e.g., "Showed warmth and friendliness towards the student") that are rated from 1 (not at all) to 5 (very much). The VPPS exhibits strong reliability and validity in a variety of therapeutic settings (Windholz & Silberschatz, 1988). State mindfulness will be assessed with the **State Mindfulness Scale** (SMS) (Brown & Ryan, 2003). Five items tap a state of mindfulness that will be asked regarding the experience in class (e.g., "I found myself preoccupied with the past or the future" (reverse-scored) and rated from 1 (not at all) to 6 (very much). Reliability and validity of the SMS are very good (Brown & Ryan, 2003). **The Exercise-Induced Feeling Inventory** (EIFI) consists of 12 feelings that participants rate currently experiencing from 0 (do not feel) to 4 (feel very strongly). This instrument has four subscales (Positive Engagement, Revitalization, Tranquility, and Physical Exhaustion), has good psychometrics (Gauvin & Rejeski, 1993), and has been used successfully in yoga research (Streeter et al., 2007). The final battery of questionnaires is still in development.

Reliability. Reliability will be established through ratings of yoga sessions. (1) **Interrater reliability** will be conducted on (a) EPYQ scores of independent observers of each class video, and (b) EPYQ scores of student and instructor questionnaires for each class. In particular, intraclass correlations will be computed. (2) **Internal consistency** will be computed for the measure using Phase III data. In addition, data from students and teachers will be examined for consistency. To assess how well the items compris-

ing each subscale identified in a factor analysis in Phase III tap a single underlying construct, we will compute Cronbach's alpha coefficients for each EPYQ dimension subscale (Cronbach, 1951). We will also compute corrected item-scale correlations for each of the EPYQ subscales and the full scale (Schmitt, 1996). A correlation of .4 has been deemed acceptable for supporting item internal consistency (Stewart & Ware, 1992). (3) **Test-Retest Reliability.** To assess the stability of measurement over time, we will conduct a test-retest reliability substudy in which the independent observers rate the same video-recorded yoga session twice, with two weeks separating the ratings, and with other sessions rated in between the repeat ratings. The test-retest reliability coefficient will be computed following Magnusson's (1967) recommendations. Fleiss (1986) recommended a sample size of 15-20 raters to examine test-retest reliability of quantitative variables.

Validity. Concurrent validity will be assessed by comparing the EPYQ scores gathered in Phase IV with other questionnaires rated immediately after the class, including perceived physical exertion, teacher warmth and friendliness, feeling states, and state mindfulness. We expect that physical challenge or demands will be related to higher levels of exertion during the class; a dimension tapping teacher characteristics will be reflected in teacher warmth; and a dimension tapping mindfulness will be related to higher scores on state mindfulness experienced during the class. We anticipate that scores on the EPYQ showing a higher emphasis on peace/relaxation or energy will be reflected in students having more of those feelings after the yoga class. **Discriminant/convergent validity** of the EPYQ dimension subscales will be examined in the large (Phase III) dataset by comparing scores on the EPYQ across different styles of yoga. We expect scores on some dimensions to vary by type of yoga. For example, we expect that students reporting on their experience in an Iyengar class will report a higher degree of focus on poses and form, while students reporting on their experience in restorative yoga classes will report more focus on relaxation, and students reporting on their experience in Ashtanga or Baptiste will report a more physically demanding class.

Study Management

Each of the three study sites continues to be actively involved in all phases of this study. While recruitment has occurred and will occur at all study sites, the University of Connecticut (location of the study PI) served as the lead administrative site throughout the study. Staff at UConn coordinated biweekly or monthly conference calls and central IRB efforts. Boston University served as the lead site for the literature review and focus groups in Phase I and the cognitive interviews in Phase II. With extensive expertise working with qualitative data and measure development, Boston University completed the literature review, analyzed focus group data, and formalized procedures for the cognitive interviews and took the lead analyzing the cognitive interview data. The UCSD site served as the lead site for item-reduction analysis in Phase III to derive the EPYQ factors and remove any unnecessary items from the measure. The UCSD site will also serve as the lead site for recruiting and enrolling military and veteran participants for Phase IV and qualitative interviews. Finally, UConn will lead most analyses for Phase IV. All sites have participated in the dissemination of research results.

Discussion

Although the term *yoga* is commonly used to refer to an instructor-led or self-directed series of postures that are coordinated with breathing and cognitive attention or concentration, yoga in the generic sense is a broader philosophy and set of practices that can encompass many activities outlined in the Yoga Sutras and other ancient Vedic texts. Examples include meditation and breathing exercises as well as behavior towards oneself and others, such as diet and ethical principles. Thus, many diverse practices are rightly described as yoga or yoga-based.

To better describe yoga interventions and yoga practices, our project identifies and classifies the essential dimensions of yoga interventions in order to develop a psychometrically sound measure of yoga components. There is currently no way to quantify the various components across which yoga interventions may differ. There is also currently no way to compare interventions against one other, so it is not possible to systematically study the relative effects of various yoga interventions on health outcomes. This measurement void highlights the necessity of developing a "process measure" of what happens in a given yoga intervention in order to facilitate yoga research. Quantifying dimensions of yoga interventions can advance the scientific conceptualization that some have of yoga as a unitary or imprecise phenomenon to a much more sophisticated and differentiated set of phenomena. Once developed, this tool will lead to the asking and answering of a variety of complex research questions that are currently beyond the reach of yoga researchers.

The EPYQ is a measurement tool that will characterize and describe which components of yoga are most emphasized for a given intervention. By intervention, we are referring to a series or recommended course of yoga sessions designed to produce measurable changes in health. Individual sessions may vary within an intervention, and thus our goal is to describe the intervention as a whole. For

example, if researchers are designing an intervention for improving metabolism and improving diabetes, they may propose to study a physically active style of yoga and can explain their reasoning for doing so. In another case, researchers may want to compare the effects of two different yoga interventions for asthma, one that emphasizes breathwork and one that more subtly integrates breathwork with asanas and meditation, in which case the interventions can be described and differences in outcomes can be observed. Linking components of yoga to outcomes at the intervention level can be achieved by compiling and meta-analyzing an EPYQ profile and outcomes data from multiple interventions.

However, because the EPYQ is designed to rate "interventions," the value of having numerous yoga participants/students or instructors complete the EPYQ for a single intervention is unclear; results of Phase IV may shed some light on this issue. Our focus group work suggests that each individual may interpret or rate a given yoga intervention in his or her own way and each may have a very different internal experience and reference standard than others. While understanding the internal and personal experiences of yoga participants may be fruitful and interesting, the EPYQ was specifically designed to focus on tangible and observable aspects of yoga interventions. Thus, by using structured questions and objective raters, we believe that this measure can provide a useful profile for describing all yoga interventions and that the components can eventually be tied to the changes in health produced by those interventions across participants.

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