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Is Less More? A randomized Comparison of Home Practice Time in a Mind-Body Program

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Abstract

Home practice is a major component of mind-body programs, yet little is known about how to optimize the amount of prescribed home practice in order to achieve an effective “dose” of practice while minimizing participant burden. This study tested how varying the amount of home practice in a mind-body program impacts compliance and stress reduction, and whether prescribing a flexible home practice schedule increases compliance. Eighty-four stressed participants undergoing a 12-week yoga program were randomized to low, medium, and high home practice conditions. The medium condition allowed participants the flexibility to choose one of two amounts of practice each day. The low practice group exhibited the highest compliance (91%) compared to the medium and low practice groups (~60%), but exhibited the lowest total practice time, and did not significantly reduce stress. The high practice group was the only group to achieve significant stress-reduction, which was maintained 12 weeks post program. Prescribing a flexible home practice schedule did not increase compliance. Results suggest that prescribing higher practice doses may maximize practice time and symptom reduction despite lower compliance.

Keywords

Mind-body; yoga; stress; home practice

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1. Introduction

Yoga and meditation-based programs reduce stress and alleviate symptoms of a broad range of mental and physical ailments (Balasubramaniam, Telles, & Doraiswamy, 2013; Chiesa & Serretti, 2011). Prescribed daily home practice is commonly regarded as one of the key therapeutic elements of these programs and as essential for treatment benefit as exercise is for muscle growth (Kabat-Zinn, 1990). Home practice is often viewed within the framework of skill development which requires regular rehearsal for mastery and gaining the desired outcome (Parsons, Crane, Parsons, Fjorback, & Kuyken, 2017). Maximizing amount of home practice is thus a high priority in mind-body interventions (Crane et al., 2014). However, home practice may pose a burden on participants, and a compliance is highly variable (Parsons et al., 2017). Importantly, the relationship between amount of prescribed practice, the degree to which participants comply with their prescribed practice, and clinical outcome is currently unclear.

Many mind-body studies do not report the relationship between home practice compliance and outcome (Carmody & Baer, 2009), and those which do have found mixed results (Vettese, Toneatto, Stea, & Wang, 2009). Some studies have found that amount of home practice is correlated with stress reduction (e.g. Davis, Fleming, Bonus, & Baker, 2007; Quach, Gibler, & Mano, 2017) and other clinical outcomes (e.g. Crane et al., 2014; Grow, Collins, Harrop, & Marlatt, 2015) while other studies have not (e.g. Cadmus-Bertram et al., 2013; Davidson & Kabat-Zinn, 2004; Speed-Andrews, Stevinson, Belanger, Mirus, & Courneya, 2010). A recent meta-analysis of Mindfulness-Based interventions (Parsons et al., 2017) found substantial heterogeneity in the amount of reported home practice, with a weak (r=.26) yet statistically significant association between self-reported home practice and outcome. However, the correlational/observational approach in these studies may be severely confounded by individual differences and other factors. A randomized examination of the effects of home practice is thus needed in order to determine the specific and causal role of home practice.

A specific strategy which may improve individuals' propensity to comply with a home practice regimen is increasing participants' sense of autonomy and personal choice. Autonomy can predispose individuals to comply with requests and instructions (Guéguen & Pascual, 2000), and is associated with interest, a positive emotional tone, and persistence in behavioral change (Deci & Ryan, 1987). Importantly, a sense of autonomy facilitates intrinsic ("want-to" rather than "have-to") motivation, which involves action out of personal interest, excitement, enhances performance, and promotes goal attainment (Deci, 1975; Deci & Ryan, 1987). However, to our knowledge the effects of increasing individuals' sense of autonomy and personal choice on practice compliance has not been examined.

To disambiguate the relationships among prescribed amount of home practice, actual time spent practicing, compliance and outcome, we randomized participants enrolled in a yoga program to one of three amounts of prescribed home practice; low, medium, and high. Prescribed practice lengths were determined based on popular mind-body programs which commonly prescribe 40 minutes a day (e.g. Kabat-Zinn, 1990; Segal, Williams, & Teasdale, 2013) and other popular methods of practice such as the Headspace mobile app which rely

on short 10-minute practice sessions. The practice frequency of 6 days a week was similarly chosen in order to match the frequency prescribed in other popular mind-body interventions (Bowden, Gaudry, An, & Gruzelier, 2012; Kabat-Zinn, 1990; Raghuram, Deshpande, & Nagendra, 2008; Segal, Williams, & Teasdale, 2013a). We hypothesized that the low practice group (10 minutes per day) would have higher compliance than the high practice (40 minutes a day) and medium practice groups, but lowest total practice time. To test the potential effects of autonomy on compliance, the medium practice group contained a novel element of flexibility. This group was instructed to practice 10 minutes 3 days a week and 40 minutes 3 days a week, with the autonomy to choose which days to practice each amount in a way that best fits their needs. We hypothesized that this increased autonomy and flexibility would promote the highest amount of practice.

2. Methods

2.1 Participants and Procedure

The study was part of a larger study examining the effects of yoga on health behaviors including diet and exercise, which will be reported elsewhere (Braun et al., in preparation). Recruitment began in April 2015 and follow-up assessments concluded in October 2016. Sample size was determined based on power calculations of the larger study dietary measures. Participants were recruited from two sites, the greater Boston Area and Eastern Connecticut via online advertisements for a stress reduction program, in public transit and direct mail advertisements. Potential participants completed a web survey and phone screen, followed by an in-person screening appointment where they provided written informed consent and completed the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1997), the Eating Disorders module from the Structured Clinical Interview (SCID), and a BMI assessment. Participants had to be between the ages of 23 and 67. Exclusion criteria, implemented as part of the larger study, included an exercise regimen of more than 180 minutes per week (based on Haskell et al., 2007), daily consumption of 5 or more servings of fruits and vegetables, current diagnosis of psychiatric illness as determined by the MINI and SCID eating disorder module, significant previous meditation/yoga experience (defined as ≥12 classes in last 3 years or more than 20 classes in lifetime), medications that alter appetite, and medical conditions that would limit the ability to exercise or do yoga. Following screening, 117 volunteers gave informed consent. Eighty-four participants were randomized. Participant flow and available data are detailed in Figure 1. Participants received the program for free and were remunerated up to $100 for completing study assessments. The study protocol was approved by the Institutional Review Boards (IRB) of Massachusetts General Hospital and the University of Connecticut and monitored by Westat. The protocol is registered in Clinicaltrials.gov (NCT02098018).

Participants were randomized with equal allocation ratio into one of three groups (see Table 1) in blocks of 6 stratified by gender at each class site/location (Boston or Eastern Connecticut). The randomization list was generated via an algorithm on SealedEnvelope.com and imported into RedCap, where the randomization module was used to assign participants to groups. Randomization occurred after the first class in an effort to randomize participants who have shown enough commitment to show up for at least one

class. Participants in the "low practice" group were instructed to practice 10 minutes a day 6 days a week, participants in the "medium" group were instructed to practice 40 min a day 3 days a week and 10 min a day 3 days a week, and participants in the "high practice" group were instructed to practice 40 minutes a day 6 days a week for the duration of the 12-week program. No differences were found between groups in age ($F(2,81)=0.76, p=.47$), gender ($X^2(2)=0.38$, $p=.83$), race ($X^2(6)=1.83$, $p=.93$), or level of education ($X^2(4)=1.05$, $p=.64$; Table 1). The perceived stress questionnaire was completed using RedCap and homework logs ($M=8.28$, $SD=3.85$ for study completers) were handed to an unblinded research assistant.

2.2 Stress reduction program

The 12-week Kripalu Yoga program was comprised of two segments: 1) an 8-week manualized protocol with 2-hour weekly sessions that included 25–30 minutes of didactic content, 20–25 minutes of experiential exercises and 75–90 minutes of yoga practice, followed by 2) four weekly 90-minute yoga classes without didactic content. The 8-week protocol was created and piloted by collaborators at the Kripalu Center for Yoga and Health, and modified for use with this population by the second author, a 200-hour certified yoga therapist and 500-hour certified Kripalu yoga teacher. The two-segment intervention design was implemented to give participants theoretical and applied grounding in important yogic practices and concepts before offering standard yoga classes.

Each session of the 8-week manualized protocol comprised a didactic section including group discussion (25–30 min), an experiential section in which participants practiced specific yogic techniques (20–25 min), and a full yoga class (75–90 min). Session themes were as follows: Introduction to Kripalu Yoga (Session 1), Witness Consciousness (a concept similar to mindfulness, Session 2), Finding Your Edge (avoiding over or under-efforting, Session 3), Breathe Relax Feel Watch Allow (BRFWA; a Kripalu-based stress reduction technique), BRFWA during Yoga (Session 4) and during daily life activities (Session 5); Self-Kindness (Session 6), Body Wisdom (listening to one's body, Session 7), and Autonomy (developing a home practice, Session 8). The remaining four weeks of classes comprised of 5–10 minutes of centering (e.g., meditation on the breath), posture warm-ups (10–20 min.), standing posture flow including sun salutations (30–40 min.), cool-down poses (10–20 min.), and final relaxation (7–10 min).

2.3 Home practice and compliance

Participants were assigned daily home practice materials corresponding to the group to which they were randomized, including videos of appropriate length (10 minutes, 40 minutes, or both) demonstrating posture flows. Home practice and compliance for each week were assessed via a written log that participants turned in at the following week's class.

2.4 Self-reported Stress

Stress levels were assessed through the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) at baseline, 8 weeks, 12 weeks (post-program), and 24 weeks (follow-up). The PSS is a 10-item scale designed to evaluate the extent to which one perceives

situations in one's life as stressful. Participants are instructed to indicate how often they felt or thought a particular way (e.g. "In the last month, how often have you been upset because of something that happened unexpectedly?") in the form of a number between 0–4. Higher scores indicate higher perceived stress. In the current sample the PSS had good internal consistency (Cronbach's Alpha=.87).

2.5 Statistical Methods

To assess the effects of prescribed home practice on actual home practice and compliance, one-way Analyses of Variance (ANOVA) were used, with group (low, medium, and high practice) as the independent variable. Practice time compliance was computed by dividing participants' average minutes of weekly home practice by their assigned home practice minutes (i.e. 60 minutes for the low practice group, 150 minutes for the medium group and 240 minutes for the high practice group). For example, a person in the low practice group who practiced 30 minutes a week on average received a compliance score of 30/60=0.5.

To assess the relationship between amount of prescribed home practice and stress reduction, a random intercept linear mixed model was used with PSS as the dependent variable to account for within-subject correlation, while also providing estimates for group, time, and their interactions. This method uses maximum likelihood methods of parameter estimation and does not require complete cases (Jennrich & Schluchter, 1986). Time was examined as a continuous or categorical predictor, and selected as categorical based on graphical examination, as well as AIC/BIC evaluation. Following evaluation of several models of correlation structure using AIC/BIC, compound symmetry was selected as optimal. Participants scoring beyond 2.5 SDs of the mean on the main outcome measures were excluded as outliers. All between-group analyses are repeated while covarying for Gender and Site (Boston or Eastern Connecticut) in order to control for their potential effects given that the randomization procedure stratified participants by these variables.

3. Results

3.1 Group differences in home practice and compliance

The ANOVA examining group differences in actual practice time (see Statistical Methods) yielded a significant effect for group ($F(2,59)=11.21$, $p<.001$, $\eta_p^2=.28$, see Table 2 for means). Post-hoc contrast comparisons revealed that the high practice group practiced more than both the low practice group ($F(1,59)=22.15$, $p<.001$, $\eta_p^2=0.27$) and, contrary to our hypothesis, the medium practice group ($F(1,59)=9.05$, $p=.004$, $\eta_p^2=0.13$). This remained significant after adding Gender and Site (Boston or Eastern Connecticut) as covariates ($F(2,57)=10.77$, $p<.001$). A similar ANOVA conducted on average number of days practiced per week was non-significant ($F(2,59)=0.01$, $p=.99$). An ANOVA conducted on practice time compliance scores (see Statistical Methods) with group as the independent variable did not reach statistical significance ($F(2,59)=2.30$, $p=.11$). To specifically test our hypothesis that the low practice group would have the highest compliance, home practice compliance scores of the low practice group were contrasted with those of the medium and high practice groups. The low practice group showed higher compliance than the medium and high practice groups together ($F(1,59)=4.48$, $p=.04$). The medium group by itself did not

significantly differ from the low practice group ($F(1,59)=2.65$, $p=.11$), or from the high practice group ($F(1,59)=0.07$, $p=.79$). Including Gender and Site as covariates yielded similar differences between the low practice group and the medium and high practice groups ($F(1,57=4.54$, $p=.037$).

3.2 Prescribed home practice and perceived stress

To test whether the program overall reduced stress within the linear mixed model (see Statistical Methods section), we contrasted baseline PSS scores with post-program PSS scores. The contrast was just-significant, with post-program PSS scores ($M=17.13$, std error=0.94) being lower than baseline scores ($M=18.90$, std error=0.77; $t(139.901)=1.94$, $p=.05$, Cohen's $d=0.27$). The group X time interaction was non-significant ($F(6,130.555)=0.73$, $p=.62$), indicating that the effect of time on stress reduction was not significantly different across groups. To determine the minimal prescribed home practice dose effective for stress reduction, contrasts comparing baseline with post-program PSS scores for groups were conducted. Only the high practice group exhibited significant reductions in PSS scores from baseline ($M=19.23$, std error=1.43) to post-program ($M=15.93$, std error=1.64; $t(131.820)=2.15$, $p=.03$; Cohen's $d=0.38$; maximal $t(132.743)=1.29$, $p=.20$) for the low and medium groups). These differences remained significant at 24 weeks, i.e.12 weeks following program completion ($M=15.06$, std error=1.76; $t(132.554)=2.503$, $p=.014$, Cohen's $d=0.47$ for the high practice group; maximal $t(138.32)=0.60$, $p=.55$ for the low / medium groups; see Figure 2). When including Gender and Site as covariates, these pre-post ($t(130.963)=2.013$, $p=.046$) and pre-follow-up ($t(131.89.)=2.384$, $p=.019$) differences in perceived stress reduction for the high group remained significant.

4. Discussion

Despite home practice being a major component of mind-body programs, the impact of prescribed practice dose on compliance and clinical outcome remains unclear. In the current study, the low practice group had the highest rates of practice-time compliance but the lowest actual practice time, and did not significantly reduce stress. The medium and high practice groups had lower rates of compliance but greater actual practice time. Importantly, only the high practice group, who reported practicing the most, significantly reduced stress, and maintained this effect 12 weeks after program completion. These results are the first to indicate a causal link between prescribed home practice dose and symptom reduction, so that only prescribing high practice results in such clinical benefit. Furthermore, results constitute novel evidence indicating that prescribing low amounts of home practice boosts compliance, but results in lower overall practice. It may therefore be advisable in such programs to prescribe higher amounts of home practice, despite the entailed lower compliance rates, due to the increased overall practice time and significant symptom reduction.

One of the novel elements of the study was inclusion of a medium practice condition, which allowed participants the flexibility to choose days to practice 40 minutes and days to practice 10 minutes to fit their schedule. The intention was to increase participants' sense of autonomy and personal choice. However, our hypothesis that this group would practice the

most was not supported. It is possible that the increased flexibility in this condition was not sufficient to elicit an increased sense of autonomy, considering that participants were still required to choose between two home practice options based on an external referent. If so, participants' choice may have been a *controlled choice*, which is associated with depletion of energy and self-control, rather than an *autonomous choice* which is not (see Moller, Deci, & Ryan, 2006). This, however, remains speculative given the lack of direct assessment of perceived degree of autonomy. Moreover, as this group additionally differed from the low and high group in prescribed practice time, it is uncertain whether any potential group differences can be attributed to participants' ability to choose or the specific amount of prescribed practice time.

A significant limitation of the study is the modest sample size and relatively high drop-out rate. This results in low power, raising the possibility that additional effects were missed. The linear-mixed model analyses applied for the main findings was chosen in part to make use of all available data and minimize the effect of missing data. Additionally, amount of home practice was self-reported, which may be potentially biased or inaccurate. Our use of weekly self-report logs, nevertheless, may have minimized some retrospective report biasing and potential social desirability effects (Sylvia, Bernstein, Hubbard, Keating, & Anderson, 2014). Future studies with larger samples and other clinical outcome metrics are warranted to further support the causal link between prescribed home practice and clinical outcome in mind-body interventions.

5. Conclusion

Our preliminary results suggest that prescribing high home practice doses results in significant symptom reduction and maximizes the dose of time spent practicing. This indicates that mind-body programs may benefit from prescribing higher doses of practice despite the lower compliance. Levels of compliance are not impacted by a flexible home practice regimen.

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Highlights

1. Only high doses of prescribed home practice yielded significant stress reduction
2. These remained significant 12 weeks following completion of the mind-body program
3. Such benefits occurred despite lower levels of home practice compliance in this group
4. Prescribing a flexible home practice schedule did not increase compliance
5. Overall mind-body interventions may benefit from prescribing high home practice doses

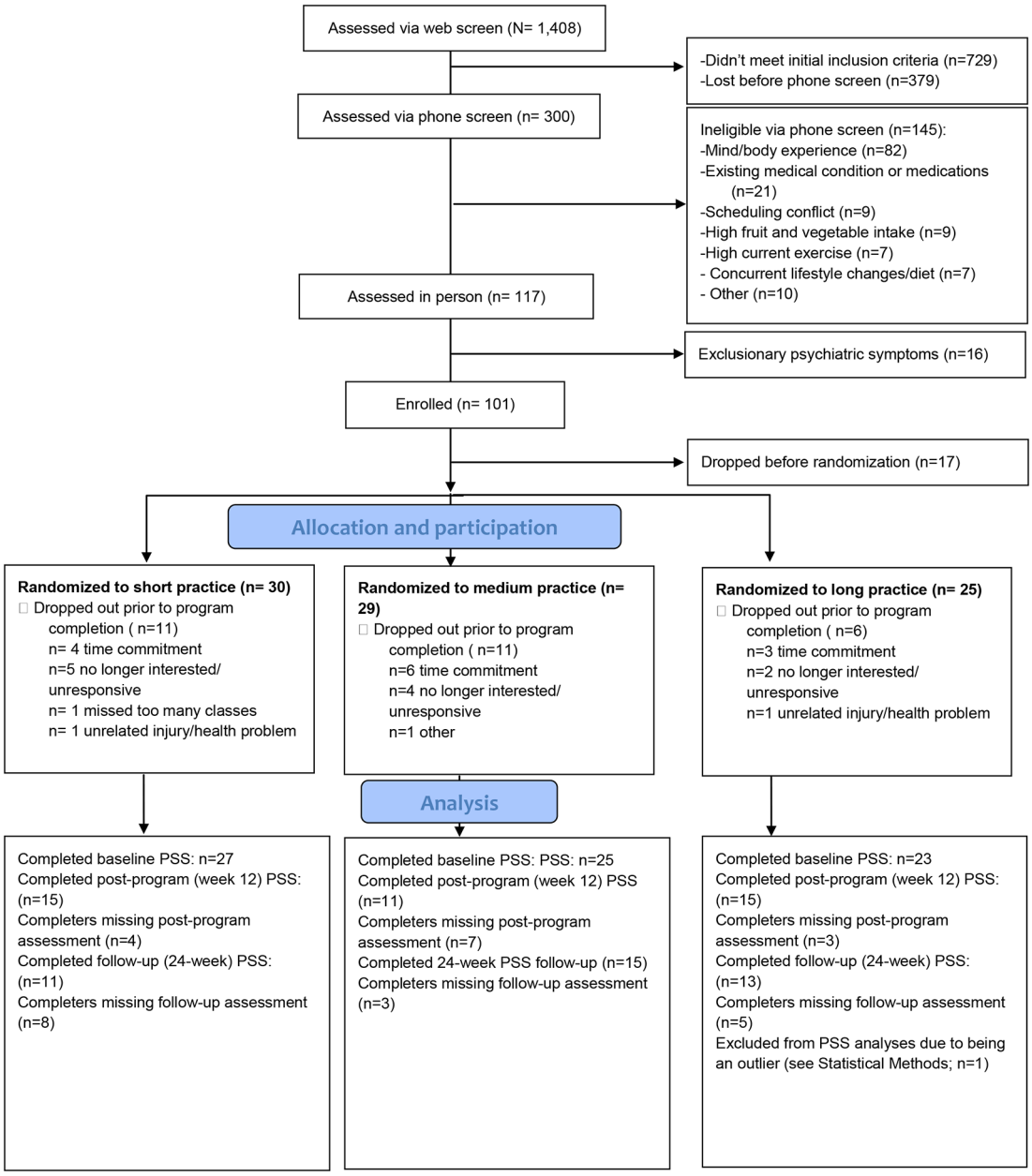

Figure 1:
Participant Flow

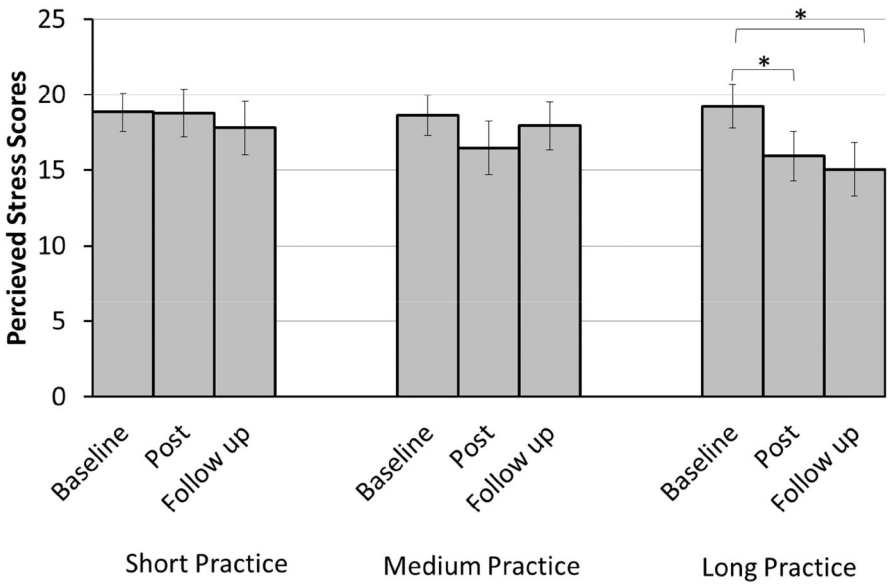

Figure 2.
Self-reported stress at baseline, immediately following the program, and 12 weeks after program completion (error bars represent standard error)

Table 1.

Group characteristics

	Low practice	Medium practice	High practice
N	**30**	**29**	**25**
Gender			
% female	70	72	68
% male	30	28	32
Average age (SD)	39.03 (14.81)	36.72 (13.43)	41.48 (14.07)
Race			
% White	63	55	68
% Asian	17	14	12
% Black/African American	3	3	4
% Other/Mixed/Not reported	17	28	16
Education			
% Some college or less	10	4	8
% 2 or 4 year college	50	41	56
% Graduate school	40	55	36

Table 2.

Practice time and compliance means (SDs in parentheses)

	Low practice	Medium practice	High practice
Prescribed weekly minutes practice	60	150	240
Average weekly minutes practice	54.85 (44.71)	87.00 (64.43)	151.13 (87.14)
Average weekly days practice	4.04 (1.66)	4.08 (1.88)	4.12 (1.96)
Average minutes compliance	91% (75%)	58% (43%)	63% (36%)
Average days compliance	67% (28%)	68% (31%)	69% (33%)