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Weekly assessment of number of yoga classes and amount of yoga home practice: Agreement with daily diaries

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ABSTRACT

Objective: To evaluate a weekly yoga practice assessment instrument designed to assess number of classes attended in the previous week, number of times engaged in formal home yoga practice, total number of minutes engaged in formal home yoga practice in the past week, and number of times engaged in informal home yoga practice. "Informal" practice was defined as "in the middle of other activities, you spent a few moments engaged in asanas/postures, focus on breath, body awareness, or very brief meditation, for less than 5 min at a time." We assessed agreement between this weekly assessment and a daily home practice log.

Design and setting: Seventy-two community yoga practitioners completed online daily yoga logs for 28 days as well as the weekly yoga practice assessment four times over the 28 day period.

Results: We examined agreement between the two methods on the four indices of amount of weekly yoga practice. We found acceptable agreement between the two methods for number of classes, number of times engaged in formal home practice, and total number of minutes engaged in formal home practice. Agreement was lower for number of times engaged in informal practice.

Conclusions: These data provide support for use of a weekly yoga practice assessment to assess number of classes attended and amount of formal but not informal home practice.

1. Introduction

Interest in hatha yoga as an intervention to improve symptoms and quality of life in people with problems such as breast cancer, asthma, depression, diabetes, chronic pain, or hypertension has increased in recent years.[1] General public interest in yoga in the U.S. is high: epidemiologic data suggest that 9% of the U.S. population has practiced yoga in the previous 12 months.[2] Yoga originated in India, and is gaining popularity in many other countries as well.[3] Yoga may be practiced in the context of a class or at home. In the epidemiological data from the U.S., of those people who practiced, only about half of them attended classes or received other formal yoga training.[2] Practitioners reported using DVDs and CDs, the internet, and printed media to guide their yoga practice. Thus, in community settings, a substantive proportion of yoga practice occurs in the home. Similarly, researchers have included home practice as an important part of yoga interventions for various problems such as chronic low back pain,[4] depression,[5] or smoking cessation[6] although we note that experts may vary in their opinions about feasibility and safety of home practice in a yoga-naïve medical population.[7] There are some data to suggest that the amount of home practice in a yoga program might have an impact on outcomes such as stress reduction.[8]

Although more home practice might be associated with improved outcomes, there is no published and validated assessment instrument for measuring amount of home yoga practice. When methods for documentation of amount of home yoga practice are described, researchers typically cite use of a written daily log[8–10] of home practice with little other description. Similarly, in a review of home practice research for Mindfulness Based Stress Reduction (MBSR), authors state that "no study reported on the psychometric properties of the monitoring methods nor included the log/diary in the appendices of the study"[11] (p. 677).

We asked participants to use a written daily log to document home practice in the context of a clinical trial of yoga for depression.[5] In doing so, we identified several limitations to its use. First, some participants did not complete the log every day, and then would often want to backfill the log when they came in for yoga class each week, thus defeating the purpose of having a daily log. Second, participants varied

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in what they considered to be home practice. We asked participants to record in the log study-related activities in which they engaged at home. In doing so, some people included only a specific asana series or a particular yoga video or pranayama practice. Other participants included a much wider range of activities such as "tried to sit up straight at work," "taking the time to notice my meal," "mindful shower," "washing dishes," "walking," "breathing + avoiding the monkey brain, often during the day," or "using wise mind" (Uebelacker, unpublished data). Many of these activities are likely examples of the use of mindfulness during everyday life, which was certainly advocated by yoga teachers and in written suggestions for home practice. However, these data point to two issues with home practice logs: a) home yoga practice should likely be explicitly defined so that investigators and participants are in agreement as to what constitutes yoga practice; and b) participants believe that "informal" practice – i.e., allowing yoga to inform how they go about activities in everyday life – is important. MBSR researchers employ a similar distinction between "formal" and "informal" home practice.[12]

In order to address limitations and lack of specificity of existing yoga home practice measurement, we developed a measure of home yoga practice. First, in order to reduce burden on participants, we created a weekly (rather than daily) log. Second, we provided definitions of yoga practice. Third, we attempted to measure both formal and informal home yoga practice. In the current study we asked community yoga practitioners to complete both the weekly practice assessment and a daily log of home yoga practice. We hypothesized that the weekly yoga practice assessment would show good agreement with the daily practice logs on four variables: a) number of yoga classes per week; b) number of times engaged in a formal home yoga practice per week; c) number of minutes of formal home yoga practice per week; and d) number of times engaged in an informal home yoga practice per week. If agreement was good, this suggests that the weekly assessment – rather than a daily log – is an acceptable way to measure amount of practice. Although our primary focus was on measuring home practice, we thought it useful to also capture number of classes per week.

2. Materials and methods

2.1. Procedures

We advertised the study via two methods: circulation of postcards at local yoga studios, and by asking local yoga instructors to include the same advertisement on their social media pages. The advertisement said: "Practice yoga? We need your help. Help us pilot test an online system for understanding and tracking different types of yoga practice." Participants were then given a link which led them to an online REDCap survey page. On that page, participants read an informed consent form and responded yes or no that they met the following inclusion criteria: aged 18 or older, practice yoga on a weekly basis, and have regular access to a computer or smartphone. If they agreed that they met those criteria, they were given an opportunity to enroll in the study. Participants were given information to contact researchers if they had questions. Participants then completed a) longer surveys at baseline, week 1, week 2, week 3, and week 4; b) brief daily surveys for 28 days. They were paid $10 for each longer survey and $2 for each daily survey, in one check, after study completion. All surveys were completed in REDCap. Daily survey links were automatically sent to participants' email addresses each day in the early evening and expired after 18 h. Enrollment occurred over a 1-month time period in 2018. The Butler Hospital IRB determined that this study was exempt from IRB oversight.

2.2. Assessments

2.2.1. Baseline questionnaire

At baseline, participants completed a questionnaire describing demographic characteristics and characteristics of their yoga practice.

2.2.2. Daily diary

Each day, participants were asked to complete a brief survey in REDCap with the following elements with regard to that day: number of classes attended, total time in minutes in yoga classes, times engaged in formal home yoga practice, average number of minutes each time, types of activities used in that formal home practice, times engaged in informal home practice, and types of activities used in that informal home practice. We defined "formal" home practice as "you set aside a time and engaged in asanas/postures, pranayama or focus on breath, or meditation for at least 5 min at a time." We defined "informal" home yoga practice as "in the middle of other activities, you spent a few moments engaged in asanas/postures, focus on breath, body awareness, or very brief meditation, for less than 5 min at a time."

2.2.3. Weekly questionnaire

The weekly practice yoga questionnaire was structured almost identically to the daily questionnaire, except that it (repeatedly) referred to the amount and type of practice engaged in *during the past week*. In addition, each week, participants completed one other questionnaire that is not reported in this paper.

2.3. Participants

One hundred thirty-two people went to the initial REDCap page with the informed consent form. Of those, 80 completed the informed consent and enrolled in the study, and 72 completed any of the assessments. The sample was predominantly female and White, with 50% of the sample endorsing being trained as yoga teachers. Participants practiced a range of yoga styles. Please see Table 1 for details about demographics and yoga practice.

Table 1
Demographics and Predominant styles of yoga practice in this sample (n = 72).

	n	%
Gender		
Female	66	92%
Male	6	8%
Trained as a Yoga Instructor	36	50%
Hispanic/Latino		
Yes	3	4%
No	65	90%
Preferred not to say	4	6%
Race		
American Indian	1	1%
Asian	1	1%
Black or African American	2	3%
Multiracial	3	4%
White	63	88%
Preferred not to say	2	3%
Predominant Yoga Style		
Ashtanga	12	17%
Bikram	3	4%
Hatha	31	43%
Iyengar	4	6%
Kripalu	1	1%
Kundalini	0	0%
Restorative	19	26%
Viniyoga	21	39%
Vinyasa	43	60%
Yin	17	24%
Other	8	11%
	Mean	SD
Years of Age (Range = 19-74)	44.8	14.8
Years Practicing Yoga (Range = 1-40)	11.6	8.9

Note. "Other" yoga included: power, yoga and pilates, fluid, Integral yoga, kids, iRest Yoga Nidra, chair, "breath centric, pranayama, meditation," and Sivananda. Participants could choose more than one style.

2.4. Statistical methods

We used descriptive statistics to summarize baseline demographic and yoga practice characteristics of the sample. We next used data from the daily diaries to created weekly variables that represented the aggregated daily diary data. We included all available data, and making the assumption that people were more likely to forget or not have time to log yoga practice on days on which they did not practice, imputed 0 classes and no home practice on days when data were missing. We chose this approach rather than excluding people with a certain amount of missing data because we wanted to include the maximum number of people, and not restrict our range for comparison with the weekly assessments.

We computed weekly scores as long as participants completed at least one day of the daily diary that week. We calculated means and standard deviations, paired-sample t-tests (i.e., comparing aggregated daily diary and weekly variables), and the corresponding index of effect size of the difference between methods (Cohen's d for dependent groups) for all indices of amount of yoga practice, and for all weeks. For Cohen's d, reference ranges are: small effect size, d = 0.20; medium effect size, d = 0.50; and large effect size, d = 0.80.[13] We then compared aggregated daily diary variables with weekly variables using an intraclass correlation coefficient (ICC). We used a two-way random effects model using a consistency definition, with the between-measure variance excluded from the denominator variance. We computed ICCs for a) each week separately; b) all available weeks included for all participants. In order to characterize ICCs, we used the following rules of thumb: between 0.75–1.00 indicates excellent agreement, between 0.60 and 0.74 indicates good agreement; between 0.40 and 0.59 indicates fair agreement, and less than 0.40 indicates poor agreement.[14]

3. Results

3.1. Missing data

Of 72 people, 69% (n = 50) had 4 or fewer days missing in the daily diary over the 28 day period. Nineteen percent (n = 14) did not have any days missing. Mean number of days missing over the 28-day period was 4.5 (SD = 5.4). The mean number of days missing per week ranged from 0.88 (week 3; SD = 1.35) to 1.33 (week 1; SD = 1.85). For the weekly assessments, 72% (n = 52) of participants completed these all 4 weeks, 17% (n = 12) missed 1 week, and 11% (n = 8) missed two weeks. No one missed more than two weeks. See Table 2 for further description of missing data by week.

3.2. Comparison of amount practice reported in weekly questionnaires and aggregated daily diaries

Table 2 provides means and standard deviations of four key variables: number of yoga classes per week, number of times engaged in formal home practice per week, number of minutes engaged in formal home practice per week, and number of times engaged in informal

Table 2
Description of amount of yoga practice and missing data.

	Reported in weekly Questionnaire		Aggregated from daily diaries		Paired sample t-test			Cohen's d For paired samples
	Mean	SD	Mean	SD	T	df	p	
Number of yoga classes								
Week 1	2.24	2.31	2.16	2.22	0.55	62	0.583	0.07
Week 2[1]	2.43	2.28	2.41	2.33	0.18	60	0.860	0.02
Week 3	2.79	3.15	2.36	2.50	3.07	65	0.003	0.38
Week 4	2.48	2.77	1.87	1.85	2.73	62	0.008	0.35
Number of times engaged in a formal home yoga practice per week								
Week 1[2]	4.33	4.43	4.44	4.77	−0.22	63	0.823	0.03
Week 2	4.65	5.14	3.68	3.68	2.19	61	0.032	0.28
Week 3	4.27	4.87	3.62	4.17	1.80	65	0.077	0.22
Week 4	4.27	5.29	3.61	3.88	1.83	60	0.073	0.23
Number of minutes engaged in formal home yoga practice per week								
Week 1[3]	127	134	110	131	1.02	63	0.310	0.13
Week 2	104	102	94	95	1.12	56	0.270	0.15
Week 3	99	107	93	113	0.57	58	0.573	0.08
Week 4	108	109	96	106	1.32	57	0.191	0.18
Number of times engaged in informal home yoga practice per week								
Week 1	7.99	11.42	14.95	20.71	−3.65	65	0.001	0.45
Week 2	10.38	15.43	16.02	26.04	−2.10	59	0.040	0.27
Week 3	10.74	18.42	15.42	22.72	−2.10	65	0.040	0.26
Week 4[4]	10.65	15.70	10.58	12.79	0.62	58	0.951	0.01
Number of participants with data missing for a particular week								
	N	%	N	%				
Week 1	5	7%	4	6%				
Week 2	8	11%	1	1%				
Week 3	6	8%	0	0%				
Week 4	10	14%	1	1%				

[1] We excluded one outlier for which the number of classes reported on the weekly questionnaire was implausible (response = 25) and > 7 SD from the mean calculated with all weeks combined.

[2] We excluded one outlier for which the number of times engaged in a formal home yoga practice classes reported on the weekly questionnaire was implausible (response = 60) and > 9 SD from the mean calculated with all weeks combined.

[3] We excluded one outlier for which the number minutes engaged in a formal home yoga practice classes reported on the weekly questionnaire was implausible (response = 1500; this was the same person reporting having engaged in formal home yoga practice 60 times in the week) and > 9 SD from the mean calculated with all weeks combined.

[4] We excluded one outlier for which the number of times engaged in informal home yoga practice as calculated from daily diaries was implausible (response = 200) and = 8 SD from the mean calculated with all weeks combined.

Table 3
Intraclass correlations for aggregated daily and weekly variables.

	Number of yoga classes per week	Number of times engaged in a formal home yoga practice per week	Number of minutes engaged in formal home yoga practice per week	Number of times engaged in informal home yoga practice per week
Week 1				
Valid n	63	64[2]	64[3]	66
ICC (95% CI)	0.87 (0.80 - 0.92)	0.64 (0.47 – 0.77)	0.50 (0.30 – 0.67)	0.57 (0.38 – 0.71)
Week 2				
Valid n	61[1]	62	57	60
ICC (95% CI)	0.89 (0.82 - 0.93)	0.70 (0.55 – 0.81)	0.78 (0.65 – 0.86)	0.53 (0.32 – 0.69)
Week 3				
Valid n	66	66	59	66
ICC (95% CI)	0.92 (0.88 - 0.95)	0.79 (0.68 – 0.87)	0.75 (0.61– 0.84)	0.62 (0.44 – 0.75)
Week 4				
Valid n	63	61	58	59[4]
ICC (95% CI)	0.72 (0.58 – 0.82)	0.81 (0.71 – 0.88)	0.80 (0.69 – 0.88)	0.78 (0.66 – 0.86)
All weeks combined				
Valid n	253[1]	253[2]	238[3]	251[4]
ICC (95% CI)	0.86 (0.82 – 0.89)	0.73 (0.67 – 0.79)	0.68 (0.60 – 0.74)	0.59 (0.51 – 0.67)
Description of ICCs	Excellent	Good	Good	Fair

[1] We excluded one outlier for which the number of classes reported on the weekly questionnaire was implausible (response = 25) and > 7 SD from the mean calculated with all weeks combined.

[2] We excluded one outlier for which the number of times engaged in a formal home yoga practice classes reported on the weekly questionnaire was implausible (response = 60) and > 9 SD from the mean calculated with all weeks combined.

[3] We excluded one outlier for which the number minutes engaged in a formal home yoga practice classes reported on the weekly questionnaire was implausible (response = 1500; this was the same person reporting having engaged in formal home yoga practice 60 times in the week) and > 9 SD from the mean calculated with all weeks combined.

[4] We excluded one outlier for which the number of times engaged in informal home yoga practice as calculated from daily diaries was implausible (response = 200) and = 8 SD from the mean calculated with all weeks combined.

home practice per week. We used paired sample t-tests to determine whether there were differences in means. There were some statistically significant differences. For number of yoga classes and number of times engaged in formal home practice, when there were differences, the weekly report tended to be somewhat higher than the aggregated daily report. Cohen's D-values for the difference between methods ranged from a very small effect size (d = 0.02) to a small-to-moderate effect size (0.38). There were no significant differences between methods in number of minute of formal home yoga practice. In contrast, for number of times engaged in informal home practice, the sums derived from the daily diary tended to be higher than the weekly reports, with effect sizes ranging from very small (d = 0.01) to medium in size (d = 0.45).

We used intraclass correlations to compare reliability of aggregated daily and weekly variables. See Table 3. Examining the overall pattern of ICCs, we concluded that the number of yoga classes per week tended to show excellent agreement between the two methods; number of times engaged in formal home yoga practice and number of minutes engaged in formal home yoga practice tended to show good agreement between methods; and number of times engaged in informal home practice showed only fair agreement between methods.

4. Discussion

Daily diary approaches to recording of behaviors are often preferred because they lessen recall bias.[15] However, daily diaries can be burdensome to participants, and when they are not completed every day, result in missing data. In this study, we found that a weekly assessment of yoga practice showed acceptable agreement with daily diaries on three of the four variables we assessed. Inspection of means showed that participants tended, on average, to attend 2–3 yoga classes per week and to engage in weekly formal home practice 3–4 times per week. Both of these means are plausible in a sample of people committed to yoga participation. We did, however, find that two participants each provided a single value on one weekly assessment that was implausible and an extreme outlier. To avoid this, we recommend using data capture methods that may limit the responses only to plausible values. In this study, we did see somewhat more missing data in the weekly assessments than in the approximations of amount of weekly practice that were based on aggregated daily assessments. However, when there is daily data missing (as was the case about 16% of the time), the researcher must either make an assumption about why that data is missing and then choose a corresponding way of imputing missing data (as we did), or not calculate a weekly practice amount for participants with any daily diary missing.

We attempted to capture the number of times participants engaged in informal home yoga practice, but the agreement between the daily and weekly methods of data collection was only fair. Because there is no "gold standard" against which to compare these methods, we cannot say which method might more accurate or even sufficiently accurate. Informal practices are potentially very brief and integrated with day-to-day activities, and therefore it may quite difficult for participants to determine the number of times they engaged in these practices. Further, at the end of the week, it may be especially difficult to remember how many times they engaged in informal practice during the week. Although we cannot yet recommend a way to capture the amount of informal practice, we do think that the amount of informal practice is potentially important. When participants provided qualitative evaluations of their experience of yoga in our clinical trial of yoga for depression, many participants discussed the importance of this informal type of practice, saying "I've learned to use the yoga in many situations and throughout the day"(p.153) and "the breathing [is]… something I can do at work whenever I feel stressed" (p.154).[11] Thus, we think it worthwhile to continue to pursue methods for assessing the degree to which people are able to subtly integrate yoga-based practices into their everyday lives.

One limitation of this research is related to potential sample effects. All participants practiced yoga in the community, taking an average of

Table 4
Recommended version of the weekly yoga home practice assessment.

Question	Conditional Logic	Answer constraints
1. How many yoga classes did you go to in the past week?	None	Recommended range: 0-14
2. On average, how long was each class (in minutes)?	Ask if response to #1 > 0.	Recommended range: 10-150
3. In the past week, have you engaged in formal home yoga practice? By formal home practice, we mean that you set aside a time and engaged in asanas/ postures, pranayama or focus on breath, or meditation for at least 5 minutes at a time.	None	Choose one: Yes No
4. How many times did you engage in formal home practice? If you are not sure, please make your best guess.	Ask if response to #3 = Yes.	Recommended range: 0-35
5. Each time you engaged in formal home yoga practice in the past week, about how many minutes would you spend on average?	Ask if response to #3 = Yes.	Recommended range: 0-150
6. Please select any activities you did during home yoga practice this week:	Ask if response to #3 = Yes.	May choose one or more than one: Asanas/ postures Pranayama or focus on breath Meditation Used a video, app, or other online resource Other related activities, such as study of yoga or intention setting
7. Please list other activities:	Ask if response to #6 = other related activities	None (string variable)

Note. We omitted questions about informal home yoga practice as we do not recommend their use at this time.

more than 2 classes per week and practicing yoga at home. Half were yoga teachers. Thus, this is a sample that is very dedicated to yoga practice, and is unlike a yoga-naïve sample that might enroll in an intervention to introduce yoga as an intervention for a health problem. We sought out this type of sample on purpose in order to have a group of participants with non-zero levels of weekly yoga practice. However, we acknowledge that there may be differences from a clinical sample. In particular, clinical samples who are engaged in a research project that includes other data collection as well as some type of intervention, and who have a distressing clinical condition such as depression or chronic pain, may be more easily fatigued by a daily diary and there may be more missing data as a result. In contrast, the dedication to yoga practice in the current sample may have resulted in relatively high levels of adherence to completion of daily diaries and weekly assessments.

In sum, we strove to validate a weekly assessment of number of yoga classes taken, and amount of home yoga practice. We provide a copy of the weekly assessment of yoga classes and formal home yoga practice in Table 4 so that others may use the same assessment. We believe that the agreement with the daily diary method suggests that the weekly assessment of yoga classes and formal home practice is an acceptable option for research. The field as a whole will continue to benefit from refinement of methods of assessing "dosage," as amount of time engaged in practice may in fact predict response to a yoga-based intervention.

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Conflicts of interest

Dr. Uebelacker's spouse is employed by Abbvie Pharmaceuticals. Other authors have no conflicts of interest to disclose.

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