The Roles of Yoga, Mindfulness, and Cooperative Extension in Meeting and Promoting the Physical Activity Guidelines for Americans

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Abstract

Cooperative Extension (CE) is a nationwide system that addresses leading concerns for United States residents from agricultural production to healthy youth development. As 80% of Americans are not meeting the Physical Activity Guidelines (PAG), promoting physical activity is a recent addition to CE priority areas. To build capacity of CE to offer physical activity, training on physical activity within the system is needed. Since yoga is a public health intervention growing in popularity due to its link to flourishing and mental well-being, this is a holistic practice that may target physical and mental health in the United States. Due to the variety of yoga practices one could engage with it is important to clarify the link between physical activity and yoga. This dissertation included four studies to promote physical activity and yoga within CE.

Study one established the efficacy of a virtual micro-credentialing program for CE professionals (N = 64) that increased their knowledge about physical activity programming and increased their own physical activity levels. The second study was an iterative and pragmatic investigation of wellness initiatives for CE professionals to increase flourishing and physical activity within themselves. The third study explored the degree to which temperature and tempo of yoga classes impacted measured heart rate and rate of perceived exertion. Preliminary evidence suggests that ~30% of the yoga class contributed to moderate-vigorous physical activity, regardless of the temperature and speed. The fourth study was a systematic appraisal of urban and rural yoga studio offerings. The results included that most studios offer 60-minute classes, focused on asana (movement) rather than the other limbs (components) of yoga. This work also resulted in a studio audit form for CE professionals to assess yoga studios for appropriateness to recommend to their participants. Future work includes scaling out the micro-credentialing program and determining the degree to which knowledge of physical activity leads to physical activity program adoption (study 1); ensuring CE professionals have access to wellness initiatives to avoid burn out (study 2); ongoing investigation of the physiological benefits of yoga (study 3); and testing the utility of the studio audit form (study 4).

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General Audience Abstract

Physical activity is an important part of living a healthy life and can look different for everyone. The Physical Activity Guidelines for Americans recommend for people to get 2 days of full body strength training along with 150 minutes of moderate intensity aerobic activity each week. Aerobic activity is activity that gets your heart rate up. In the first manuscript of this dissertation, Cooperative Extension professionals were trained in how to promote physical activity and physical activity programming. Cooperative Extension is a nationwide program that helps get research knowledge from the universities to the public. The second manuscript looks at how Cooperative Extension professionals were able to incorporate more mindfulness, yoga, and self-care for themselves through employee wellness programs, and which programs worked best in a practical way. The third manuscript looks at if the physical practice of yoga can increase heart rate to moderate to vigorous intensity zones in order to determine if a typical community-based yoga flow could contribute to meeting the aerobic components of the Physical Activity Guidelines. Based on this study, yoga can help participants get into the moderate intensity aerobic activity zone. The fourth manuscript explores the research and development of a yoga studio audit tool. This tool helps assess yoga studios so that public health professionals can recommend the studio that is the right fit for their clients.

Dedication

To all those who encouraged me on this journey.

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With thanks…

To all the Cooperative Extension agents and staff who made my research studies possible through enthusiastic participation and feedback.

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Attributions

Manuscript 1

Dr. Laura E. Balis is at the Louisville Center, Pacific Institute for Research and Evaluation in Louisville, KY. She assisted in developing the micro-credentialing program, leading the program, and editing the manuscript.

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Dr. Samantha M. Harden is an associate professor in the Department of Human Nutrition, Foods, and Exercise at Virginia Tech. She developed the basis for the micro-credentialing outline, facilitated the partnership with Arkansas Cooperative Extension, and provided data analysis assistance.

Manuscript 2

Dr. Samantha M. Harden is an associate professor in the Department of Human Nutrition, Foods, and Exercise at Virginia Tech. She assisted in leading the employee wellness programs described in this manuscript, as well as editing the manuscript.

Manuscript 3

Dr. Samantha M. Harden is an associate professor in the Department of Human Nutrition, Foods, and Exercise at Virginia Tech. She assisted in the development of the study framework, leading the yoga sessions during the study, data analysis, and manuscript editing.

Manuscript 4

Jake Barnett is a student in the Neuroscience Department at Virginia Tech. He assisted in qualitative data analysis, manuscript writing and editing.

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Glossary

4-H- youth development education program within division of Virginia Cooperative Extension (stands for head, heart, hands, and health).

Audit- examine the performance, environment, and style of a business.

Agent/health educator- administration and professional employees of Cooperative Extension that focus on one of three program areas (agriculture and natural resources, family and consumer sciences, or 4-H youth development) while educating the community on evidence based practices.[1]

Ashtanga yoga- yoga practice that matches breath to movement in a series of poses.

Barkan yoga- yoga practice completed in a heated room, 95-100 degrees Fahrenheit through a set sequence. Three sequence options: Hot Flow Set, Hot Flow Set 2, and 26&2.

Bikram yoga- yoga practice completed in a heated room, 95-100 degrees Fahrenheit. All classes repeat the same 26 pose sequence.

Cooperative Extension- "nationwide, non-credit educational network that addresses public needs by providing non-formal higher education and learning activities to farmers, ranchers, communities, youth, and families throughout the nation."[2]

Dissemination- to spread knowledge of evidenced based interventions to the practitioners in the field who can put the interventions into place

Dissemination and Implementation Science- the formal study and investigation on how interventions get disseminated and implemented

EBI- Evidenced Based Intervention, programming and activities that are founded on strong research.

FCS- Family and Consumer Sciences division of Virginia Cooperative Extension that works to promote well-being in Virginia.

Flourishing- a person's overall well-being based on 6 domains.

FNP- Family Nutrition Program division of Virginia Cooperative Extension that works with nutrition within Virginia and oversees EFNEP (Expanded Food and Nutrition Education Program) and SNAP Ed (Supplemental Nutrition Assistance Program Education).

Hatha yoga- the physical practice of yoga. Frequently a slower form of yoga when labeled "hatha yoga."

Implementation- the methods by which interventions are put into practice, and by who the interventions are carried out.

Job Performance- how well an individual carries out the duties and responsibilities of their job.

Job Satisfaction- the degree to which an individual is content with how their expectations of the job have been met.[3]

Mindful Meet-up – online program for VCE to promote mindfulness through the exploration of a variety of topics including meditation, yoga, and journaling, as well as others.

Micro-credentialing- a training and/or continuing education program.

Mindfulness- being aware of and present in the current moment. Can be performed within meditation, yoga, and other practices.

Moderate Aerobic Activity- activity that gets a participant's heart rate to 60-75% of their maximum heart rate (maximum heart rate based on Tanaka equation: 208 - 0.7 x age).

MUSCLE- Mindfulness and Understanding of Self-Care for Leaders of Extension.

Novice Yogi- participants who are new to yoga, having not done any, or many, physical practices. May be a self-description by participants or a formal definition in a research study.

PACE- Physical Activity for Cooperative Extension.

Physical Activity Guidelines for Americans- science-based recommendations for amount and type of physical activity Americans age 3 and older should be getting to promote health.

Public Health Worker- those who promote health on a community level, i.e. Cooperative Extension Agents; frequently implementing evidence-based interventions and programming.

VCE- Virginia Cooperative Extension.

RADaR- the Rigorous and Accelerated Data Reduction technique[4], a method of analyzing the themes of quantitative data.

RE-AIM- an acronym for Reach, Effectiveness, Adoption, Implementation, Maintenance;[5] a technique that encourages those planning and implementing interventions to assess different program elements

Self-care- engaging in activities that rejuvenate your mind, body, and spirit.

Tempo- the speed and rhythm of a class, in context of yoga, movement and tempo are frequently matched with breath

Typical Yoga Class- 60-90 minutes of physical postures and breath work[6]

Vinyasa- style of yoga in which the poses flow together, matching breath to movement. Typically a faster paced yoga style. May also refer to a smaller sequence within a class that flows from pose to pose with the breath.

Wearable Activity Trackers- devices such as Fitbit, Apple Watch, Garmin, etc. that contain accelerometers and/or heart rate monitors and monitor the wearer's activity levels.

Yoga Alliance- non-profit organization that sets standards for yoga instruction and registration in the United States.

Yoga- 1) a group of physical practices, breathing, and mindfulness techniques that is used in some cultures to promote physical and mental well-being. 2) a spiritual practice and philosophy rooted in Indian culture

References

1. Careers in Extension. Virginia Polytechnic Institute and State University. https://ext.vt.edu/employment.html. Accessed November 1, 2021.
2. Cooperative Extension System. National Institute of Food and Agriculture. https://nifa.usda.gov/cooperative-extension-system. Accessed November 1, 2021.
3. Dickin KL, Dollahite JS, Habicht JP. Job satisfaction and retention of community nutrition educators: the importance of perceived value of the program, consultative supervision, and work relationships. *J Nutr Educ Behav.* 2010;42(5):337-344.
4. Watkins D. Rapid and Rigorous Qualitative Data Analysis: The 'RADaR' Technique for Applied Research. *International Journal of Qualitative Methods.* 2017.
5. Glasgow RE, Harden SM, Gaglio B, et al. RE-AIM Planning and Evaluation Framework: Adapting to New Science and Practice With a 20-Year Review. *Frontiers in public health.* 2019;7:64-64.
6. Clay CC, Lloyd LK, Walker JL, Sharp KR, Pankey RB. The metabolic cost of hatha yoga. *J Strength Cond Res.* 2005;19(3):604-610.

Introduction

Overview

Cooperative Extension (herein: Extension) is a nation-wide, federally funded system where county-based agents provide education and programming to meet community needs.[1-3] Within Extension, particularly in the Family and Consumer Sciences, Food Nutrition Program, and 4-H, agents have a unique set of skills and competencies[4,5] to disseminate public health programs and interventions.[1,2] Extension personnel who have higher job satisfaction are more motivated and high performing,[6,7] and those who are physically active themselves are more likely to initiate physical activity programming within Extension.[8] Simultaneously, personnel who see the value of the programming that they lead are more likely to have higher job satisfaction and lower intention to leave.[6] However, Extension agents are experiencing increased rates of burnout,[9] a trend echoed in most healthcare professions over the last few years,[10] suggesting decreased motivation and increased stress and intention to leave one's job.

Participation in mind-body practices, such as yoga, can decrease anxiety, stress and burnout[10-15] and increase flourishing, which is a person's overall well-being.[16] For Extension personnel to be mentally and physically prepared to start incorporating more areas of yoga and mindfulness into their county-based programming, workplace wellness interventions can encourage physical activity, mindfulness, and self-care among employees.[9] Extension personnel should also be given the resources and training to choose appropriate evidence-based interventions (EBIs) and recommend appropriate areas to engage in physical activity outside of Extension programing. Agents are not often certified fitness instructors, but rather are educators—linking university-produced knowledge to community members and linking community members to existing resources. In this way, agents can refer to exercise places such as yoga studios, to reduce the community members' dependence on the agent for ongoing physical activity programming. Increasing physical activity and flourishing will help create a healthier and happier Extension workforce, as well as improving the lives of the Americans they serve.

Rationale

In part because many adults spend over half their time at their place of employment,[17] workers are more likely to meet the aerobic Physical Activity Guidelines for Americans (PAG) (i.e., 150 minutes of moderate-intensity aerobic activity per week)[18] if there are workplace policies, programs, and environments in place that encourage physical activity.[17] Multicomponent interventions that simultaneously target employee behavior and activities for clients/students may also result in larger intervention effects.[19] Being physically active can help improve or maintain physical health,[18] which is also linked to increased flourishing[16] and potentially increased productivity at work.[7] Physical activity behaviors of Extension personnel can be promoted in the workplace in a variety of ways, which may in turn increase the physical activity of Extension personnel, increase the physical activity programming offered within Extension, and help reach the goal of increasing physical activity in the community.

Incorporating stress management practices and other aspects that promote flourishing[16] within wellness initiatives can also result in higher job satisfaction,[7,20] lower levels of job stress,[20] and lower intention to leave.[6] One robust intervention approach that can help promote lower levels of stress and more physical activity is yoga and its mindfulness principles.[11-15] Yoga is thought to reduce stress through the breathing and movement patterns.[13,15] Yoga has been studied within multiple settings (e.g., a university workplace,[13] healthcare workers,[10,21] and graduate students[22]) as a method of stress reduction, and was found to reduce stress and anxiety. The success of yoga within these varying fields suggests it may also be successful within an Extension system wellness program to reduce stress.

a. Workplace Wellness: Mindfulness, Yoga, and Physical Activity

Mindfulness, both associated with acute yoga interventions as well as disentangled from a yoga practice, has also been found to be an appropriate and effective method for stress reduction[22-24] and burnout reduction.[10] Participants in a 8-week yoga-based mindfulness intervention were found to have decreased emotional exhaustion and increased mindfulness.[10] Interventions with mindfulness-based focused were also found to be beneficial in decreasing anxiety and stress,[10,22] and increasing self-compassion and

mindfulness.[22] Yoga can also help bridge self-care interventions, with reduced burnout and increased self-care.[10] Promoted self-care strategies may encompass different strategies such as nurturing interpersonal connections, performing emotional hygiene,[21] and physical movement like yoga.[10] Including self-care within workplace wellness interventions may help to diminish stress,[22] with less-stressed employees having higher performance and better job satisfaction.[7,20]

Physical activity, mindfulness, and self-care can all play a role in reducing stress.[10,13,15,21,22] Specifically, yoga can also improve self-care,[10] increase well-being,[13] and increase positive affect.[25] However, there is inconclusive evidence on if yoga can meet the PAG[18] recommendations for moderate-intensity aerobic activity.[26-28] The PAG includes yoga as a recommended physical activity for multicomponent activities (those that include muscle strengthening, aerobic, and balance activities) and as relative moderate-intensity activity for some groups of individuals.[18] This suggests that a workplace wellness intervention that incorporates yoga might be able to encourage increased physical activity, mindfulness, and self-care within employees and programming throughout Extension.

b. Building Capacity for Workplace Wellness

Adding physical activity to the competencies and best practices of Extension would be an initial step towards adding more physical activity into current Extension interventions and programs. Getting all levels of Extension personnel to value physical activity interventions will require targeted capacity building[29,30] and change of personnel's personal habits.[8,19] Capacity building is the deliberate strategy to increase the motivation and ability of educators to select and implement evidence based interventions (EBIs).[29,30] Educators will all have varying levels of baseline capacity, according to their experiences and current abilities, with the capacity of the Extension system as a whole also being a factor.[29,30]

Building the capacity of educators to implement EBIs (in particular physical activity promotion EBIs) can be examined through a variety of strategies and structures.[29] Strategies that might work well within the Extension system and speak to the established best practices[5] and competencies,[4] include training, tools, and assessment and feedback.[29]

Training, in the form of education and continuing education, is already addressed as a baseline in the competencies and best practices.[4,5] Some trainings on physical activity and specific EBIs are also already available for Extension personnel (in particular Virginia Cooperative Extension) to participate in and increase their capacity to deliver these programs.[31] Tools, which include resources, assessment and feedback, and program assessment documents on physical activity EBIs are all also available to Extension.[31]

Structures, including delivery mode, dosage, and collaborative design, within the Extension system can also assist with building capacity.[29] The best practices for agents speak to dosage of feedback (at least annual) and ongoing training.[5] Collaborative design of the Extension system can be seen through both the best practices and the competencies for agents, mentioning the evaluation of the agents and the agents' evaluations and feedback of the programs being given back to the state leaders.[4,5] If physical activity language and expectations were added to these documents, then the strategies and structures for building capacity to implement physical activity EBIs would be in place where they are currently missing.[32]

Even with capacity building on the individual educator level, personal health behaviors and beliefs of the educators and the leadership within Extension can influence the implementation of physical activity and wellness EBIs.[8,20,33] Extension agents who meet the recommendations for physical activity are more likely to engage in physical activity programming.[8,33] In addition, teachers working with Head Start, a similar low income population to those served by paraprofessional nutrition educators and Supplemental Nutrition Assistance Program Education (SNAP-Ed) professionals, who were working to improve their own physical activity levels were able to see increased physical activity promotion in their classrooms.[19] This suggests that increasing agent physical activity capacity may increase the physical activity programming within Extension.

c. Increasing Engagement in Workplace Wellness

Physical activity promotion is only one facet within workplace wellness interventions and trainings that could lead to more engagement by Extension professionals. Incorporating stress management ideals and other aspects that promote

overall well-being, or flourishing,[16] within wellness initiatives can also result in higher job satisfaction,[7,20] lower levels of job stress,[20] and lower intention to leave.[6] One well-studied intervention approach that can help promote lower levels of stress is yoga and its mindfulness principles.[11-15]

Physical activity, mindfulness, and self-care can all play a role in reducing stress, including within workplace wellness interventions.[10,13,15,21,22] The evidence is inconclusive on if yoga can meet the PAG[18] recommendations for moderate-intensity aerobic activity for all or most individuals.[26-28] Therefore, a workplace wellness intervention that includes yoga could be able to increase physical activity, mindfulness, and self-care.

The Extension system is tasked with providing high-quality programming to communities. While there is still much unknown about the physical benefits of yoga as related to moderate-intensity aerobic activity, yoga can be a targeted way to decrease stress, anxiety, and burnout,[10-14,23,34] while potentially meeting recommendations for balance and other types of physical activity.[18] Incorporating physical activity within those programs through a systematic introduction of physical activity into the current best practices and competencies for Extension paraprofessionals and professionals could help give programs a more well-rounded health approach. However, knowledge around the best practices for training agents to choose and deliver physical activity EBIs is also scarce, and more research needs to be done looking at agent training and wellness interventions.

Empirical and Pragmatic Implications

This dissertation will build a foundation spanning the translational spectrum for appropriate training methods for Extension agents to more effectively choose and deliver physical activity EBIs (the Physical Activity in Cooperative Extension study); if an adult can reach moderate aerobic activity within a typical yoga class (the Moderate Aerobic Activity Through (MAT) Yoga study); and how agents can include yoga and physical activity within their own lives to promote wellness and flourishing (the Mindfulness and Understanding of Self-Care for Leaders of Cooperative Extension study). Additionally,

the dissertation covers how yoga studios present yoga online and to their participants (the study Comparing Perceptions of Yoga Studios: Websites versus Intentions included).

MAT Yoga was a T2 clinical study, i.e., a study that helps support the basis for recommendations,[35] utilizing heart rate monitors to assess the proportion of a yoga session that participants are in the moderate-intensity aerobic activity range. This knowledge increases the available evidence that some portions of a yoga class can add to participant's weekly moderate-intensity aerobic activity. PACE was a T3 study, or one that helps shape guidelines and educate health workers,[35] on the effectiveness of a virtual micro-credentialing program (i.e., a training and/or continuing education program)[36] in increasing agent's knowledge of Physical Activity in Public Health competencies and the PAG. This lays the foundation for agents to be able to promote physical activity promotion within Extension. However, even after the agents are educated and trained on physical activity programming, they need to be able to care for themselves and flourish within all aspects of their jobs and personal lives, and so MUSCLE studied the effectiveness of a virtual micro-credentialing program in increasing agent's own mindfulness, self-care, and flourishing, and how that may increase job satisfaction.

Finally, in order for public health workers, including Extension agents, to be able to accurately guide participants to yoga classes that best fit the participant's goals for physical activity, an analysis and report of yoga studio websites and the yoga studios' teaching philosophy was completed. This analysis helps public health workers on the T4 end of the spectrum[35] to be able to educate and guide the public. The yoga studio review culminated in an audit form that allows public health workers to assess yoga studios on a multitude of factors.

Research Questions and Hypotheses

Chapter 1. Physical Activity in Cooperative Extension (PACE)

Research Question 1 (RQ1): At the conclusion of the program, do agents report an increased knowledge and better understanding of Physical Activity in Public Health competencies?

H1: Participants will have a positive, significant increase across all 8 dimensions of the Extension- Physical Activity in Public Health competencies

RQ2: Will a micro-credentialing on physical activity programming have an effect on agent personal physical activity levels per week?

H2: Participants will have a positive, significant increase in personal physical activity.

RQ3: Will a virtual educational program on physical activity programming have an effect on agent personal flourishing?

H3: At the conclusion of the program, agents will report increased personal flourishing.

Chapter 2. Mindfulness and Understanding of Self-Care for Leaders of Extension (MUSCLE)

RQ1: At the conclusion of the MUSCLE program, do agents report an increased knowledge base of mindfulness practices and yoga?

H1: At the conclusion of the program agents report an increased knowledge base of mindfulness practices and yoga as measured by the Yoga Self-Efficacy Scale.

RQ2: At the conclusion of the program, do agents report an increased mindfulness practice?

H2: At the conclusion of the program agents report an increased frequency of mindfulness practice.

RQ3: Will a virtual educational program on mindfulness and self-care have a sustainable effect on agent mindfulness and self-care practice?

H3: Six months after the conclusion of the program, agents will have an increased mindfulness and self-care practice from baseline.

H4: Agents will continue attending mindfulness and self-care programming.

Chapter 3. Moderate Aerobic Activity Through Yoga (MAT Yoga)

RQ1: Will some portion of a 60-minute yoga class can be at a moderate-to-vigorous intensity aerobic activity level?

H1: At least some portion of a 60-minute yoga class will be moderate-to-vigorous intensity aerobic activity for adults and older adults.

H2: Individuals who have a lower daily moderate-vigorous physical activity at baseline will have higher heart rate during some of the yoga asana.

RQ2: How does the rate of perceive exertion change based on temperature and cadence within the 60-minute yoga sequence?

H3: Warmer temperature sessions will result in higher reported RPE during the middle of the session.

H4: Faster tempo sessions will result in higher reported RPE during the middle of the session.

Chapter 4. Yoga studio audit

RQ1: Will studio websites have similar class titles across studios for similar class styles?

H1: Studios will have a variety of class titles for similar styles.

RQ2: Will studio owners think that their websites reflect their studio and offerings?

H2: Studio owners will think that their websites reflect their studio and offerings.

RQ3: Will public health workers be able to assess the studios using an audit tool to be able to recommend yoga studios to community members?

H3: Public health workers will be able to use the audit tool to assess and recommend yoga studios to community members.

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Assessing and referring to commercial entities that promote public health: A yoga studio audit	Under Review, *Inquiry*

Reference List

1. Archibald T. Whose Extension Counts? A Plurality of Extensions and Their Implications for Credible Evidence Debates. *Journal of Human Sciences and Extension.* 2019;7(2):22-35.
2. Dunifon R, Duttweiler M, Pillemer K, Tobias D, Trochim W. Evidence-Based Extension. *J Ext.* 2004;42(2).
3. Franz NK, Townson L. The Nature of Complex Organizations: The Case of Cooperative Extension. 2008:5-14.
4. Baker SS, Pearson M, Chipman H. Development of Core Competencies for Paraprofessional Nutrition Educators Who Deliver Food Stamp Nutrition Education. *J Nutr Educ Behav.* 2009;41(2):138-143.
5. Baker S, Auld G, Mackinnon C, et al. *Best Practices in Nutrition Education for Low-Income Audiences.* 2014.
6. Dickin KL, Dollahite JS, Habicht JP. Job satisfaction and retention of community nutrition educators: the importance of perceived value of the program, consultative supervision, and work relationships. *J Nutr Educ Behav.* 2010;42(5):337-344.
7. Weziak-Bialowolska D, McNeely E, VanderWeele TJ. Flourish Index and Secure Flourish Index – Validation in Workplace Settings. *Cogent Psychol.* 2019;6(1).
8. Estabrooks P, Bradshaw M, Fox E, Berg J, Dzewaltowski DA. The Relationships Between Delivery Agents' Physical Activity Level and the Likelihood of Implementing a Physical Activity Program. *Am J Health Promot.* 2004;18(5):350-353.
9. Ensle KM. Burnout: How Does Extension Balance Job and Family? J *Ext.* 2005;43(3).
10. Alexander GK, Rollins K, Walker D, Wong L, Pennings J. Yoga for Self-Care and Burnout Prevention Among Nurses. *Workplace Health Saf.* 2015;63(10):462-470; quiz 471.
11. Brown RP, Gerbarg PL. Yoga breathing, meditation, and longevity. *Ann N Y Acad Sci.* 2009;1172:54-62.
12. Francis AL, Beemer RC. How does yoga reduce stress? Embodied cognition and emotion highlight the influence of the musculoskeletal system. *Complement Ther Med.* 2019;43:170-175.
13. Maddux RE, Daukantaité D, Tellhed U. The effects of yoga on stress and psychological health among employees: an 8- and 16-week intervention study. *Anxiety Stress Coping.* 2018;31(2):121-134.
14. Pascoe MC, Thompson DR, Ski CF. Yoga, mindfulness-based stress reduction and stress-related physiological measures: A meta-analysis. *Psychoneuroendocrinology.* 2017;86:152-168.
15. Ross A, Thomas S. The Health Benefits of Yoga and Exercise: A Review of Comparison Studies. *J Altern Complement Med.* 2010;16:3-12.
16. VanderWeele TJ. On the promotion of human flourishing. *Proc Natl Acad Sci U S A.* 2017;114(31):8148-8156.
17. Hipp JA, Dodson EA, Lee JA, et al. Mixed methods analysis of eighteen worksite policies, programs, and environments for physical activity. *Int J Behav Nutr Phys Act.* 2017;14(1):79.

18. Physical Activity Guidelines for Americans. In: US Department of Health and Human Services, ed. 2 ed. Washington, DC: US Department of Health and Human Services; 2018.
19. Esquivel MK, Nigg CR, Fialkowski MK, Braun KL, Li F, Novotny R. Influence of Teachers' Personal Health Behaviors on Operationalizing Obesity Prevention Policy in Head Start Preschools: A Project of the Children's Healthy Living Program (CHL). *J Nutr Educ Behav.* 2016;48(5):318-325.e311.
20. Hoert J, Herd AM, Hambrick M. The Role of Leadership Support for Health Promotion in Employee Wellness Program Participation, Perceived Job Stress, and Health Behaviors. *Am J Health Promot.* 2018;32(4):1054-1061.
21. Wei H, Kifner H, Dawes ME, Wei TL, Boyd JM. Self-care Strategies to Combat Burnout Among Pediatric Critical Care Nurses and Physicians. *Crit Care Nurse.* 2020;40(2):44-53.
22. Klawonn A, Kernan D, Lynskey J. A 5-Week Seminar on the Biopsychosocial-Spiritual Model of Self-Care Improves Anxiety, Self-Compassion, Mindfulness, Depression, and Stress in Graduate Healthcare Students. *Int J Yoga Therap.* 2019;29(1):81-89.
23. Burton A, Burgess C, Dean S, Koutsopoulou GZ, Hugh-Jones S. How Effective are Mindfulness-Based Interventions for Reducing Stress Among Healthcare Professionals? A Systematic Review and Meta-Analysis. *Stress Health.* 2017;33(1):3-13.
24. Harkess KN, Delfabbro P, Mortimer J, Hannaford Z, Cohen-Woods S. Brief Report on the Psychophysiological Effects of a Yoga Intervention for Chronic Stress. *Journal of Psychophysiology.* 2017;31(1):38-48.
25. Gaskins RB, Jennings E, Thind H, Becker BM, Bock BC. Acute and Cumulative Effects of Vinyasa Yoga on Affect and Stress among College Students Participating in an Eight-week Yoga Program: A Pilot Study. *Int J Yoga Therap.* 2014;24:63-70.
26. Clay CC, Lloyd LK, Walker JL, Sharp KR, Pankey RB. The metabolic cost of hatha yoga. *J Strength Cond Res.* 2005;19(3):604-610.
27. Larson-Meyer DE. A Systematic Review of the Energy Cost and Metabolic Intensity of Yoga. *Med Sci Sports Exerc.* 2016;48(8):1558-1569.
28. Schubert MM, Clark A, De La Rosa AB. The Polar (®) OH1 Optical Heart Rate Sensor is Valid during Moderate-Vigorous Exercise. *Sports Med Int Open.* 2018;2(3):E67-E70.
29. Leeman J, Calancie L, Hartman MA, et al. What strategies are used to build practitioners' capacity to implement community-based interventions and are they effective?: a systematic review. *Implement Sci.* 2015;10:80.
30. Leeman J, Calancie L, Kegler MC, et al. Developing Theory to Guide Building Practitioners' Capacity to Implement Evidence-Based Interventions. *Health Educ Behav.* 2017;44(1):59-69.
31. Physical Activity Research & Community Implementation (PARCI) Laborartory at Virginia Tech. www.parcilab.org. Accessed May 4, 2021.

32. Harden SM, Lindsay A, Everette A, Gunter K. Systematic Review of Physical Activity Objectives in Extension Strategic Plans: Findings and Implications for Improved Public Health Impact. *J Ext.* 2016;54(5).
33. Harden SM, McEwan D, Sylvester BD, et al. Understanding for whom, under what conditions, and how group-based physical activity interventions are successful: a realist review. *BMC Public Health.* 2015;15(1):958.
34. Ross KM, Leahey TM, Kiernan M. Validation of the Stanford Leisure-Time Activity Categorical Item (L-Cat) Using Armband Activity Monitor Data. *Obes Sci Pract.* 2018;4(3):276-282.
35. Translational Science Spectrum. National Center for Advancing Translational Sciences. Published 2021. Updated 07-09-2021. Accessed 08-02, 2021.
36. Mathur A, Wood ME, Cano A. Mastery of Transferrable Skills by Doctoral Scholars: Visualization using Digital Micro-credentialing. *Change.* 2018;50(5):38-45.

Health Educator Participation in Virtual Micro-credentialing Increases Physical Activity in Public Health Competencies

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Abstract

Background: Physical activity is an important component of leading a healthy life. Public health is one of the nine major sectors for disseminating information about physical activity and increasing the physical activity of the general public.

Purpose: Increase competency among Cooperative Extension agents (i.e., public health workers) on selecting, delivering, and evaluating physical activity programs through a theory-based online training program.

Methods: Cooperative Extension agents from two states were invited to participate via statewide listservs. Participants were invited to attend sessions, complete competency checks and between-session assignments each week. The study was conducted using a video conferencing platform. The intervention was nine weeks from June-July 2020 and had 130 participants. Pre- and post- program surveys included physical activity competencies and validated scales for flourishing and physical activity status. Data for competencies pre and post were analyzed using the Wilcoxon signed rank test, $p<.01$. Physical activity and flourishing pre and post were compared using t-tests, $p<.05$.

Results: Physical activity for public health professionals competency increased significantly ($p<.00$) as did agents' personal physical activity levels ($p<0.05$). Changes in flourishing were not significant ($p<.088$) but trended in the hypothesized direction.

Conclusions: The online competency-based training program significantly improved Cooperative Extension agents' knowledge of physical activity guidelines and physical activity program implementation. Future work is needed related to the scalability of the training program.

Keywords: physical activity, public health, competency-based trainings, health educators, Cooperative Extension

INTRODUCTION

Physical activity is a recognized way to stay healthier and reduce comorbidities for people of all ages and abilities (1-4). The scientific evidence and best practices of the Physical Activity Guidelines for Americans have been translated for public consumption via the United States' government-sponsored Move Your Way® campaign (2). Despite these dissemination efforts and benefits, only 26% of American men and 19% of American women meet the recommendations for physical activity (4). The public health sector is 1 of the 9 major disseminating sectors of physical activity messaging and programming, with others including faith-based organizations and health care, as discussed in the National Physical Activity Plan (4, 5). Public health workers and officials can help promote the increase of physical activity throughout the community, as well as assist in tracking the proportion of the population that is physically active (3, 4).

One public health sector that promotes healthy lifestyles is the national Cooperative Extension (herein: Extension) system (6-8). As part of the historic land-grant university system existing within all states and territories within the United States, the system is federally funded and reaches millions of Americans each year (8). County-based Extension professionals (herein: agents) have a unique opportunity to engage with communities improve individual and community health, safety, and food production (8).

The job responsibilities of agents, like most public health workers, continuously change to match public health needs (9). Notably, Extension has strong roots in rural settings (8), as it emerged from farming practices, and only recently began to translate physical activity messaging and interventions within their programming (10-12). This necessitates continued education structured around the knowledge they need to do their job (i.e., competencies) (13-15). Travel budgets, timing, and other constraints have made an online format a more appealing option for continuing education in recent times (14, 16). The COVID-19 pandemic further highlighted the need for virtual training protocols for wide-reaching systems.

Previous research indicates that online trainings have myriad benefits (e.g., reaching a broad geographic region, satisfaction with content) and challenges (e.g., sufficient internet access and cost) (14, 16, 17). Notably, asynchronous trainings have been further critiqued for the lack of peer-to-peer interaction and interaction with the

training platform (i.e. quizzes, role-playing, etc.) (16). Research is lacking in synchronous online trainings for public health workers, though there has been some research showing that synchronous online trainings can be a beneficial learning tool for teachers (18) and other health professionals (17). Trainings that allow participants to have multiple exposures to topics and are more interactive, including practicing skills through homework assignments, result in higher impacts on outcomes (19-21).

Explorations of the structure of trainings show that competency-based trainings result in significant improvement in the competency domains (13) and build confidence (15) with public health workers (13, 15). Having a competency-based training that included programming suited for adult learners and participant interaction was found to be helpful in a community-academic initiative training for community health workers to demonstrate the larger context of their work(15). This also increased their desire to take what they learned and implement it with their own participants (15).

Public health workers who participated in trainings that focused on both core (knowledge) competencies and skill-based leadership competencies were found to self-report significantly improved competency status (13). Improved competency status has also been correlated to experience and frequency of use of the knowledge obtained through the trainings (13, 22). However, trainings for public health workers need to account for varying trainee characteristics (13, 15, 22). For example, those newer to the field are more likely to benefit from training (13, 22); those who are more physically active themselves are more likely to deliver physical activity programming (11); and those who are flourishing (strong overall sense of well-being and goodness in all sectors of a person's life), also have higher job satisfaction and work engagement (23). Flourishing and physical activity are intertwined as well, as physical and mental health is one of the domains of flourishing (24) and physical activity promotes physical and mental health (2). Many fields, including medicine, have adopted micro-credentialing as a form of professional development or continuing education that demonstrates a valuable skill (25).

Taken together, Cooperative Extension agents have the potential to promote physical activity if they are trained on doing so; the training needs to be synchronous and dynamic to improve personal and professional behaviors. While eventual physical

activity program uptake by agents is the downstream goal of this work, the purpose of this study was to test the initial reach and efficacy of a micro-credentialing program developed and evaluated during the 2020 pandemic to increase the competence of Extension agents in physical activity guidelines and programming. Secondary aims included improving Extension agents' perceptions of flourishing (overall sense of wellbeing) and their own physical activity levels since these are predictors of job satisfaction and program adoption, respectively.

METHODS

Recruitment and Participants

This was a multi-state collaboration in which participants were recruited from Virginia and Arkansas state systems through Extension listserv emails detailing the program goals, objectives, and session times. The training was held during working hours, but was not tied directly to job expectations or performance reviews. While agents were the main target of the program, other Extension employees were not excluded from participating. There are five key roles in the Extension system, administrators are individuals who oversee Extension staff and budget (8) (and usually have a role in agent annual reviews); program leaders are individuals who oversee program teams (e.g., issue-dependent groups such as Food, Nutrition, and Health); specialists are university-based (8) and typically have a terminal doctoral degree; agents are county-based and responsible for responding to community needs (11); volunteers undergo program specific training provided by their agent; and 'other' personnel included area coordinators and support staff.

Reach was operationalized as the total proportion of eligible participants that joined, ongoing reach of training materials (i.e., attendance and completion of the program), and the representativeness of the participants (26). This study was reviewed by the university Institutional Review Board (IRB) and determined to be exempt from IRB review as it did not meet the criteria to be considered human subjects research (i.e., federal exemption for normal activities within educational setting).

Micro-credentialing Program

The 9-week micro-credentialing program was titled Physical Activity in Cooperative Extension (PACE)—using the tagline, *Let's set the PACE!* Weekly

synchronous sessions were approximately 60 minutes and held on the Zoom web conferencing platform. This platform has been used for other training within each state system prior to this micro-credentialing program. All sessions, assessments, and evaluation were Internet-based.

Evidence-informed components of the curricula include learner-centered approaches (19-21), educational theories (27), and group dynamics (28) (see Table 1). Between sessions, attendees were asked to complete asynchronous activities for mastery experiences related to each session topic. For discussion and application, asynchronous activities were discussed further in breakout rooms during the next Zoom session, or embedded within the between session assignments. These assignments were used as teach-back (27) moments generated in alignment with each predetermined objective (see Table 1). Post-session homework assignments were assessed for completion, not graded for accuracy (and therefore not an outcome measure of this trial but rather a feature of the micro-credentialing program). Two examples of these between-session tasks are asking participants to identify if their state Extension strategic plan includes physical activity and to view the Move Your Way® PAG campaign materials. The goal was to use these assignments to reinforcement ideas discussed each week. For the audit and feedback portion of each session, results of these assignments were discussed at the beginning of the next session, with the right answers being discussed (where applicable) as well as some of the answers to the open-ended questions.

Between the weekly synchronous sessions, support emails were sent to the entire participant pool that included a brief summary of the information covered during the synchronous session, as well as the homework assignments to complete for the asynchronous portion of the week. The recording of the week's session was not included in the weekly email, but was sent out to individual participants if requested.

Table 1. Outline for Physical Activity in Cooperative Extension

Outline for Physical Activity in Cooperative Extension: Let's set the PACE!			
9 HOURS DIRECT CONTACT; 9 HOURS OUTSIDE TRAINING			
SESSION TITLE	**COMPETENCIES** By the end of this session, participants will be able to:	**BREAKOUT**	**NON-CONTACT HOURS**
Introduction to PACE/ Physical Activity Recommendations and Types	1. Knowledge of training opportunities available in Extension 2. Ability to understand how specific training and technical assistance will help agents set the PACE.	● Active name game ● Why did you join? ● Come back to large group and share ● Create a team name! ● Exchange email addresses	● Visit Move Your Way Campaign site ● Pick a target audience (e.g., youth, adults, older adults) and determine what resources are available for you to guide them regarding the PAG ● Complete competency check
	1. Understand physical activity recommendations(2, 29) 2. Describe how PAG were developed 3. Knowledge of and ability to describe the four domains of physical activity: activities of daily living, active transportation, recreation or leisure activities, and occupational activities 4. Defend the importance of physical activity for their participants 5. Ability to select or modify physical activity programs that are appropriate to meet the needs of a specific community or population(29)	● Share how/if you are meeting PAG ● What do you think will work in your community for PAG ● How are you already promoting PACE?	
Extension's Role in Physical Activity Promotion	1. Describe the Framework for Health and Wellness 2. Relate the delivery of physical activity to the overall mission of Cooperative Extension 3. Define scope of work (educational and experiential not personal trainer or physical	● What was your favorite way to move as a kid? ● How has that changed to now? ● What is your perception that PA is a shared value in your state (other educators, admin, etc.)?	● Review your state Extension strategic plan. Does it include physical activity? If so, what does it say?

	therapist), Liability within Extensions		● Take competency check
Selecting and Adapting Evidence-based Physical Activity Programs	1. Levels of evidence, What Works? (29) 2. How do we choose programs?(29) 3. Adaptation versus deviation	● Share an example of one deviation and one adaptation you have done over the years	● Search one of the provided repositories for an evidence-based program you might use in your community. What is its level of evidence? ● Take competency check
Behavior Change Strategies	1. Knowledge of at least two behavioral strategies, such as goal setting or self-monitoring to be considered in planning PA interventions(29) 2. Understand the impact of behavior change strategies(29, 30) 3. Select and differentiate appropriate behavior change strategies(29, 30) 4. Assess if behavior change strategies are incorporated within programming 5. Describe group dynamics constructs 6. Apply group dynamic based-principles within existing Cooperative Extension programming	● When have you seen group dynamics in action? ● Which of the discussed strategies have you used before? ● What seems new and exciting to implement in your programming?	● Think of a program you offer to a "group" of people, but haven't facilitated group dynamics strategies specifically. How might you apply group dynamics going forward? ● Take competency check
Social Determinants of Health	1. Ability to incorporate socio-ecological model for physical activity promotion in your county 2. Special population considerations(29, 30)	• Responses to quiz items - what surprised you? • Populations you've worked with - what environmental barriers did they face?	• Do a walking audit of your own neighborhood or nearby location

	3. Knowledge of cultural, social, behavioral, and environmental factors that influence physical activity behaviors(29)		• Email a picture or scan of your walking audit to your team prior to the next session • Take competency check
Policy, Systems, and Environmental Approaches	1. Describe policy, systems, and environmental (PSE) changes to increase physical activity 2. List potential partners for physical activity PSE projects 3. Plan physical activity PSE projects that complement individual-level physical activity interventions(29)	● Email a picture or scan of your walking audit to your team prior to this session	● If you are not part of a local coalition addressing PA promotion, search online for a potential coalition to partner with for PA promotion and PSE ● If you are already part of a coalition, ○ Write down how you would introduce PSE to your group ○ Share how you're already doing PSE work with this group ● Take competency check

Partnerships for Physical Activity Promotion	1. Educate, collaborate and engage with external partners from a variety of disciplines to promote physical activity at multiple settings and in a variety of populations(29, 30) 2. Identify internal and external issues, such as changes and trends in financing, regulation, legislation and policies that may impact delivery of public health physical activity services.(29, 30)	● No break out this week	• Not on a coalition? How would you start one? Who would you invite to the table? • On a coalition? How did you show Extension's PA efforts and knowledge? • Take competency check
Planning and Evaluating PA Programming	1. Use of framework or model to plan and evaluate physical activity interventions(29) 2. Knowledge of the physical activity readiness questionnaire (PAR-Q) 3. Knowledge of design, implementation, and evaluation of physical activity interventions to address chronic condition 4. Skill to analyze and interpret physical activity quantitative and qualitative data to validate conclusions(30) 5. Ability to produce and evaluation report and disseminate findings to stakeholders and decision makers(29)	● Why frameworks are important to guide your planning and evaluation ● Overview of RE-AIM ● RE-AIM for Extension (with health equity considerations) ● Physical activity readiness questionnaire PLUS ● IRB approval (human subjects determination, research, program evaluation) and ethics ● Use of mixed methods ● Impact statement confusion	• Start with breakout this week: What are some challenges you face with evaluation?
Ready to set the PACE!	1. Audit and feedback on competency checks	● Recap ● Feedback on competency checks - what you all got right /	• What is one thing you learned from PACE that you

		where we need to check in ● What now? Strategies for existing programs: annual check in, deimplementation, scale out)	will incorporate in your work? What challenges remain? What should be included in PACE round 2?
PACE= Physical Activity in Cooperative Extension PAG= Physical Activity Guidelines for Americans PA= Physical Activity PSE= policy, systems, and environmental approaches PAR-Q= Physical Activity Readiness Questionnaire RE-AIM= Reach, Effectiveness, Adoption, Implementation, and Maintenance Model			

Measures

Reach and Representativeness

Participants were asked to report their sex, ethnicity, current job role, state of residence, and how long they had worked for Extension. While agents were the target of the program, other Extension personnel were not excluded; therefore, we have no denominator for the overall reach of the program. Outcome measures included pre and post program surveys that were completed online prior to and directly after the program, respectively. The post program survey also included space for participant feedback. Attendance for all sessions was also assessed as a measure of ongoing reach. All surveys and post-session homework assignments were collected via Qualtrics (Qualtrics.com, Provo, UT).

Effectiveness

The Ext-PAPH knowledge, skills, and abilities (KSAs) used in this program were modified from the Essentials for Public Health Physical Activity Practitioners core competencies (29) and the Modified Version of the Core Competencies for Public Health Professionals (30). The National Physical Activity Society created the core competencies for public health physical activity practitioners in conjunction with the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) (29). These 3 entities produced the knowledge, skills, and programming for the

Physical Activity in Public Health Specialist certification (29). Because Extension professionals are not broadly public health specialists, but rather work within the directives of Extension, competencies not covered in the specialist certification developed by the CDC and ACSM (social determinants of health, Extension's role in physical activity promotion) were added to the modified core competencies for public health professionals. Eight total competency sections were included in the pre- and post-survey: 1) Physical Activity and Public Health, 2) Extension's Role in Physical Activity Promotion, 3) Selecting and Adapting Evidence Based Physical Activity Programs, 4) Behavior Change, 5) Social Determinants of Health, 6) Policy, Systems, and Environmental Approaches, 7) Partnerships, and 8) Planning and Evaluating. The competencies included a variety of questions on items such as Extension's role in physical activity promotion (i.e., what Extension personnel can promote, activities and programs they can deliver); partnerships (i.e., building coalitions); and physical activity and public health (i.e., what are the physical activity guidelines and how can public health workers promote physical activity). Each of these 8 sections had 2-6 competencies, with those competencies on a 4-point Likert scale ranging from 'none' (I am unaware or have very little knowledge of the skill) to 'proficient' (I am very comfortable, am an expert, or could teach this skill to others). The max scores for each section ranged from 8-24, with a total possible Ext-PAPH score of 136. Neither the Essentials for Public Health Physical Activity Practitioners core competencies (29) nor the Modified Version of the Core Competencies for Public Health Professionals (30) have undergone validity and reliability testing, but were the closest measures of Ext-PAPH available in the literature (see limitations).

Secondary Outcomes

Flourishing. To measure pre- and post- training flourishing, the VanderWeele Secure Flourish Index (SFI) was employed. The SFI is broken into 6 domains (24): Happiness and Life Satisfaction, Mental and Physical Health, Meaning and Purpose, Character and Virtue, Close Social Relationships, and Financial and Material Stability (24). The last domain (Financial and Material Stability) was included as an indicator of ability to sustain flourishing (23). The SFI has been validated in a workplace setting (23). Each domain is on a 0-10 scale and has 2 questions. Anchors were based on item language;

examples included “Not Satisfied at All” to “Completely Satisfied,” “Not True of Me” to “Completely True of Me.” Higher levels of flourishing are shown through higher scores.
Physical activity. The Godin Leisure-Time Exercise Questionnaire (31), a brief 4-item questionnaire with items on mild, moderate, and strenuous activity as well as frequency of activity, was used as it has been utilized with a variety of different populations and shown to be valid (32, 33).

Analysis

Descriptive and inferential statistics for all data were calculated using SPSS software (SPSS Version 26, IBM SPSS Statistics, Chicago, IL, 2020). To compare pre- to post- competency scores the nonparametric Wilcoxon signed ranks tests were used to note areas of significant improvement following the training. Flourishing scores pre and post PACE were compared using t-tests with Bonferroni ad hoc correction. Physical activity was categorized into meeting guidelines or not meeting guidelines based on methods proposed and validated by Amireault and Godin (32). Pearson Chi Square tests were used to determine changes in meeting guidelines. Data were analyzed via present-at-follow-up rather than intent-to-treat. Open-ended question responses were examined for feedback of the program.

RESULTS

Reach

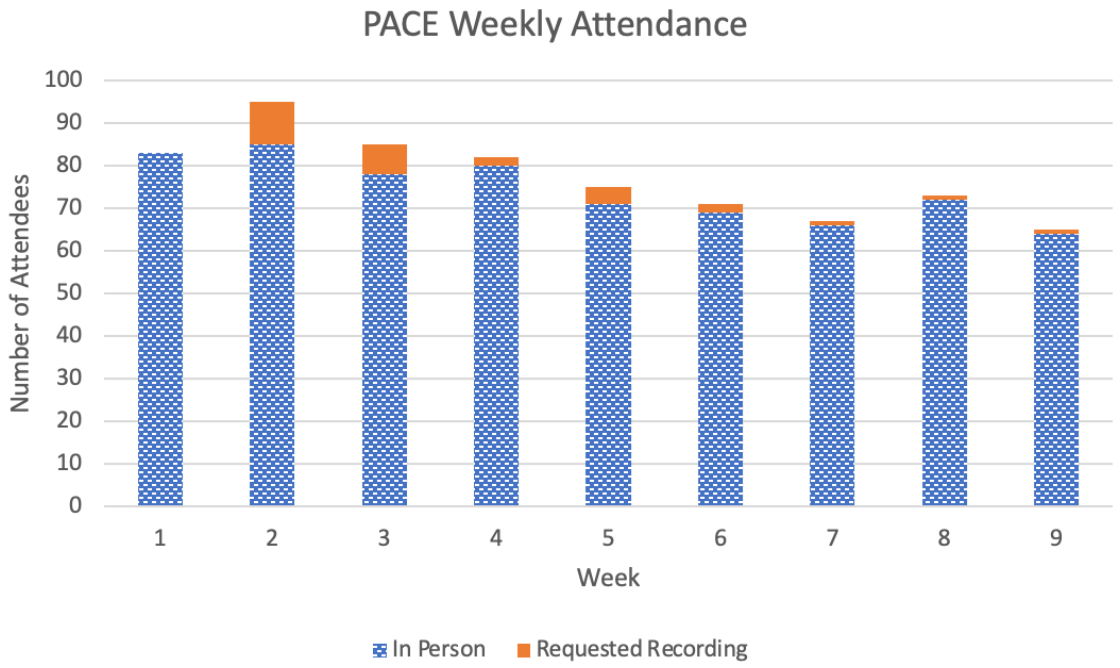
Reach Indicator 1. Total Number 130 Extension employees (including administrators, program leaders, and specialists) registered to attend PACE, 65 from Arkansas and 65 from Virginia.

Reach Indicator 2. Reach Proportions Out of 190 eligible agents (128 from Virginia and 62 from Arkansas), 79 (41.6%) registered to attend PACE. Of all the employees who registered, 15 registrants (11.5%) registered late and then never attended a PACE session, with an additional 16 who registered on time but never attended a session. The majority (56.9%) of initial registrants attended all the sessions, and 64 (49.2%) completed the certificate.

Reach Indicator 3. Ongoing Reach. Live attendance for each session was 77 ($\pm$6.0) participants, with 74 attending 100% of the sessions either live or via recording. Participants had the opportunity to request the recording of the session, with the most

requested session recording being week 2 (Figure 1). Sixty-four participants (49.2%) completed the full micro-credentialing program, including the post-survey, and received their completion certificate.

Figure 1. Weekly Participant Attendance for PACE



Reach Indicator 4. Representativeness The participants were 97% female, white (81%) or black (15%), and represented a variety of roles within Extension; of whom, 61% were agents (i.e., the intended target audience). Demographics for Extension as a system are unavailable. Completers of the program had been with Extension for an average 8.57 years (±7.95 years). Those who registered late and then never attended a session had the most years with Extension at an average of 10.53 years (±7.86 years).

Effectiveness

The Wilcoxon Signed-Rank test indicated that after participating in PACE, the median scores had a significant, positive change for all competencies except Extension's Role in Promoting Physical Activity. The results were as follows: Physical Activity and Public Health ($Z = -6.411$, $p<.001$); Extensions Role in Physical Activity Promotion ($Z= -6.040$, $p<.001$); Selecting and Adapting Evidence Based Physical Activity Programs ($Z= -6.261$, $p<.001$; Behavior Change Theories and Strategies ($Z= -6.261$, $p<.001$); Social Determinants of Health ($Z=-6.353$, $p<.001$); Policy, Systems, and Environmental

Approaches (Z=-6.202, p<.001); Partnerships (Z= -6.152, p<.001); Planning and Evaluation (Z=-6.280, p<.001). Notably, seven and four participants decreased competencies for 'Extension's Role in Physical Activity' and 'Partnerships,' respectively. Flourishing increased from 92.59 to 94.78, but not significantly, $p<.08$. Physical activity levels significantly increased ($p<0.05$).

Table 2. PACE Participant Pre- and Post- Change Scores for the Extension-based Physical Activity and Public Health Competencies (n=64)

PACE Participant Pre- and Post- Change Scores for the Extension-based Physical Activity and Public Health Competencies (n=64)			
	Pre-training M(SD) (out of 4)	Post-training M(SD) (out of 4)	Change M(SD)
Physical Activity and Public Health	2.38(±.58)	3.26(±.38)	.77(±0.56)***
Extension's Role in Physical Activity Promotion	2.25(±.75)	3.23(±.44)	.85(±.77)***
Selecting and Adapting Evidence Based Physical Activity Programs	2.14(±.75)	3.07(±.48)	.94(±.76)***
Behavior Change Theories and Strategies	2.29(±.68)	3.31(±.49)	1.00(±.72)***
Social Determinants of Health	2.19(±.69)	3.21(±.53)	.91(±.67)***
Policy, Systems, and Environmental Approaches	2.22(±.85)	3.32(±.50)	1.10(±.80)***
Partnerships	2.18(±.82)	3.22(±.51)	1.02(±.76)***
Planning and Evaluating	2.02(±.75)	3.04(±.48)	1.01(±.75)***
*** p<0.001 via Wilcoxon Signed Ranks			

Open ended responses to survey questions were included to capture quality improvement/participant perspectives and did not undergo rigorous qualitative analysis. However, it is notable that many participants wanted to share personal limitations (physical or simply 'new to this') as well as excitement for physical activity and the PACE training. Feedback from participants while the training was ongoing included

liking the interactive physical activity breaks, engaging with their small group members, and wanting even more interaction in the form of Zoom polls.

DISCUSSION

Public health workers can implement evidence-based programming, spread knowledge about physical activity guidelines to the public, and lead experiential learning opportunities (3, 15). Competency-based trainings have been shown to increase desire of participants to translate knowledge to others (13, 15, 22). A micro-credential provides employers with evidence that specific individuals within the workforce have specified training (25). Therefore, Extension set the PACE through a competency-based physical activity training. PACE was shown to be effective in increasing Ext-PAPH competency scores, and had participants enthusiastic about what they learned. This program was successful in retaining participants who attended at least 1 session (65% in PACE when compared to 67% in other PAPH trainings(13)).

Regarding participant representativeness of typical Extension demographics, it is difficult to know the true demographic profile of Extension as a whole, as many times data are not made available at the state level or in the reporting of different studies. The majority of the program participants were white females. This is a similar demographic profile to other studies that have focused on agents who deliver health-based programming (11, 34, 35). However, 4-H, national nutrition programs, and Family and Consumer Sciences (FCS), which are the typical areas within Extension that deliver health-based programming, are only a few avenues for physical activity promotion within Extension. Extension agricultural agents can also engage in these efforts, and a larger proportion of agriculture agents are male (compared to FCS and 4-H) (36). This iteration of PACE focused primarily on reaching agents delivering health-based programming, but future variations of PACE will strive to reach other agents as well (10). Representativeness data for comparison on participants' position (i.e. agent, administrator) within Extension is also difficult to fully determine, as many studies do not report data on participants' position, duration in Extension, and background/training (12, 37). Taken together, while this research brief aimed to compare PACE participants to non-participants within Extension, the lack of these data at the state or national level makes this challenging. Simultaneously, the predominantly white and female

demographic profile of the PACE participants limits generalizability. Future PACE efforts would benefit from a wider representation of program areas, sex, and race.

Ongoing reach can be operationalized as how much of the intervention was received (26). In this research brief, ongoing reach was operationalized within the program based on the denominators influenced by the Diffusion of Innovation Theory (38). For example, approximately 65% of those who chose to come to at least one session attended all the sessions, finished the program, and earned their completion certificate. For participants who registered on time, retention was greater than 50%. However, and despite the request to re-open registration, none of the individuals who registered late attended sessions (i.e., 0% ongoing reach). This suggests that those who learn of an intervention and register (almost immediately) were early adopters and more likely to complete the program.

Initially, 9 weeks of sessions and homework were proposed to cover the content and improve physical activity and flourishing within agents. Improving physical activity and flourishing of Extension personnel was a goal of PACE based on research that increased physical activity of agents increases likelihood that those agents will lead physical activity programming (11). Physical health is also a part of flourishing, which includes life and job satisfaction (23). While flourishing and physical activity both increased significantly after PACE, there was not sufficient time to fully detail other aspects of flourishing within Extension, such as mindfulness and self-care.
Extension agents who are more active have been shown to be more open to starting physical activity programs within their state (11). To begin physical activity programming, agents must first be aware of the Physical Activity Guidelines for Americans (PAG), as well as Extension's role in physical activity promotion. Based on the changes in Ext-PAPH competencies, the greatest number of participants improved in knowledge of PAGA competency section versus the change in the 7 other competency areas (see Table 2). Learning more about PAGA, the Move Your Way Campaign, and evidenced-based physical activity through a competency-based intervention may lead to increased delivery of community interventions (14, 15, 22) for physical activity and an increased proportion of Americans meeting the PAGA.

While Ext-PAPH competency scores improved significantly overall from pre- to post-program, 7 individuals showed decrease competency in the Extension's Role in Physical Activity section. This is worrisome in that the design of the program was meant to increase competency in physical activity and physical activity programs for Extension personnel. This decline may be, in part, due to potential disagreement or initial misunderstandings of Extension's role (e.g., participants who believe Extension agents should serve as fitness instructors rather than deliver behavior change interventions). Other competency sections showed a few participants who reported less competency post-program, but overall participants gained knowledge.

Lack of peer-to-peer interaction has previously been cited as the roadblock for many participants in asynchronous trainings (16). By both using and teaching about group dynamics principles in a synchronous training through mechanisms such as breakout rooms on Zoom, individuals were able have peer-to-peer interaction and experience group dynamics in action. Through emails and answers to open ended questions on the post-survey, participants expressed that they enjoyed these aspects of the program and planned to incorporate them in their own programming moving forward. Participants also expressed a high desire to relate what they learned to their own program participants, which is in keeping with findings that competency-based learning increases knowledge translation to others (15).

There were a number of further limitations to this work. The competencies used were the best fit for the program in their focus on public health and public activity. However, neither set of competencies that the Ext-PAPH competencies were drawn from has been tested for validity or reliability. Additionally, Godin is not a very sensitive measure, and may not be able to fully model the changes in physical activity that participant's experienced. Finally, there is no national repository of Extension personnel demographics in order to formally compare PACE participants demographics to the Extension personnel states or national demographics. This might lead to misinterpretation of the representativeness of the program participants.

Considering the promise of the program against the study limitations, a number of future directions are underway. Once the Extension workforce has the basic information on physical activity programming, they will be better able to deliver evidence-based

programs that already exist (12). PACE covered the physical activity in public health basics, with a goal of increased knowledge and competency of Extension public health workers in. More modules to promote physical activity and flourishing via mindfulness and self-care have been developed and piloted. Validation of both Ext-PAPH and subsequent modules will be feasible once a larger sample is obtained. Once the competencies and format have been further studied (including in iterations outside the COVID-19 pandemic), there is potential for scaling out the program, using the same structure and core components to cover both other topics and other systems.

Implications for research and practice

Physical activity is an important part of health and can be effectively promoted by public health workers including Extension personnel. Competency-based trainings can improve dissemination of knowledge and evidence-based programming to the public, and PACE is a competency-based training that has been shown to significantly improve competency scores across the physical activity core competency essentials. These data support that public health workers in other settings will also benefit from competency-based trainings on physical activity in public health. The PACE program has engaged Extension personnel and exhibited a high retention rate, leading to more Extension personnel having confidence and skill in evidence-based physical activity programming. Future iterations of PACE will expand to include more state Extension systems and other public health workers, and monitor the long terms effects of PACE to see if participants incorporate more evidence-based physical activity programming. This could be evaluated based on number of physical activity programs delivered by PACE participants, or in a more general manner by reviewing reported physical activity support through grants obtained or partnerships formed to promote physical activity. Based on feedback from PACE participants, future efforts on recruitment and retention will focus on detailing the time commitment involved. Work is needed on the frequency and duration (i.e., dose) that fits within participants' work schedule while actually changing behavior, and also evaluating what additional training strategies, such as one-on-one instruction or further group dynamics-based trainings, are necessary to ensure increased competencies for all participants across all competency categories. The mechanism of effect, and the most effective group dynamics strategies – e.g., the rich discussion possible in small group

break outs (interaction and communication) or establishing a team name (team distinctiveness) -should be explored.

Reference List

1. Haskell W, Lee I, Pate R, Powell K, Blair S, Franklin B, et al. Physical Activity and Public Health Updated Recommendation for Adults From the American College of Sports Medicine and the American Heart Association. Medicine & Science in Sports & Exercise. 2007;116(9):1081-93.
2. Physical Activity Guidelines for Americans. In: US Department of Health and Human Services, editor. 2 ed. Washington, DC: US Department of Health and Human Services; 2018.
3. Piercy KL, Dorn JM, Fulton JE, Janz KF, Lee SM, McKinnon RA, et al. Opportunities for Public Health to Increase Physical Activity Among Youths. American Journal of Public Health. 2015;105(3):421-6.
4. Piercy KL, Troiano RP, Ballard RM, Carlson SA, Fulton JE, Galuska DA, et al. The Physical Activity Guidelines for Americans. JAMA. 2018;320(19):2020-8.
5. National Physical Activity Plan. Columbia, SC; 2016.
6. Fetsch R, MacPhee D, Boyer L. Evidence-Based Programming: What Is a Process an Extension Agent Can Use to Evaluate a Program's Effectiveness? . Journal of Extension. 2012;50(5).
7. Dunifon R, Duttweiler M, Pillemer K, Tobias D, Trochim W. Evidence-Based Extension. Journal of Extension. 2004;42(2).
8. Franz NK, Townson L. The Nature of Complex Organizations: The Case of Cooperative Extension. 2008:5-14.
9. Strayer TE, 3rd, Balis LE, Harden SM. Partnering for Successful Dissemination: How to Improve Public Health With the National Cooperative Extension System. J Public Health Manag Pract. 2020;26(2):184-6.
10. Balis LE, Brown SD, Kesterson H, Harden SM. Move More, Site Less: Applying the Physical Activity Guidelines for Americans to Extension Programs. Journal of Human Sciences and Extension. (In press).
11. Estabrooks P, Bradshaw M, Fox E, Berg J, Dzewaltowski DA. The Relationships Between Delivery Agents' Physical Activity Level and the Likelihood of Implementing a Physical Activity Program. American Journal of Health Promotion. 2004;18(5):350-3.
12. Harden SM, Balis LE, Strayer TE, Prosch N, Carlson B, Lindsay A, et al. Strengths, Challenges, and Opportunities for Physical Activity Promotion in the Century-old National Cooperative Extension System. Journal of Human Sciences and Extension. 2020;8(3):104-24.
13. Hawley SR, St. Romain T, Orr SA, Molgaard CA, Kabler BS. Competency-Based Impact of a Statewide Public Health Leadership Training Program. Health Promotion Practice. 2011;12(2):202-8.
14. Kenefick HW, Ravid S, MacVarish K, Tsoi J, Weill K, Faye E, et al. On Your Time: Online Training for the Public Health Workforce. Health Promotion Practice. 2014;15:48S-55S.
15. Ruiz Y, Matos S, Kapadia S, Islam N, Cusack A, Kwong S, et al. Lessons Learned From a Community–Academic Initiative: The Development of a Core Competency–Based Training for Community–Academic Initiative Community Health Workers. American Journal of Public Health. 2012;102(12):2372-9.

16. Ballew P, Castro S, Claus J, Kittur N, Brennan L, Brownson RC. Developing Web-based Training for Public Health Practitioners: What Can We Learn From a Review of Five Disciplines? Health Educ Res. 2013;28(2):276-87.
17. Farrell B, Ward N, Jennings B, Jones C, Jorgenson D, Gubbels-Smith A, et al. Participation in Online Continuing Education. International Journal of Pharmacy Practice. 2016;24(1):60-71.
18. Woodcock S, Sisco A, Eady M. The Learning Experience: Training Teachers Using Online Synchronous Environments. Journal of Educational Research and Practice. 2015;5(1).
19. Cervero RM, Gaines JK. The Impact of CME on Physician Performance and Patient Health Outcomes: An Updated Synthesis of Systematic Reviews. Journal of Continuing Education in the Health Professions. 2015;35(2):131-8.
20. Davis D, O'Brien MAT, Freemantle N, Wolf FM, Mazmanian P, Taylor-Vaisey A. Impact of Formal Continuing Medical EducationDo Conferences, Workshops, Rounds, and Other Traditional Continuing Education Activities Change Physician Behavior or Health Care Outcomes? JAMA. 1999;282(9):867-74.
21. Salas E, Tannenbaum S, Kraiger K, Smith-Jentsch K. The Science of Training and Development in Organizations: What Matters in Practice. Psychological Science in the Public Interest. 2012;13:74-101.
22. Saleh SS, Williams D, Balougan M. Evaluating the Effectiveness of Public Health Leadership Training: The NEPHLI Experience. American journal of public health. 2004;94(7):1245-9.
23. Weziak-Bialowolska D, McNeely E, VanderWeele TJ. Flourish Index and Secure Flourish Index – Validation in Workplace Settings. Cogent Psychology. 2019;6(1).
24. VanderWeele TJ. On the promotion of human flourishing. Proc Natl Acad Sci U S A. 2017;114(31):8148-56.
25. Mathur A, Wood ME, Cano A. Mastery of Transferrable Skills by Doctoral Scholars: Visualization using Digital Micro-credentialing. Change. 2018;50(5):38-45.
26. Harden SM, Fanning JT, Motl RW, McAuley E, Estabrooks PA. Determining the reach of a home-based physical activity program for older adults within the context of a randomized controlled trial. Health Educ Res. 2014;29(5):861-9.
27. Yen PH, Leasure AR. Use and Effectiveness of the Teach-Back Method in Patient Education and Health Outcomes. Fed Pract. 2019;36(6):284-9.
28. Estabrooks PA, Carron AV. Group cohesion in older adult exercisers: prediction and intervention effects. J Behav Med. 1999;22(6):575-88.
29. Society NPA. Core Competencies and Knowledge, Skills, and Abilities: Essentials for Public Health Physical Activity Practitioners. In: Medicine ACoS, editor. p. 1-11.
30. Place J. Modified Version of the Core Competencies for Public Health Professionals. Competency Assessment: Council on Linkages Between Academia and Public Health Practice; 2017.
31. Godin Leisure-Time Exercise Questionnaire. Medicine & Science in Sports & Exercise. 1997;29(6):36-8.
32. Amireault S, Godin G. The Godin-Shephard leisure-time physical activity questionnaire: validity evidence supporting its use for classifying healthy adults into active and insufficiently active categories. Percept Mot Skills. 2015;120(2):604-22.

33. Amireault S, Godin G, Lacombe J, Sabiston CM. The use of the Godin-Shephard Leisure-Time Physical Activity Questionnaire in oncology research: a systematic review. BMC Med Res Methodol. 2015;15:60-.
34. Balis LE, Strayer TE, Ramalingam N, Harden SM. Beginning with the End in Mind: Contextual Considerations for Scaling-out a Community-Based Intervention. Frontiers in Public Health. 2018;6.
35. Strayer TE, Kennedy LE, Balis LE, Ramalingam N, Wilson ML, Harden SM. Cooperative Extension Gets Moving, but How? Exploration of Extension Health Educators' Sources and Channels for Information-Seeking Practices. American Journal of Health Promotion. 2020;34(2):198-205.
36. Ensle KM. Burnout: How Does Extension Balance Job and Family? Journal of Extension. 2005;43(3).
37. Harden SM, Gaglio B, Shoup J, Kinney K, Johnson S, Brito F, et al. Fidelity to and Comparative Results Across Behavioral Interventions Evaluated Through the RE-AIM Framework: A Systematic Review. Systematic Reviews. 2015;4(155).
38. Rogers E, Singhal A, Quinlan M. Diffusion of Innovations. In: Stacks DW, Salwon MB, editors. An Integrated Approach to Communication Theory and Research. 2 ed. NY2009. p. 418-34.

Mindfulness and Understanding of Self-Care for Leaders of Extension: Promoting well-being for health educators and their clients

Anna Dysart, Samantha M. Harden

Abstract

Background: Mindfulness and self-care, practiced through a variety of methods like meditation and exercise, can improve overall sense of holistic well-being (i.e., flourishing). Increasing mindfulness and self-care may lead to increased flourishing and job satisfaction among the nation-wide Cooperative Extension system delivery personnel (agents) through a theory-based online program and an extended experiential program.
Methods: Cooperative Extension agents from two states were invited to participate in a zoom-based program, MUSCLE, via statewide listservs. Participants were invited to attend sessions and complete competency checks and between-session assignments each week. Pre- and post- program surveys included validated scales for flourishing and physical activity status. Due to high demand for mindfulness programing during the onset of the COVID-19 pandemic, experiential "Mindful Meet-up" 30-minute sessions were also offered. Dissemination and implementation of the two differing interventions (i.e., MUSCLE and Mindful Meet-ups) were examined.
Results: MUSCLE (more intensive program with assignments and competency checks) had lower reach and did not show statistically increased flourishing or physical activity. Mindful Meet-ups had higher attendance and proportional reach during the beginning of the pandemic, but no objective measure of flourishing or physical activity behaviors. Unsolicited qualitative feedback was encouraging because the interventions were well-received and participants felt as though they were more mindful.
Conclusions: While agents anecdotally reported personal improvements, capturing data on outcomes was challenging. Complementing outcome data with implementation and dissemination outcomes allowed for a richer picture to inform intervention decision-making (i.e., offering the same or new programming depending on participant needs).

Keywords: dissemination, implementation, RE-AIM evaluation framework, mindfulness, online interventions, employee wellness

Introduction

Physical, mental, and emotional health are all components of individual well-being and health status (1). While there are Physical Activity Guidelines published by the U.S. Department of Health and Human Services, (2) there are no recognized formal guidelines for increasing flourishing. Flourishing is a state of well-being in all aspects of an individual's life (1). Work and job life, as areas where individuals spend much of their time, are important to consider when discussing well-being (3).

Cooperative Extension (herein: Extension) is a nation-wide, federally funded system where educators work to engage with the community and provide education and programming to meet community needs (4-6). Within Extension, educators (most often called agents) have a unique set of skills and competencies (7, 8) to disseminate public health programs and interventions (4, 5). Similar to other worksite wellness investigations, (3, 9, 10) it is known that Extension personnel who have higher job satisfaction are more motivated and higher performing (3, 9). Incorporating stress management ideals and other aspects that promote overall well-being, or flourishing, (1) within wellness initiatives can also result in higher job satisfaction, (3, 10) lower levels of job stress, (10) and lower intention to leave (9). One well-studied intervention that can help promote lower levels of stress is yoga and its mindfulness principles (11-15).

Yoga is thought to reduce stress through shifting the body to the parasympathetic nervous system, stimulated by the breathing and movement patterns (14, 15). Yoga has been studied within multiple settings, including a university workplace (14) healthcare workers, (16, 17) and graduate students (18) as a method of stress reduction, and was found to reduce stress and anxiety. The success of yoga within these varying fields suggests it may also be successful within an Extension system wellness program to reduce stress.

Mindfulness interventions, defined as being fully aware and present in the moment, both based within yoga interventions and not, has also been found to be an appropriate and effective method for stress reduction (18-20) and burnout reduction (16). Participants in an 8-week yoga-based mindfulness intervention were found to have decreased emotional exhaustion and increased mindfulness (16). Interventions with mindfulness-based focused were also found to be beneficial in decreasing anxiety and

stress, (16, 18) and increasing self-compassion and mindfulness (18). Yoga can also help bridge self-care interventions, with reduced burnout and increased self-care (16). Self-care may encompass strategies such as nurturing interpersonal connections, performing emotional hygiene, (17) and physical movement like yoga (16). Including self-care within workplace wellness interventions may help to diminish stress, (18) with less stressed employees having higher performance and better job satisfaction (3, 10).

Physical activity, mindfulness, and self-care can all play a role in reducing stress (14-18). The Physical Activity Guidelines for Americans (PAG) (2) include yoga as a multicomponent physical activity (those that include muscle strengthening, aerobic, and balance activities) and as relatively moderate-intensity activity for some groups of individuals (2). It is hypothesized that a workplace wellness intervention that incorporates yoga might be able to encourage increased physical activity, mindfulness, and self-care. To explore this hypothesis, mindfulness and self-care interventions were developed and deployed using the RE-AIM framework (21). Use of RE-AIM in pragmatic planning and evaluation (22-24) was used to provide a full picture of the interventions.

Methods

Overview

Based on the RE-AIM Framework, each domain was operationalized as the following: The reach of an intervention or program is how well it connects with the intended audience (21). This allows investigators to know what they might need to do differently in order to draw more people to the program. Effectiveness is the impact the intervention had on the target health behavior. The reach and effectiveness in a program are both very important in getting a system or target staff to agree to adopt the program. The program implementation, in terms of cost, and adherence to the original intervention, is also an important factor in both the adoption and maintenance, or ongoing intervention effects, of the program (21).

The iterative Assess, Plan, Do, Evaluate, Report (APDER) cycle of RE-AIM, outlined by Harden, et al., (25) was applied to the promotion of mindfulness and self-care among Extension professionals. In the spring of 2020, with the work from home orders due to the COVID-19 pandemic, 30 minute “Mindful Meet-up” sessions were scheduled

for Monday mornings on the video conferencing platform, Zoom (see Figure 1). These sessions consisted of both lecture and experiential learning about a variety of mindfulness and stress-relieving tips for working from home. No data on flourishing and mindfulness level of participants prior to the start of Mindful Meet-ups is available as it was deemed more important to offer the mindfulness opportunities for employees than to take time to formulate a study. In the fall of 2020, with the continued pandemic, a 2-day mindfulness and self-care retreat titled "Mindfulness and Understanding of Self-Care for Leaders of Extension (MUSCLE)", was planned to be online in place of the originally planned in-person retreat. The online format increased the reach of the program to all Extension professionals in Virginia, and 73 individuals signed up for the retreat. However, attendance at each of the sessions averaged only 24 for day 1 (range of 7-43) and 19 for the second day (range of 7-36). Despite the lower than anticipated attendance, feedback obtained through a follow-up survey indicated a strong interest in continued mindfulness and self-care education.

To meet the requests for more education on the topic and to follow-up from other programs on physical activity (described more below), a 9-week version of MUSCLE was conducted in the fall/winter of 2020. With more time prior to the launch of the program, research questions were formulated and validated surveys were used during program registration. Due to the low adoption rate of the MUSCLE programs, and the higher adoption and reach of the Mindful Meet-up program, in the fall of 2021 the focus was placed on further refining the implementation and maintenance of the Mindful Meet-up program.

Recruitment and Participants

Extension employees were invited to MUSCLE via emails and during other programming, as described below. MUSCLE was a follow-up to a previously completed physical activity micro-credentialing program as well as the Mindful Meet-ups, which were informal, experiential mindfulness sessions led on Zoom. In brief, the micro-credentialing program PACE, which preceded MUSCLE, was a 9 week program that educated Extension personnel on methods and best practices to implement physical activity programing (26, 27). Both previous wellness offerings were effective and well-

attended, with participants from both programs requesting more education and experience with mindfulness and movement breaks. In response to these requests, the 9-week MUSCLE intervention was created.

All employees who attended the physical activity micro-credentialing program were eligible to attend MUSCLE sessions. They were verbally invited to participate in MUSCLE during the last week of the PACE program as well as via email *(appendix A)*. The email was sent out twice, once 30 days before the study sessions began, and once two weeks before the study sessions began. There were 130 PACE registrants (65 from each state) eligible to participate in MUSCLE. VCE employees (n= 83) were also invited during the FCS/FNP Mindful Monday Meet-up that discussed topics of self-care, mindfulness, and stress relief.

Intervention: Synchronous and Asynchronous Education

MUSCLE was conducted at 12pm EST on Mondays, filling the timeslot previously held by the PACE project. Each synchronous session was approximately 60 minutes and held on the Zoom platform. Each synchronous session included both didactic and experiential learning. Between sessions attendees were asked to complete asynchronous activities for mastery experiences related to techniques of mindfulness and self-care. These mastery experiences were included as practice as it has been shown that it promotes improved outcomes (28, 29). For audit and feedback, asynchronous activities were discussed further in breakout rooms during the next Zoom session, or put on the competency checks completed by participants.

Between synchronous sessions, support emails were sent to the entire participant pool that included a brief summary of the information covered during the synchronous session, the recording of the instructor view of the session (not the breakout rooms), as well as the activity to complete for the asynchronous portion of the week.

To facilitate behavior change, group dynamics strategies(30) and individual behavior change strategies were utilized. These included methods such as breakout rooms on Zoom within the synchronous sessions to enhance collective efficacy, competition, and group communication/interaction. Groups within the breakout rooms were sized to promote interaction and cohesion, with approximately 5 participants per group. Groups

came up with team names to promote group distinctiveness. Individual behavior change strategies included having social support from other participants, encouraging the use of action & coping plans, and having participants utilize self-monitoring tools as part of their asynchronous learning (31).

The following year the decision to promote Mindful Meet-ups and increase that program was made due to higher engagement from agents and stakeholders in Mindful Meet-up. Mindful Meet-up sessions are experiential mindfulness sessions that are conducted weekly on Zoom for 30 minutes on Monday mornings. Mindful Meet-up participants were requested to complete the same surveys that MUSCLE participants completed, both before the semester series of Meet-ups commenced, and at the end of the semester.

Measures

Reach

Sociodemographic Variables. Participants were asked to disclose their age and how many years they had worked with or been affiliated with Cooperative Extension. The hypothesis was the years working with Cooperative Extensions would correlate positively with flourishing and confidence in delivering physical activity.

Effectiveness

MUSCLE participants were given pre- and post-program surveys to complete, whereas the Mindful Meet-up participants were given surveys at the beginning of the third iteration/semester of the program and post-program surveys at the end of the third semester. In order to keep the spirit of Mindful Meet-ups as a wellness initiative and encourage program evaluation while preventing participants from feeling uncomfortable, surveys were optional for participants.

Flourishing. Flourishing is when all sectors of a person's life are good and there is a sense of well-being (1). To measure this construct the VanderWeele Secure Flourishing Index (SFI) (*Appendix B)* that breaks flourishing into six domains was used at pre, post, and 6-month follow-up (3). Each domain has two questions on a 0-10 scale. The domains

were: Happiness and Life Satisfaction, Mental and Physical Health, Meaning and Purpose, Character and Virtue, Close Social Relationships, and Financial and Material Stability (1). The last domain (Financial and Material Stability) was included not as a goal for current flourishing, but as means to sustain flourishing (3). Each domain has two questions on a 0-10 scale. Scales included anchors of "Not Satisfied at All" to "Completely Satisfied", "Not True of Me" to "Completely True of Me", "Poor" to "Excellent", "Not at all Worthwhile" to "Completely Worthwhile", "Strongly Disagree" to "Strongly Agree", "Not True of Me" to "Completely True of Me", and "Worry All of the Time" to "Do Not Ever Worry". Higher scores on the index correlate with increased flourishing. The SFI was validated for use in a workplace setting in 2019 by Weziak-Bialowolska, et. al with the correlation that workers who experience increased flourishing also experience increased job satisfaction and work engagement (3).

Self-efficacy for yoga. The yoga self-efficacy scale (YSES) (*Appendix C)* is a validated tool used to assess the confidence a participant has in their yoga practice and their sense of competency in their yoga practice (32). The YSES is a 12-item tool with each item rated on a nine point Likert scale with anchors of strongly disagree to strongly agree. The 12 items are broken down into three domains – Body, Breath, and Mind. Higher YSES scores correlated with increased health competence and health-related quality of life during the validation study. While the YSES had the highest Cronbach's alpha for practitioners of the target yoga style, the YSES was shown to still be valid for practitioners of five other common yoga styles (32).

Physical Activity. The Stanford Leisure-Time Activity Categorical Item (L-CAT) (*Appendix D)* is a validated, one item tool with six differentiating responses to assess non-work physical activity (33). It has been validated with both men and women who are overweight or have obesity, (33, 34) utilizing both pedometers (35) and Sensewear™ Armbands (34) as comparative assessments of physical activity. It has also been compared to the Godin Leisure Time Exercise Questionnaire with populations of low health literacy and shown to have similar results (35). The L-CAT version 2.2 was used in this study, which was shown to be accurate when compared with other measures of

physical activity, (34) and is the suggested version to use by the creators of the L-CAT (34). Statements with higher numbers corelate to increased activity (33).

Separate questions were asked of the participants to determine the proportion of time during work hours the participants spent with Cooperative Extension participants conducting physical activity. The working hypothesis, based on the social cognitive theory for health promotion, (36) was that attendance of MUSCLE and Mindful Meet-up would start a chain of increased learning and knowledge that would end with increased teaching of physical activity to Cooperative Extension participants and increased incorporation of PA within Cooperative Extension workplaces. See Figure 2.

Competency Checks. At the end of each week of the MUSCLE program, participants were asked to complete competency checks via Qualtrics software. The competency checks were de-identified, with participant IDs being their team name and a randomly chosen number that they were asked to decide upon in their first breakout room during the first Zoom session. Competency checks included information checks on the information covered during the synchronous sessions, as well as the asynchronous activities the participants were to complete throughout the week. By completing the competency checks, participants had another point of contact that encouraged them to complete their self-monitoring tools, action and coping plans, etc. Competency checks were evaluated based on completion, and not based on percent correct answers due to the subjective nature of some questions, i.e. “What is your favorite method of self-care?” This follows the projected model that increased MUSCLE participation will increase SFI and YSES, and results of increased PA will be seen on the follow-up L-CAT surveys.

Adoption

MUSCLE was solely adopted and implemented by the original program team. Mindful Meet-ups was able to reach a broader adoption throughout the system by incorporating another team, Hokie Wellness, in the program delivery. Hokie Wellness was integrated into the Mindful Meet-up program during the second semester and will be further responsible for carrying Mindful Meet-ups into the future. We will be able to determine if this adoption was successful in the next semester.

Implementation

Each program was implemented through online video conferencing software. Calendar invites for each program were sent to registered participants to encourage attendance post-registration. Hours of time team members worked to implement each program was specifically tracked for MUSCLE and more generally estimated for Mindful Meet-ups.

Maintenance

Follow-up surveys were sent to each participant at the conclusion of the MUSCLE program and Mindful Meet-ups semester series, as well as 6 months after the conclusion of the MUSCLE program. Follow-up surveys included the same validated survey items from the pre-survey, including the SFI, the YSES, and the L-CAT.

Analysis

Descriptive and inferential statistics for all data were calculated using SPSS software (IBM, version 26). T-tests with Bonferroni ad hoc were used to evaluate physical activity and flourishing pre and post. As previously detailed, each program was evaluated through a pragmatic application of the RE-AIM framework (24, 25).

Results

Reach

Total Number. The MUSCLE 2-day retreat had 73 individuals registered, and an average attendance of 26 on the day 1 sessions and 19 on the day 2 sessions. Seventeen (13% of those eligible) participants completed the 9-week MUSCLE program. Approximately 120 participants attended Mindful Meet-ups each week during the spring of 2020, declining to about 80 participants each week for the following semesters.

Proportion. Out of the 130 eligible participants for MUSCLE, only 13% participated. Out of the approximately 130 eligible participants for Mindful Meet-ups, 61.5% participated each week. With the higher total number and higher proportional reach of Mindful Meet-ups, it reaches more participants.

Effectiveness

The 9-week MUSCLE program was not found to statistically increase flourishing, physical activity, or yoga self-efficacy. Mindful Meet-ups effectiveness is unknown due to low survey response rates.

Adoption

Currently no other systems or teams have adopted any of the programs. However, Hokie Wellness, has stepped up to lead and participate with Mindful Meet-ups while targeting the same participant group, i.e. Cooperative Extension.

Implementation

Both the 9-week MUSCLE program and the 2-day MUSCLE retreat were more labor intense programs, as they required more effort from the leading team to implement. The 2-day MUSCLE retreat required approximately 60 hours of work over 6 weeks, including the eight hours each day of the retreat itself. The MUSCLE 9-week program required approximately 55 hours of work for the primary team member over 15 weeks, or approximately 3 hours and 40 minutes per week. Mindful Meet-ups require only 30 minutes to 1 hour per week to deliver, based on if there is a handout for the week or only experiential learning. Both programs had no monetary cost associated with them.

Maintenance

The MUSCLE 9-week program and the 2-day MUSCLE retreat have not been repeated. However, there have been requests from both past participants and those who did not attend the MUSCLE program or retreat to have it held again. The Mindful Meet-ups had support for over 1.5 years from the administration of VCE FCS/FNP as well as Hokie Wellness, however did not receive any support or feedback from administration for a fourth semester. The program leaders for Mindful Meet-ups did receive a number of unsolicited emails from participants speaking about how much they enjoyed the program, how useful it was for them, and how they had grown in mindfulness. One notable email stated, “This was a great program. The program was very informative in helping me become more centered with all the new normal's in effect.”

Responses on the pre- and post-semester surveys for Mindful Meet-ups were highly limited, despite 58 people registering to attend the sessions and average attendance in the last semester being 13 (range 5-21). There were 9 pre-semester surveys completed and 6 post-semester surveys completed, with only 2 participants completing both the pre- and post- surveys. See table 1 for the application of RE-AIM across all three programs.

Discussion

Throughout the COVID-19 pandemic, needs for mindfulness, physical activity, and human connection evolved rapidly. While many others have explored the need for yoga and mindfulness offerings during the COVID-19 pandemic, (37-40) there is less available evidence for how mindfulness programs that were deemed efficacious prior to the pandemic were adjusted and implemented during the pandemic. Evaluation of the implementation and maintenance of programs needs to be continued and reported, (23) as it is not helpful to the general public if interventions are known by researchers to be effective, but never implemented with the public. Even prior to the start of the pandemic, interventions deemed effective (including come discussed above) (14, 16, 18) often have very little follow-up information readily available.

Extension specific Mindful Meet-ups sprung from a desire to connect while working from home in the earliest weeks of the pandemic, and continued to serve throughout the following semesters. The MUSCLE programs, originally conceived prior to the pandemic, pivoted and flowed online and ended up reaching a larger proportion of the target audience than initially thought would be possible. Utilizing the APDER process, (25) the program leaders were able to assess what would best serve employee wellness and learning in that moment, and then quickly evaluate and change as needed.

While the MUSCLE programs, in particular the 2-day retreat, were well attended, interest in conducting/attending them again has waned. This may be in part due to increased in-person activities, a proliferation of mindfulness and wellness based programming, or general disinterest in more mindfulness and physical activity content. When the last semester of Mindful Meet-ups came to a close, there was interest in continuing them from the participants, but due to shifting availability in the program leaders and wider availability of other, similar programs, Mindful Meet-ups was also

discontinued. Participants from both the MUSCLE and Mindful Meet-ups who have expressed desire to attend more mindfulness and physical activity-based programming have been directed to other, on-going efforts that are not employee based and instead serve the general public.

Conclusion

The RE-AIM and APDER cycles can be used before, during, and after implementation to evaluate programs and interventions for appropriateness, effectiveness, and necessity. These are especially helpful as guides when circumstances are changing rapidly, as in a pandemic. While employees expressed appreciation and personal commitment to attending mindfulness and physical activity-based programming throughout a variety of different programming iterations, there was no statistical improvement in flourishing or physical activity able to be discerned from the various programs described above. Future studies may look at effectiveness of various styles of mindfulness programs and implementation and maintenance of those programs.

Table 1. Application of RE-AIM dimensions across three mindfulness programs

	Mindful Meet-ups	MUSCLE 2-day Retreat	MUSCLE 9-week Program
Reach	~80 participants	73 participants	17 participants
Total Proportion	80/130 (61.5%)	73/130 (56.2%) (~33% attended at least 1 session)	17/130 (13%)
Representativeness	Family and Consumer Sciences (FCS) and Family Nutrition Program (FNP)	Limited participation from those outside FCS	Only FCS agents
Deciding Factor: Mindful Meet-ups has the greatest proportional reach			
Effectiveness	Unknown	Participants qualitatively reported that they felt valued within VCE after the retreat	No statistically significant change in flourishing or yoga self-efficacy
Deciding Factor: Evaluate Mindful Meet-ups as a method to increase flourishing, MUSCLE programs not statistically effective			
Adoption	Hokie Wellness partnered with original leading team to increase their reach	No outside adoption	No outside adoption
Deciding Factor: Other teams and systems want to adopt Mindful Meet-ups			
Implementation	Low resource investment, no curriculum to implement with fidelity	Medium time investment, no curriculum to implement with fidelity	High time investment, developed curriculum needs to be implemented with fidelity
Deciding Factor: Mindful Meet-ups are easiest to implement with limited resources			
Maintenance	Mindful Meet-ups have continued for multiple semesters	One time event	One time program
Deciding Factor: Evaluate how other teams and systems adopting Mindful Meet-ups can improve maintenance			

Appendix A

Subject: Educational Sessions- Put a little MUSCLE into it

VCE is hosting educational sessions focusing on "Mindfulness and Understanding of Self-Care for Leaders of Extension" (MUSCLE). This is an experimental online program that is open the attendees of the Mindful Monday Meet-ups, PACE, and anyone else who would like to join. Participants will be asked to complete surveys before and after. These educational sessions will be focused on mindfulness, yoga, and self-care. For more information, contact adysart@vt.edu.

Appendix B

Flourishing Scale

VanderWeele, T. On the promotion of human flourishing. PNAS. 2017;114(31):8148-8156

Domain 1: Happiness and Life Satisfaction.
Overall, how satisfied are you with life as a whole these days?
0 = Not Satisfied at All, 10 = Completely Satisfied

In general, how happy or unhappy do you usually feel?
0 = Extremely Unhappy, 10 = Extremely Happy

Domain 2: Mental and Physical Health.
In general, how would you rate your physical health?
0 = Poor, 10 = Excellent

How would you rate your overall mental health?
0 = Poor, 10 = Excellent

Domain 3: Meaning and Purpose.
Overall, to what extent do you feel the things you do in your life are worthwhile?
0 = Not at All Worthwhile, 10 = Completely Worthwhile

I understand my purpose in life.
0 = Strongly Disagree, 10 = Strongly Agree

Domain 4: Character and Virtue.

I always act to promote good in all circumstances, even in difficult and challenging situations.
0 = Not True of Me, 10 = Completely True of Me

I am always able to give up some happiness now for greater happiness later.
0 = Not True of Me, 10 = Completely True of Me

Domain 5: Close Social Relationships.
I am content with my friendships and relationships.
0 = Strongly Disagree, 10 = Strongly Agree

My relationships are as satisfying as I would want them to be.
0 = Strongly Disagree, 10 = Strongly Agree

Domain 6: Financial and Material Stability.
How often do you worry about being able to meet normal monthly living expenses?
0 = Worry All of the Time, 10 = Do Not Ever Worry

How often do you worry about safety, food, or housing?
0 = Worry All of the Time, 10 = Do Not Ever Worry

Appendix C

Yoga Self-Efficacy Scale Items

Birdee et al. BMC Complementary and Alternative Medicine 2016;16(3)
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Please circle the corresponding number for each item, with 1 being "strongly disagree" and 9 being "strongly agree"

Body

When I practice yoga…

1. I am able to remain as comfortable as possible while doing movements.
   1 2 3 4 5 6 7 8 9
2. I am able to keep my mind focused on movements of my body.
   1 2 3 4 5 6 7 8 9
3. I can coordinate the movements of my body with my breath.
   1 2 3 4 5 6 7 8 9
4. I am able to move my body smoothly.
   1 2 3 4 5 6 7 8 9
5. I am able to maintain a feeling of stability in my body.
   1 2 3 4 5 6 7 8 9

Breath

When I practice yoga…

6. I am able to keep my breath smooth and continuous.
   1 2 3 4 5 6 7 8 9
7. I am able to remain comfortable while regulating my breath.
   1 2 3 4 5 6 7 8 9
8. I am able to focus my mind on my breath.
   1 2 3 4 5 6 7 8 9
9. I am able to make my breath longer and deeper without feeling anxious.
   1 2 3 4 5 6 7 8 9

Mind

During my yoga practice…

10. If distracted, I can re-focus my mind.
    1 2 3 4 5 6 7 8 9
11. If asked, I am able to visualize or have an impression of an object in my mind.
    1 2 3 4 5 6 7 8 9
12. I am able to remain focused on a meditative object or point.

1 2 3 4 5 6 7 8 9

Appendix D

Stanford Leisure-Time Activity Categorical Item

Kiernan M, Schoffman DE, Lee K, et al. The Stanford Leisure-Time Activity Categorical Item (L-Cat): a single categorical item sensitive to physical activity changes in overweight/obese women. Int J Obes (Lond). 2013;37(12):1597-1602. doi:10.1038/ijo.2013.36

During the past month, which statement best describes the kinds of physical activity you usually did? Do not include the time you spent working at a job. Please read all six statements before selecting one.

1. I did not do much physical activity. I mostly did things like watching television, reading, playing cards, or playing computer games. Only occasionally, no more than once or twice a month, did I do anything more active such as going for a walk or playing tennis.
2. Once or twice a week, I did light activities such as getting outdoors on the weekends for an easy walk or stroll. Or once or twice a week, I did chores around the house such as sweeping floors or vacuuming.
3. About three times a week, I did moderate activities such as brisk walking, swimming, or riding a bike for about 15–20 minutes each time. Or about once a week, I did moderately difficult chores such as raking or mowing the lawn for about 45–60 minutes. Or about once a week, I played sports such as softball, basketball, or soccer for about 45–60 minutes.
4. Almost daily, that is five or more times a week, I did moderate activities such as brisk walking, swimming, or riding a bike for 30 minutes or more each time. Or about once a week, I did moderately difficult chores or played sports for 2 hours or more.
5. About three times a week, I did vigorous activities such as running or riding hard on a bike for 30 minutes or more each time.
6. Almost daily, that is five or more times a week, I did vigorous activities such as running or riding hard on a bike for 30 minutes or more each time.

Reference List

1. VanderWeele TJ. On the promotion of human flourishing. Proc Natl Acad Sci U S A. 2017;114(31):8148-56.
2. Physical Activity Guidelines for Americans. In: US Department of Health and Human Services, editor. 2 ed. Washington, DC: US Department of Health and Human Services; 2018.
3. Weziak-Bialowolska D, McNeely E, VanderWeele TJ. Flourish Index and Secure Flourish Index – Validation in Workplace Settings. Cogent Psychology. 2019;6(1).
4. Archibald T. Whose Extension Counts? A Plurality of Extensions and Their Implications for Credible Evidence Debates. Journal of Human Sciences and Extension. 2019;7(2):22-35.
5. Dunifon R, Duttweiler M, Pillemer K, Tobias D, Trochim W. Evidence-Based Extension. Journal of Extension. 2004;42(2).
6. Franz NK, Townson L. The Nature of Complex Organizations: The Case of Cooperative Extension. 2008:5-14.
7. Baker SS, Pearson M, Chipman H. Development of Core Competencies for Paraprofessional Nutrition Educators Who Deliver Food Stamp Nutrition Education. J Nutr Educ Behav. 2009;41(2):138-43.
8. Baker S, Auld G, Mackinnon C, Ammerman A, Hanula G, Lohse B, et al. Best Practices in Nutrition Education for Low-Income Audiences. 2014.
9. Dickin KL, Dollahite JS, Habicht JP. Job satisfaction and retention of community nutrition educators: the importance of perceived value of the program, consultative supervision, and work relationships. J Nutr Educ Behav. 2010;42(5):337-44.
10. Hoert J, Herd AM, Hambrick M. The Role of Leadership Support for Health Promotion in Employee Wellness Program Participation, Perceived Job Stress, and Health Behaviors. Am J Health Promot. 2018;32(4):1054-61.
11. Pascoe MC, Thompson DR, Ski CF. Yoga, mindfulness-based stress reduction and stress-related physiological measures: A meta-analysis. Psychoneuroendocrinology. 2017;86:152-68.
12. Francis AL, Beemer RC. How does yoga reduce stress? Embodied cognition and emotion highlight the influence of the musculoskeletal system. Complement Ther Med. 2019;43:170-5.
13. Brown RP, Gerbarg PL. Yoga breathing, meditation, and longevity. Ann N Y Acad Sci. 2009;1172:54-62.
14. Maddux RE, Daukantaité D, Tellhed U. The effects of yoga on stress and psychological health among employees: an 8- and 16-week intervention study. Anxiety Stress Coping. 2018;31(2):121-34.
15. Ross A, Thomas S. The Health Benefits of Yoga and Exercise: A Review of Comparison Studies. Journal of alternative and complementary medicine (New York, NY). 2010;16:3-12.
16. Alexander GK, Rollins K, Walker D, Wong L, Pennings J. Yoga for Self-Care and Burnout Prevention Among Nurses. Workplace Health Saf. 2015;63(10):462-70; quiz 71.

17. Wei H, Kifner H, Dawes ME, Wei TL, Boyd JM. Self-care Strategies to Combat Burnout Among Pediatric Critical Care Nurses and Physicians. Crit Care Nurse. 2020;40(2):44-53.
18. Klawonn A, Kernan D, Lynskey J. A 5-Week Seminar on the Biopsychosocial-Spiritual Model of Self-Care Improves Anxiety, Self-Compassion, Mindfulness, Depression, and Stress in Graduate Healthcare Students. Int J Yoga Therap. 2019;29(1):81-9.
19. Burton A, Burgess C, Dean S, Koutsopoulou GZ, Hugh-Jones S. How Effective are Mindfulness-Based Interventions for Reducing Stress Among Healthcare Professionals? A Systematic Review and Meta-Analysis. Stress Health. 2017;33(1):3-13.
20. Harkess KN, Delfabbro P, Mortimer J, Hannaford Z, Cohen-Woods S. Brief Report on the Psychophysiological Effects of a Yoga
Intervention for Chronic Stress. Journal of Psychophysiology. 2017;31(1):38-48.
21. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. Am J Public Health. 1999;89(9):1322-7.
22. Glasgow RE. What does it mean to be pragmatic? Pragmatic methods, measures, and models to facilitate research translation. Health Educ Behav. 2013;40(3):257-65.
23. Stoutenberg M, Galaviz KI, Lobelo F, Joy E, Heath GW, Hutber A, et al. A Pragmatic Application of the RE-AIM Framework for Evaluating the Implementation of Physical Activity as a Standard of Care in Health Systems. Prev Chronic Dis. 2018;15:E54.
24. Steketee AM, Harden SM. Mom Expo: Bridging the Gap Between Local Women and Perinatal Resources. J Perinat Educ. 2021;30(2):108-17.
25. Harden SM, Smith ML, Ory MG, Smith-Ray RL, Estabrooks PA, Glasgow RE. RE-AIM in Clinical, Community, and Corporate Settings: Perspectives, Strategies, and Recommendations to Enhance Public Health Impact. Front Public Health. 2018;6:71.
26. Daniels B, Harden SM, Dysart A, Balis LE. What does it take: The roles, responsibilities, and fidelity of a prevention support system to build capacity. Evaluation and the Health Profession. 2021;Under Review.
27. Dysart A, Balis LE, Daniels BT, Harden SM. Health Educator Participation in Virtual Micro-Credentialing Increases Physical Activity in Public Health Competencies. Front Public Health. 2021;9:780618.
28. Salas E, Tannenbaum S, Kraiger K, Smith-Jentsch K. The Science of Training and Development in Organizations: What Matters in Practice. Psychol Sci Public Interest. 2012;13:74-101.
29. Davis D, O'Brien MAT, Freemantle N, Wolf FM, Mazmanian P, Taylor-Vaisey A. Impact of Formal Continuing Medical EducationDo Conferences, Workshops, Rounds, and Other Traditional Continuing Education Activities Change Physician Behavior or Health Care Outcomes? JAMA. 1999;282(9):867-74.
30. Carron AV, Spink KS. Team Building in an Exercise Setting. 1993;7(1):8.
31. Sheeran P, Webb TL. The Intention–Behavior Gap. Social and Personality Psychology Compass. 2016;10(9):503-18.
32. Birdee GS, Sohl SJ, Wallston K. Development and Psychometric Properties of the Yoga Self-Efficacy Scale (YSES). BMC Complement Med Ther. 2016;16(1):3.

33. Kiernan M, Schoffman DE, Lee K, Brown SD, Fair JM, Perri MG, et al. The Stanford Leisure-Time Activity Categorical Item (L-Cat): A Single Categorical iItem Sensitive to Physical Activity Changes in Overweight/Obese Women. Int J Obes. 2013;37(12):1597-602.
34. Ross KM, Leahey TM, Kiernan M. Validation of the Stanford Leisure-Time Activity Categorical Item (L-Cat) Using Armband Activity Monitor Data. Obes Sci Pract. 2018;4(3):276-82.
35. Kružliaková N, Estabrooks PA, You W, Hedrick V, Porter K, Kiernan M, et al. The Relationship Between the Stanford Leisure-Time Activity Categorical Item and the Godin Leisure-Time Exercise Questionnaire Among Rural Intervention Participants of Varying Health Literacy Status.15(4):269.
36. Bandura A. Health Promotion by Social Cognitive Means. Health Educ Behav. 2004;31(2):143-64.
37. Jasti N BH, George S, Varambally S, Gangadhar BN. Tele-yoga for Stress Management: Need of the Hour During the COVID-19 Pandemic and Beyond? Asian J Psychiatr. 2020;54.
38. Mohanty S, Sharma P, Sharma G. Yoga for Infirmity in Geriatric Population Amidst COVID-19 Pandemic. Asian J Psychiatr. 2020;53.
39. Nagendra H. Yoga for COVID-19. International Journal of Yoga. 2020;13(2):87-8.
40. Rajkumar RP. COVID-19 and mental health: A review of the existing literature. Asian J Psychiatr. 2020;52:102066-.

Effects of Temperature and Tempo: Evaluating how much time of a typical community-based yoga class is moderate intensity aerobic activity

Anna Dysart, Samantha M. Harden

Abstract

Background: The 2nd edition of the Physical Activity Guidelines for Americans (PAG) recommends, in part, 150 minutes of moderate-intensity aerobic physical activity. The PAG states that yoga may be able to help meet the guidelines for moderate-intensity aerobic exercise for adults and older adults.

Purpose: To determine what proportion of a typical community-based 60-minute yoga session meets the criteria for moderate-intensity aerobic activity based on heart rate data and rate of perceived exertion (RPE) of the participants.

Methods: Participants completed the Stanford Leisure-Time Activity Categorical (L-CAT) item day to establish if they typically meet or do not meet the PAG aerobic activity recommendations. Participants then completed 4, 1-hour yoga sessions at different cadence and temperatures while wearing the heart rate monitors. During and directly after the session they also marked their RPE on a modified 10-point scale. Kruskal-Wallis and Pearson correlations were used to compare the effects of baseline physical activity, temperature, and tempo on heart rate. Independent t-tests were used to compare RPE between younger and older adults

Results: All participants reached moderate-intensity aerobic activity for at least some portion of a yoga session based on heart rate monitor data and RPE. Age was a significant factor in time spent in moderate-to-vigorous intensity physical activity for only the thermo-neutral hatha classes (p=.010). Tempo, temperature, and baseline activity levels were not significant factors in time spent in MVPA based on Pearson Correlation and the Kruskal-Wallis test.

Conclusions: Hatha and vinyasa yoga classes, at room or hot temperatures, can be used to meet a portion of the PAG moderate-intensity activity recommendations.

Keywords: yoga, physical activity, moderate intensity aerobic activity

Introduction

The 2nd edition of the Physical Activity Guidelines for Americans (PAG) recommends at least150 minutes of moderate-intensity aerobic physical activity and two days of muscle-strengthening each week to promote health for those 18 years of age and older.[1] In addition, balance practices are recommended for those 65 years of age and older. Approximately 25% of adults are meeting the current PAG.[2] Yoga is a multicomponent activity that includes balance, muscle strengthening, and aerobic components,[1] and has been associated with the positive psychological and physiological benefits.[3-10] When yoga was compared with physical activity as pertaining to health related quality of life, a systematic review and meta-analysis by Patel et al. found that yoga was superior to traditional forms of physical activity for older adults.[11] The most recent Physical Activity Guidelines Advisory Committee Scientific Report[12] suggested further studies are necessary regarding yoga for adults.

Some of the reasons the PAG was unable to conclude that all yoga can help meet the recommendations include 1) the practice of yoga has a variety of different aspects and meanings based on the lineage that the yoga practitioner comes from,[4,8,10] 2) few studies have been conducted on yoga and its relative intensity, or ability to meet the PAG[13] ; 3) existing studies have focused on younger, healthy participants in metropolitan areas who are fairly experienced with yoga[13]; and 4) research designs have yet to parse out mechanisms of the exercise impact of yoga versus the temperature of the room or experience level affecting heart rate. Notably, a reductionist approach to the PA component of yoga is controversial as yoga is multifaceted mind-body practice with ancient roots related to yuj (union) with self and the divine. Yoga, as a spiritual and cultural practice has never been about physical mastery of postures;[14] much research has been done regarding stress reduction,[4,10,15] worry and anxiety,[9] but less research has specifically looked at yoga as a way to get aerobic physical activity in addition to its other benefits. While yoga is not solely a physical practice, being able to meet some of the PAG through yoga might help engage public interest in yoga. Data collection on older adults, as well as those who may be less experienced with yoga, and the PAG has been limited.[13]

While some research suggests that yoga does not reach moderate aerobic activity,[13,15,16] weaknesses in these studies relates to the short duration of the sessions (15-20 minutes compared to 60-minute classes typically available in studios),[13,15,16] as well as the fact that the sessions were led by video (which might lead to less engaged participation)[16] and, finally, that the postures were repetitive and included a number of supine and seated postures.[13,16 17] A yoga study with 6 weekly high-intensity yoga sessions (30-40 minutes of sun salutations followed by 15 minutes of other poses) with 'additional home training' found no improvement in cardiovascular fitness when tested through a Cooper running test.[18] The rate of perceived exertion (RPE) during sessions was on average 14, which is within the cardiovascular training range, but heart rate was not monitored during these study sessions.[18]

In contrast, and in favor of the potential of yoga classes for meeting moderate to vigorous physical activity (MVPA), multiple studies that had more dynamic flows (sequences) and longer sessions found improvements in a 6-minute walk test[19] and heart rate and exertion.[20] A study looking at power yoga, heart rate, skin temperature, and body mass determined that power yoga could be considered a moderate-vigorous intensity activity with 45-minute sessions.[21]

Despite these existing studies and calls to action, there is a gap in the research on understanding the intensity of exercise offered within a typical yoga studio including "flow", hatha/classical, and hot yoga. Most yoga classes are about 60 minutes in length,[16] and yoga classes of that length have not been well investigated. There is also minimal research done on whether wearable activity trackers and accelerometers are able to accurately assess heart rate, and therefore activity intensity level, in a yoga setting. Making a connection between yoga participants of all ages and backgrounds and common fitness tracking technology is important to help a broader population feel empowered to engage in more physical activity.

Therefore, the purpose of this study was to test three hypotheses: a typical yoga class offered in a community setting will get participants into a moderate heart rate zone for at least some portion of the class (H1); individuals are not meeting PAG aerobic recommendations at baseline will have higher heart rate during some of the

yoga asana (H2); warmer temperatures will result in higher RPE (H3); and faster tempos will result in higher reported RPE (H4).

Methods

Recruitment

Subjects were primarily recruited through a local yoga studio (In Balance Yoga) in Blacksburg, VA via posted flyers, class announcements, and the studio newsletter. Recruitment was also conducted over Twitter and email listservs. Approved flyers were posted on the Virginia Tech campus, local community centers, faith-based organizations, and gathering places. Participants completed the Physical Activity Readiness Questionnaire Plus (PAR-Q+)[22] as a screening tool to join the study, and if the PAR-Q+ score indicated that it is safe for them to participate in physical activity, then they were sent the consent form and survey. If the PAR-Q+ indicated need for further screening, the ePARmed-X+,[23] which is an additional, more detailed screening tool for physical activity, was completed. If they were not indicated as safe for physical activity based on their responses to the PAR-Q+ and/or ePARmed-X+, they were not eligible for the study and were informed of their non-eligibility.

Orientation and Equipment

Participants attended an orientation session via Zoom that detailed information and study protocols for participants—this included a brief overview of how to wear a heart rate monitor and the foundations of the asanas (postures). The recording was available for those who could not attend live via Zoom. They were randomly assigned to intervention arms (see Table 1) and then informed of their times/days when they picked up their equipment. Participants were given Polar Verity Sense heart rate monitors based on previous yoga studies and validation.[21] The Polar Verity Sense is the newer version of the Polar OH1, with increased Bluetooth range and longer battery life.

Study Interventions

Participants were requested to complete a survey on their current activity level (utilizing the Stanford Leisure-Time Activity Categorical (L-CAT) item)[24] and familiarity with yoga (utilizing the Yoga Self Efficacy Scale).[25]

The yoga sequence for each class was standardized between sessions and crafted by two registered yoga teachers to match a typical yoga class, containing breathing practice, warm-up, conditioning, and cool down postures with many of the same postures utilized in previous studies[16,21] (see Appendix A). Yoga sessions were led by the same 500 hour Registered Yoga Teacher, wearing the same outfit, using the same playlist. This reduces the risk for injury due to the extensive training the yoga teacher has received and the knowledge of cuing and sequencing for best practice while attempting to control as many implementation factors as possible. The hatha classes held each pose for 5 breaths while the flow class was approximately one breath per movement (i.e., continuous flow from posture to posture) and repeated the sequence twice. Sessions were hatha thermo-neutral, flow thermo-neutral, hatha hot, and flow hot yoga (see Table 1). During the 60-minute yoga sessions participants and the instructor wore the heart rate monitors. Participants with their own personal commercial activity trackers were asked to share screenshots of heart rate data provided by the activity trackers' phone app.

Table 1. Yoga Class Sessions Descriptors

	Hatha Thermo-neutral	Flow Thermo-neutral	Hatha Hot	Flow Hot
Temperature	78	78	92	92
Cadence	5 breaths per posture	1 breath per posture	5 breaths per posture	1 breath per posture
Opening pranayama (breath work)	Guided equal parts breathing in standing mountain pose (Sama Vritti in Tadasana) for 2 minutes			
Savasana	5 minutes			

To assess during- and after-class rate of perceived exertion (RPE), participants were asked to rate their exertion level on a sheet of paper that was placed by their mat using a scale of 1-10, with 1 being 'very light activity' to 10 being 'maximum effort'.

Statistical Analysis

After all 4 sessions were completed, data from the heart rate monitors was assessed to determine the time each participant spent in each intensity zone, based on their age-predicted max heart rate using the adjusted Tanaka, et al. equation (208-.7*age).[26] Each intensity zone was defined based on the following definitions: light <60% maximum heart rate, moderate 60-75% maximum heart rate, vigorous 76-90% maximum heart rate, and near maximal >90% maximum heart rate.[1] The Kruskal-Wallis test was used to determine differences in sessions.

The RPE of each class was assessed by averaging the participants' answers and using independent t-tests to examine the differences between age groups. The RPE of each participant was also compared to the data from their heart rate monitor for differences in perceived exertion versus heart rate.

Results

Sample

A total of 21 participants (9 of whom (43%) were 65+ years of age) were recruited for the study. The mean age was 48.1 $\pm$ 21.82 years with a range of 19-74 years. Sixteen participants completed all 4 types classes, with the other 5 participants completing 2-3 of the 4 classes. Due to unforeseen issues with the heart rate monitors, data were collected from 9 participants for the hot vinyasa style classes, 11 participants for the room temperature vinyasa and hot hatha classes, and 14 participants for the room temperature hatha classes. Only 3 participants had personal wearable activity trackers. Data was obtained from all 3 for the room temperature hatha class, from 2 participants for the room temperature vinyasa and hot vinyasa classes, and 1 participant for the hot hatha class. Further demographic information is in table 2.

Table 2. Study participant demographics

Study participant demographics (n=21)	
Age, M(SD)	48.1 (21.82)
Sex, n(%)	
Male	7 (33.3)
Female	13 (61.9)
Declined to answer	1 (4.8)
Race, n(%)	
White	16 (76.2)
Black	2 (9.5)
Asian	2 (9.5)
Declined to answer	1 (4.8)
Physical Activity Level, n(%)	
Insufficiently Active	9 (42.9)
Meeting PA Guidelines	5 (23.8)
Very Active	6 (28.5)
Declined to answer	1 (4.8)
Regular Yoga Practitioner	
Yes	8 (38.1)
No	12 (57.1)
Declined to answer	1 (4.8)

MVPA

When looking at all participants and all class types based on their heart rate data, there was an average of 32.75% of MVPA within the approximately 60-minute classes. By class, this was 38.57% (±24.54%) for vinyasa hot, 34.45% (±32.67%) for hatha hot, 40.55% (±29.09%) for vinyasa thermo-neutral, and 24.93% (±28.63%) for hatha thermo-neutral respectively. Notably, 2 participants did not meet MVPA for any duration of the room temperature hatha class with only 1 participant not meeting MVPA at any time during the other three class types. However, every participant reached MVPA in at least one of the classes. Using the independent samples t-test, age was a significant factor in time spent in MVPA for only the thermo-neutral hatha classes, in that those who were older were more likely to be in higher heart rate zones (p=.010). Tempo, temperature, and baseline activity levels were not significant factors

in time spent in MVPA based on the Kruskal-Wallis test. See table 2 for specific class information.

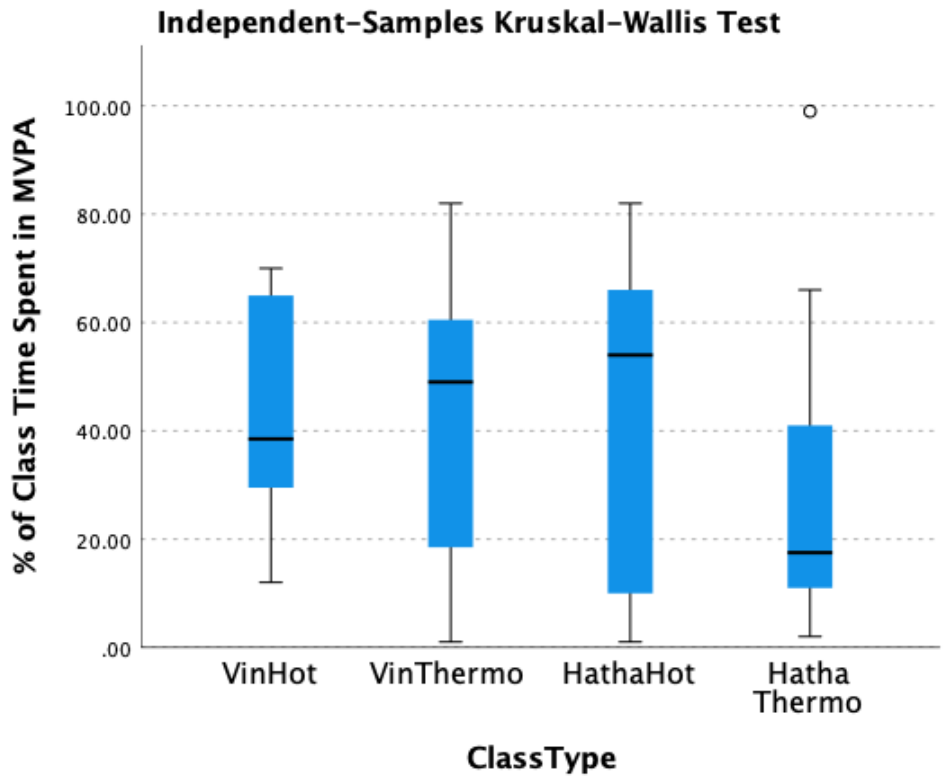
RPE

The mid-point RPE was on average within the moderate intensity range (5.8 (1.8), with no significant differences in RPE reports by younger and older adult (p>.05). For the end-of-class RPE, participants who were over 65 reported significantly higher RPE when compared to their younger counterparts (p<.05) after every session.

Table 3. RPE and MVPA Results for Each Class

	Hatha Thermo-neutral	Vinyasa Thermo-neutral	Hatha Hot	Vinyasa Hot
Avg % Time in MVPA (by HR)				
All M(SD)	24.93 (28.63) (n=13)	40.55 (29.09) (n=12)	34.45 (32.67) (n=11)	38.57 (24.54) (n=9)
<65 M(SD)	22.61 (14.56) (n=7)	34.95 (27.11) (n=7)	38.65 (37.55) (n=7)	44.93 (22.33) (n=7)
>=65 M(SD)	31.59 (40.95) (n=6)	40.48 (36.75) (n=5)	24.85 (27.42) (n=4)	16.58 (23.45) (n=2)
Avg RPE Mid-Session				
All	5.2 (n=20)	6.2 (n=20)	6.4 (n=18)	6.2 (n=19)
<65	3.4 (n=11)	4.4 (n=11)	4.5 (n=10)	4.9 (n=11)
>=65	5.4 (n=9)	6.1 (n=9)	5.9 (n=8)	6.2 (n=8)
Avg RPE Session End				
All	3.3 (n=20)	3.1 (n=20)	3.5 (n=18)	4.0 (n=19)
<65	1.5 (n=11)	1.4 (n=11)	2.1 (n=11)	1.9 (n=11)
>=65	**3.6 (n=9)**	**3.3 (n=9)**	**3.6 (n=8)**	**4.8 (n=8)**
Bold denotes significant difference between older adults and younger adults				

Figure 1. Kruskal-Wallis Box Plot for Differences Between Classes



Commercial Device and Heart Rate Monitor Correlation

Although only three participants in the study wore personal commercial activity trackers in addition to their Polar heart rate monitors, we found that the average time in MVPA for the hatha thermo-neutral condition was 23.67 minutes, vinyasa thermo-neutral was 30 minutes, hatha hot was 30 minutes (this was the only data point for this class type), and vinyasa hot was 35.5 minutes. These results are similar to the percent time spent in MVPA when looked at via the Polar Verity Sense heart rate monitors, though with not enough data to conduct statistical comparisons.

Discussion

This study was able to demonstrate among a small number of diverse participants that all individuals achieved a moderate or vigorous intensity heart rate zone during at least one of these yoga sessions, regardless of tempo or temperature. However, and although not significant, the precent of time in MVPA trended in the hypothesized direction with hotter and faster classes having more time in MVPA than the hatha thermo neutral class. This provides preliminary evidence that regardless of age, tempo, temperature, or baseline physical activity level, a typical yoga class can contribute to the 150 minutes of MVPA recommended per week; especially since the 2nd edition of the PAG removed the requirement for MVPA to be performed in 10 minute increments.[1]

These data are in agreement with other studies[19,20] that were conducted focusing on yoga classes that were more similar to community-based yoga classes (i.e., longer duration[16] and led by a live instructor). Additionally, many participants choose hot and/or flow classes when a studio offers a variety of classes.[6] Unlike previous studies,[13] the participants that were recruited had a variety of levels of experience with yoga, many being new to the practice. This is also more similar to a community-based yoga class that participants might attend with a mixture of regular yoga practitioners and non-regular practitioners. However, in a study that looked at Bikram yoga, a hot style yoga, it was found that participants with more yoga experience had higher heart rates.[27] Future studies may look at creating sessions with experienced and novice yoga practitioners together and in separate classes and see how changing the demographics of the class affects participant's heart rate.

In keeping with the community-based class framework, and varying from the methods of previous studies,[16,21] participants were not instructed to avoid physical activity on the days that they were attending sessions. Some participants ran or rode their bike to class, which may have affected their heart rates, particularly during the beginning of class. However, this reflected their normal physical activity levels, as one participant's only form of transportation was bike riding. Future research looking into

the effects of daily physical activity, medicines, and other factors on heart rate during yoga is needed.

Spreading the 4 classes over 2 weeks helped prevent mental and physical fatigue in the yoga instructor. Additionally, having multiple class styles that each participant attends within the research study is novel in that many previous studies have looked at the energy expenditure or heart rate data of participants after having attended only one yoga session or one style of yoga.[13,16,21,27] Future research into the physical and mental demands of instructing yoga classes would be appropriate, as yoga teachers may instruct multiple classes per day or per week. The spread of classes may have been a negative in getting participants to be available for all four sessions. Participants who missed sessions had their data removed from the between-session comparisons, but the data for each session was also analyzed on a session-by-session basis.

Many previous yoga studies have been limited by lack of demographic diversity.[13,15,16] Care was taken in the recruitment materials and placement of recruitment flyers for this study, to be welcoming to participants of all genders and ethnicities. The participant demographics reflect the community from which participants were recruited for this study.[6] Due to equipment and COVID-19 restrictions, cohort sizes were kept small. A larger participant pool might bring in a greater diversity among participants.

Conclusions

Based on the heart rate and RPE data, the time adults and older adults spend in MVPA within a typical hatha or vinyasa yoga class can be helpful in meeting the PAG guidelines, with some participants meeting as much as one-third of the recommended 150 minutes of MVPA in a single class. While the entirety of the class is unlikely to meet MVPA, knowing that yoga may contribute to reaching the PAG guidelines may encourage promotion of yoga as exercise by healthcare providers and public health workers. This study will help build the body of evidence for yoga being used and recommended as a way to help meet the aerobic activity components of the PAG.

Reference List

1. Physical Activity Guidelines for Americans. In: US Department of Health and Human Services, ed. 2 ed. Washington, DC: US Department of Health and Human Services; 2018.
2. Physical Activity, Healthy People 2030. Office of Disease Prevention and Health Promotion. https://health.gov/healthypeople/objectives-and-data/browse-objectives/physical-activity#cit1. Accessed November 11, 2021.
3. Sullivan MB, Erb M, Schmalzl L, Moonaz S, Noggle Taylor J, Porges SW. Yoga Therapy and Polyvagal Theory: The Convergence of Traditional Wisdom and Contemporary Neuroscience for Self-Regulation and Resilience. *Front Hum Neurosci.* 2018;12:67.
4. Smith B LM, Esat G. Yoga Kernels: A Public Health Model for Developing and Disseminating Evidence-Based Yoga Practices. *International Journal of Yoga Therapy.* 2019;29.
5. Roland K, Jakobi J, Jones G. Does Yoga Engender Fitness in Older Adults? A Critical Review. *Journal of Aging and Physical Activity.* 2011;19:62-79.
6. Harden SM, Steketee AM, Kelliher R, Mason KA, Fitzwater Boyle N. Using a Studio-Academic Partnership to Advance Public Health Within a Pragmatic Yoga Setting. *Journal of Primary Care & Community Health.* 2019;10:2150132719874621.
7. Hamrick I, Mross P, Christopher N, Smith P. Yoga's Effect on Falls in Rural, Older Adults. *Complementary Therapies in Medicine.* 2017:57-63.
8. Elwy AR, Groessl EJ, Eisen SV, et al. A systematic scoping review of yoga intervention components and study quality. *Am J Prev Med.* 2014;47(2):220-232.
9. Brenes G, Diver J, Miller M, Danhauer S. A Randomized Preference Trial of Cognitive-Behavioral Therapy and Yoga for the Treatment of Worry in Anxious Older Adults. *Contemporary Clinical Trials Communications.* 2018:169-187.
10. Brems C. A Yoga Stress Reduction Intervention for University Faculty, Staff, and Graduate Students. *International Journal of Yoga.* 2015;25.
11. Patel NK, Newstead AH, Ferrer RL. The effects of yoga on physical functioning and health related quality of life in older adults: a systematic review and meta-analysis. *J Altern Complement Med.* 2012;18(10):902-917.
12. Committee PAGA. 2018 Physical Activity Guidelines Advisory Committee Scientific Report. In: Services; DoHaH, ed. Washington, D.C.2018.
13. Larson-Meyer DE. A Systematic Review of the Energy Cost and Metabolic Intensity of Yoga. *Med Sci Sports Exerc.* 2016;48(8):1558-1569.
14. Barkataki S. Yoga Alliance Standards Review Project. https://yastandards.com/susanna-barkataki/. Accessed June 12, 2020.
15. Boyd CN, Lannan SM, Zuhl MN, Mora-Rodriguez R, Nelson RK. Objective and subjective measures of exercise intensity during thermo-neutral and hot yoga. *Applied Physiology, Nutrition, and Metabolism.* 2018;43(4):397-402.
16. Clay CC, Lloyd LK, Walker JL, Sharp KR, Pankey RB. The metabolic cost of hatha yoga. *J Strength Cond Res.* 2005;19(3):604-610.
17. Sherman SA, Rogers RJ, Jakicic JM. Yoga for Health: Considerations beyond Energy Cost and Isolated Asanas (Poses). *Med Sci Sports Exerc.* 2017;49(4):859.

18. Papp ME, Lindfors P, Nygren-Bonnier M, Gullstrand L, Wändell PE. Effects of High-Intensity Hatha Yoga on Cardiovascular Fitness, Adipocytokines, and Apolipoproteins in Healthy Students: A Randomized Controlled Study. *J Altern Complement Med.* 2016;22(1):81-87.
19. Akhtar P, Yardi S, Akhtar M. Effects of yoga on functional capacity and well being. *International Journal of Yoga.* 2013;6(1):76-79.
20. Sherman SA, Rogers RJ, Davis KK, et al. Energy Expenditure in Vinyasa Yoga Versus Walking. *J Phys Act Health.* 2017;14(8):597-605.
21. Schubert MM, Clark AS, De La Rosa AB, Newcomer SC. Heart rate and thermal responses to power yoga. *Complementary Therapies in Clinical Practice.* 2018;32:195-199.
22. Warburton DER, Bredin SSD, Jamnik VK, Gledhill N. Validation of the PAR-Q+ and ePARmed-X+. *The Health & Fitness Journal of Canada.* 2011;4(2):38-46.
23. Warburton D, Jamnik V, Bredin SSD, Gledhill N. The ePARmed-X+ Physician Clearance Follow-up. *The Health & Fitness Journal of Canada.* 2014;7(2):35-38.
24. Ross KM, Leahey TM, Kiernan M. Validation of the Stanford Leisure-Time Activity Categorical Item (L-Cat) Using Armband Activity Monitor Data. *Obes Sci Pract.* 2018;4(3):276-282.
25. Birdee GS, Sohl SJ, Wallston K. Development and Psychometric Properties of the Yoga Self-Efficacy Scale (YSES). *BMC Complement Med Ther.* 2016;16(1):3.
26. Tanaka H, Monahan KD, Seals DR. Age-predicted maximal heart rate revisited. *J Am Coll Cardiol.* 2001;37(1):153-156.
27. Pate JL, Buono MJ. The physiological responses to Bikram yoga in novice and experienced practitioners. *Altern Ther Health Med.* 2014;20(4):12-18.

Assessing and referring to commercial entities that promote public health: A yoga studio audit

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Abstract:

Public health workers can refer community members to local yoga studios as avenues for increased physical activity or mental and emotional benefits. Public health workers may not be familiar with these resources and may use yoga studio websites to determine characteristics about the studio before referral. A pragmatic, sequential mixed-methods study was employed with quantitative data extraction, summarized as means and proportions, to score the studio websites (n=28), and semi-structured interviews (n=6), analyzed using the RADaR technique, to confirm website content and staff intention. To explore urban and rural characteristics, yoga studios in southwest Virginia and Los Angeles were selected for inclusion. Based on this mixed-methods review, a yoga studio audit was developed (similar to a community walking audit) to guide public health workers in referring novice practitioners to an appropriate place and space. Studios were grouped as 'traditional' (n=2), focused more on the 8 limbs of yoga and the spiritual traditions of yoga; or 'modern' (n=4), viewing yoga as a form of exercise. Studio websites matched the intentions of the owners, conveying the culture and characteristics of the studio. As frontline health information disseminators, public health workers can utilize yoga studios' website and disseminate the audit tool to evaluate studios.

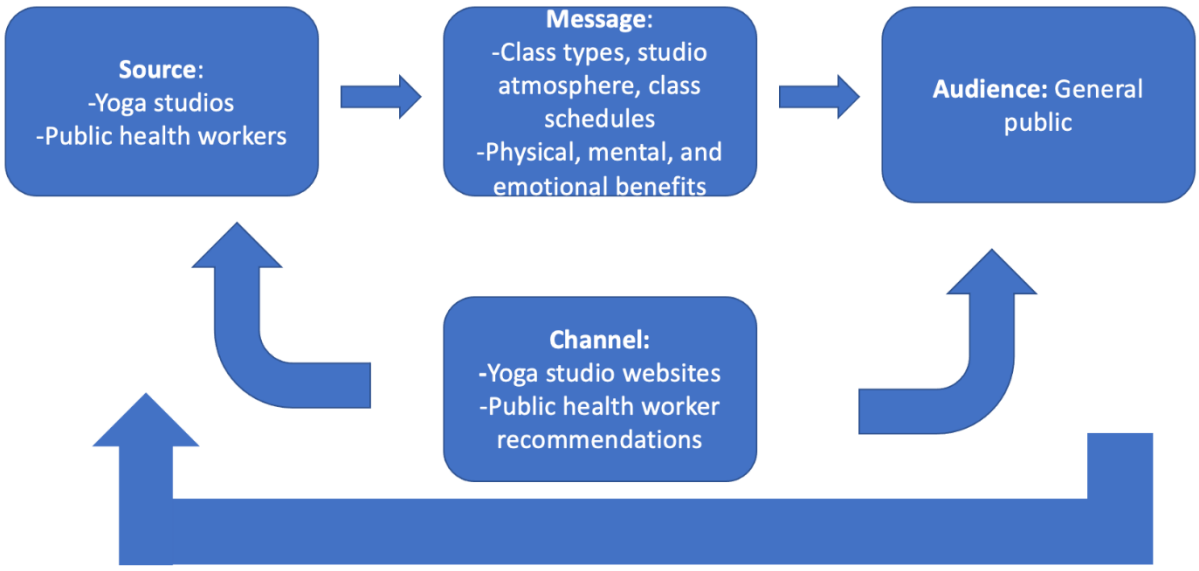
Keywords: yoga studio, physical activity, public health, audit tool

Introduction

The practice of yoga in the United States is gaining in popularity, and with over 6,000 yoga studios in the United States, those wanting to practice yoga have a wide variety of studios to choose from (Alliance, 2016). Research has focused on yoga and emotional regulation, i.e. stress reduction (Brems, 2015; Brenes G et al., 2018; Smith B, 2019), worry (Brenes G et al., 2018) and anxiety (Brenes G et al., 2018). Other research has focused on how yoga might be beneficial for a range of different communities, including older adults (Haber, 2018; Hamrick I et al., 2017; Roland et al., 2011) and university communities (Brems, 2015) in both physical aspects (fall prevention (Brems, 2015; Haber, 2018; Hamrick I et al., 2017), aerobic activity (Roland et al., 2011), muscle strengthening and flexibility (Roland et al., 2011)) and emotional regulation (Brems, 2015; Brenes G et al., 2018; Smith B, 2019).

Although yoga in the U.S. represents a 16 billion dollar industry (Alliance, 2016), research acknowledging the yoga studio and its representatives (owners, managers, teachers) as an integral part of the broader yoga community and their influences on the participants physical and emotional health is nascent. Yoga studios follow a wide range of teaching philosophies and offer a multitude of different class types, experiences, and lengths (Alliance, 2016). People wishing to begin a yoga practice may be unsure of the terminology, etiquette, or typical cost involved with yoga classes and one of the top ways they get more information about yoga and physical activity behavior changes is through the internet (Alliance, 2016; Thomas et al., 2018). Therefore, as the studio website may be the first interaction between industry professionals and their clients, it is important for yoga studio websites to clearly convey the studio's yoga philosophy and teaching/class structure to assist beginners in choosing the right studio for them. The studio website serves as a channel within a dissemination strategy—both the messaging and the intended audience matters when trying to draw in attendees and increase physical activity (see Figure 1) (Brownson et al., 2018; Thomas et al., 2018). Having websites that meet readability and suitability standards (Thomas et al., 2018) as well as utilizing emotion and demonstrative usefulness to the audience (Brownson et al., 2018) may increase participant draw into the studio.

Figure 1. Modified dissemination model from Brownson, et al. first published in J Public Health Manag Pract. 2018



Furthermore, during the COVID-19 pandemic, many yoga studios were forced to close per health department regulations. However, new and old yoga participants continued to turn to the breathing and mindfulness inherent in yoga practice as a way to combat the physical and emotional tolls of the pandemic (Jasti N, 2020; Mohanty S et al., 2020; Nagendra, 2020). Multiple editorials touted the immune system promoting effects of yoga as a prophylactic measure against COVID-19 (Jasti N, 2020; Mohanty S et al., 2020; Nagendra, 2020), while others outlined the preliminary results of using virtual yoga to combat the stress during pandemic times (Jasti N, 2020).

With the continued interest in yoga during the pandemic, the information presented to the public by studio websites about typical offerings and virtual pandemic offerings can inform the decisions of health educators and professionals of which studios to recommend. Indeed, interest in physical activity, stress reduction, and overall well-being increased for many, and public health workers were tasked with either providing direct education or referring to existing "interventions." Although classes taught in a yoga studio may not meet formal definitions of evidence-based interventions, they align with the notion that if we want more evidence-based evidence, we need more practice-based evidence. Typical yoga classes offered in community settings include breathwork, meditation, movement, and building a sense of community—all of which are protective

of mental and physical health deterioration. However, there has been limited participatory work linking the yoga industry with empirical practices.

Therefore, community-based educational systems that serve as prevention medicine (*Educational and Community-Based Programs*; "Healthy People 2020 Midcourse Review,") have a prime opportunity to refer to yoga studios. These prevention system health educators are frequently on the front lines of dissemination and the spread of knowledge gathered through research (Derman & Jaeger, 2018). It is important for health educators and professionals, to have a baseline for what the images and language on yoga studio websites reflect for the potential physical and emotional health benefits of attendees.

The purpose of this study was to extract data related to the information, imagery and language on yoga studio websites and inform the development of a yoga studio assessment. These data were coded by registered yoga teachers and non-yoga participants to have a variety of perspectives. Assessing a key dissemination channel can inform community-based health educators, in their referral process. Due to the unique way public health workers connect with a wide array of the population as a preventative measure (*Educational and Community-Based Programs*; "Healthy People 2020 Midcourse Review,"), it is important for them to be able to appropriately refer people to yoga studios and yoga classes. This may ultimately increase the proportion of Americans accessing a yoga practice for mind, body, and spiritual health.

Methods

Overview

Yoga studios were reviewed using a sequential mixed methods design (Bishop & Holmes, 2013). First using a data extraction technique looking at the yoga studio websites, followed by qualitative investigation utilizing a semi-structured interview technique. Studios were chosen from two regions, the New River Valley in Virginia and Los Angeles, California. These regions were chosen to explore potential differences between a more rural area with a population of approximately 180,000 (*New River Valley Map & Population*) and a metropolitan area with over 10 million people (*Quick Facts Los Angeles, California*).

Studio Selection

Studios were found online through searches on the Yoga Alliance website and top search engines. Yoga Alliance is non-profit organization based in the United States that supports and advocates for standards for studios and teachers (*Teachers*). Studios/teachers within an 85 mile radius of New River Valley, Virginia, and a 15-mile radius of Downtown Los Angeles, California with a website linked to the Yoga Alliance website were recorded. Search engines were used to expand the pool of studios examined, as not all studios are registered with Yoga Alliance. Due to the limited number of studios in the New River Valley region versus the Los Angeles region, studios were limited to 15 in each region (the number of studios found in the New River Valley).

Studio Coding

Data extraction variables were developed from input of the coders, who had varying familiarity with yoga. Coding categories were developed to encompass details such as diversity, studio culture, and attitudes that a health professional might want to know in order to recommend a yoga studio to clients or participants ("Communication and Dissemination Strategies To Facilitate the Use of Health and Health Care Evidence," 2012; Dunifon et al., 2004; *Educational and Community-Based Programs*). Coding of websites took place during the COVID-19 pandemic when studios in both regions were unable to be open. This was accounted for as one of the categories and availability of online classes was also determined. See appendix 1 for full list of data extraction variables. Coders also had access to the coding companion sheet (appendix 2), which explored the categories and answers in more depth to promote consistency across the coders. All coders extracted data from two eligible studio websites from the Los Angeles region and two from the New River Valley region to establish inter-rater reliability. Inter-rater reliability was determined to be high (> 90%). Any differences in coding were resolved by the third coder.

Data obtained by the coding process was then evaluated to determine trends across the studios in each region and overall. Categories that were frequently not found on the websites were used as the basis for development of the interview questions.

Semi-Structured Interviews

Semi-structured interviews of the studios were completed by coder 1. This was determined to be non-human subject research by the university IRB. Studios were first

contacted through the phone number listed on their website. This method received the best results from studios in the New River Valley region. No studios in Los Angeles responded when contact was attempted via phone call. Due to lack of response, emails and then text messages were sent to the studios that were not reached by phone utilizing the information found on the studio website. If there were no contact methods available, the studio was not contacted for an interview.

Interviews were recorded by the interviewer with permission from the interviewee. Interviews followed a semi-structured guide. Attempts were made for the interviewee to be a studio manager or owner in order for more knowledgeable answers. Following each interview, the interviewer transcribed the interview verbatim so that accurate analysis of the interviews could be completed.

Interview Analysis

The transcripts of the semi-structured interviews were analyzed using a rapid analysis technique to derive the overarching themes for all the interviews (Watkins, 2017). First, each interview was separated into the main themes that appeared in the interview. This was the broadest table, which was then reduced further following the rigorous and accelerated data reduction (RADaR) technique into smaller tables that narrowed in on the themes that pervaded all the interviews (Watkins, 2017). See appendix 3.

Audit

Following the website coding and interview analysis, an audit form for yoga studios was created based on previously studied walkability audits (Smith B, 2019). These walkability audit tools can be used by anyone to assess how easy it is to walk in a community as a source of physical activity. They can also be used by communities to plan and build improvements for increased walkability and physical activity (Smith B, 2019). With the structure and impacts of walkability audits in mind, a yoga studio audit form was developed to assess, refer, and potentially improve perceptions of the studio for increased access and engagement in yoga as public health strategy for physical, mental, social, and spiritual well-being. Studios in the New River Valley were audited using the

yoga studio audit form created after the yoga studio review was completed (appendix 4). Cooperative Extension agents gave feedback in an interactive discussion on the form based on their first impressions, how they would like to use the tool, and how they saw their participants/clients using the tool in the future.

Results

In total 28 yoga studio websites were coded, 15 in Los Angeles (LA), California and 13 in the New River Valley region of Virginia.

Quantitative Results- Website Disparities and Similarities

LA had more studios registered with the Yoga Alliance, as well as more studio chains when compared to the VA region. Both VA and LA studios had COVID-19 messages; however, a greater proportion of the LA studios provided a COVID context, such as what they were doing to mitigate the spread of COVID, to their website. The LA studios had a higher average of 58.8 Google reviews and 135.9 Yelp reviews, while the VA studios had an average of 1.2 Google reviews and 5.5 Yelp reviews. LA studios earned lower star ratings out of 5 on both Google (4.3) and Yelp (4.4), while the VA studios received an average of 4.6 on Yelp and 4.98 on Google. The LA studios had higher ethnicity diversity, age, and gender diversity visible on their websites, while the VA studios had higher body type and body ability diversity.

More studios in LA offered classes early morning classes between 5:00 am, and 8:00 am. Both LA and VA studios offered more morning and evening classes than any other time. LA also offered more night classes after 7:01 pm until midnight. The average number of classes offered in the LA studios was 24.2, while the VA classes only offered 8.5 classes a week. However, this average for VA studios was calculated from schedules of available class schedules before the COVID-19 pandemic. On the available schedule during the pandemic, the VA studios offered an increased number of classes per week at 9.375 per week.

The average monthly cost of membership was higher for the LA studios and the LA studios also charged more for a single class, averaging $20.46 per class versus $14.09 in the VA studios. The max price of private classes was higher in LA; however, both locations offered a broad range of prices depending on the teacher. Both LA and VA

studios' most popular class length was 60 minutes. The longest class length was 150 minutes for the LA studios, while the VA studio's longest class time was 120 minutes. For both LA and VA, the most popular class style was "Flow". A larger percentage of the VA studios offered a pay-scale or donation system for classes.

While both VA and LA locations had studios that used social media, a larger proportion of the LA studios used Facebook, Twitter, and Instagram. The LA studios also had more newsletters and blogs for attendees. A small minority of the studios in both locations offered competitions and prizes for attendees.

The mean number of teachers was higher for the LA studios, though the number of 200RYT instructors was higher in the VA studios. Both studios had an equal number of 500RYT, and LA had a higher number of instructors with other certifications or none listed. The LA studios were also more likely to offer teacher training. The LA studios also listed more benefits of exercise, meditation, and nutrition recommendations on their websites.

Phone Interviews

The six phone interviews were 14.97 ($\pm$9.01) minutes in duration. Thematic patterns emerged from the interviews provided by studio staff. Notable differences were present between studios that had been open for a more extended period of time with the more modern studios. These differences were present regardless of the location, and were concerned with the style of yoga practice offered. Two-thirds of the studios tracked popularity of yoga classes through attendance, also citing the teacher as one of the main reasons a class is popular. Morning and evening were the most popular times for classes to be held across both regions. All the studios thought the relationships they have with their participants were very important in making attendees feel welcome. See appendix 3 for more information on themes.

Audit

General feedback on the audit form was obtained from public health workers and Cooperative Extension agents. Audit form reviewers reported liking the questions on the audit form, the short one-page length of the form, and how it combined the relevant

questions. The reviewers stated that they might use the form to evaluate a broad group of studios to have general referrals without showing an individual business favoritism. Other reviewers also commented that rather than assessing the studios themselves for referral, they could see the audit form being used by community members themselves to determine which studio suits their needs the most.

Discussion

Through this mixed-methods work we were able to compare studios from different regions of the country at a very transitional time for yoga studios. There were some key differences between more traditional and modern studios that arose when examining the websites and the 'why' of yoga practice, though those differences were less apparent in the studios' handling of the COVID-19 pandemic. The pandemic affected many different aspects of the studios, which was evident in both the website coding and semi-structured interviews. After reviewing studios from the different regions, it was evident that the coding might be done on a smaller scale by public health workers to evaluate studios in their areas for appropriateness when recommending to their participants. A Yoga Studio Audit Tool, a mini-version of the coding done within this study, which public health workers could utilize to assess yoga studios for culture, accessibility, and promotion of physical activity, etc., is available in appendix 4. Community yoga studios could also be part of the public health physical activity promotion programming utilizing the Yoga Studio Audit Tool. Studios could have the form downloadable on their website or available at their front desk to invite reflection from their new and continuing participants, which could then also be utilized as feedback by the studios.

Two studios appeared to have a more traditional yoga approach despite the contrasting geographic locations and were open 28 years and 21 years, respectively. These traditional practitioners affirmed in the phone interviews that the exercise benefits of yoga are a "side effect," while the modern studios prioritized exercise and health benefits before the spiritual and transformative benefits of yoga. These traditional studios also emphasized the eight limbs in at least their phone interviews; however, one did not mention eight limbs on their website.

Matching their mission of spiritual growth, the comprehension of the spiritual and transcendent benefits of yoga emerged as a primary criterion for hiring teachers for these studios. The owners of these studios valued experience with the 8 limbs and knowledge of 'true yoga' in a potential teacher. This is in contrast to the report from the 2016 Yoga in America Study, which found that 91% of studio owners valued the Yoga Alliance credentialing (Alliance, 2016). Intervention studies have also valued Yoga Alliance credentialing, relying on instructors having a minimum of a 200hr RYT certification (Hamrick I et al., 2017). However, knowledge of poses and continued training has been highlighted as important both in utilizing yoga instructors in research studies and studies on the yoga industry (Alliance, 2016; Haber, 2018). Interestingly, the traditional locations spoke primarily of ending suffering or offering a reprieve from life for the attendees, while the modern studios primarily focused on introducing yoga to new people as a primary goal.

The use of websites and social media by yoga studios has evolved, with both the traditional style yoga studios and the more modern studios commenting that they use social media and the web. Most studios were pleased with their websites. Others stated that it needed a few adjustments after the COVID-19 pandemic stating, "*it doesn't reflect because we're a virtual studio. If we were still brick and mortar, it would be wonderful.*" Tele-yoga, or yoga being done virtually instead of in-person, has been discussed as a reasonably accepted response to the COVID-19 pandemic necessitating the move of classes online (Jasti N, 2020). Even prior to the pandemic, yoga students who chose to practice outside of structured classes frequently chose to use instructional materials such as pre-recorded classes (Quilty MT et al., 2013). Continued changes to the way yoga classes are presented both live online and pre-recorded may happen as the world adjusts to the pandemic.

The LA studios also displayed more diversity in instructors and class attendees both online and during the phone interview. The website analysis the LA studios contained more images and mentions of diversity in body ability, age, ethnicity, and gender. This is likely due to the difference in the demographics of the more urban community of LA and the rural locations encompassed by the New River Valley region,

as well as greater population density and community turnover. The VA locations reflected the homogeneous community.

Accessibility During COVID

Interestingly, several studios mentioned that during the pandemic, the reach of their studio has increased. The COVID-19 pandemic has put an increased premium on efficient online interfaces, and small businesses like yoga studios had to adapt their business model. The online presence of the studio was prioritized and became the primary location for conducting many classes during the pandemic. As the pandemic caused an increase in reported depression, anxiety, and stress (Rajkumar, 2020), many yoga practitioners continued to turn to their practice as a way to mitigate the effects of the pandemic (Jasti N, 2020). Those who promote health and wellness as their work, like yoga studios, face a great deal of adaptability challenges, and must continue to evaluate their use of technology.

Studios also stated that streamed classes online increased the relative diversity of attendees. In addition to increased diversity, class times that were less popular saw higher attendance levels. One studio owner also mentioned that the studio was also experiencing more participation from individuals in different time zones and even different countries. Allowing participants to practice in the comfort and safety of their own homes may promote a willingness to try new activities that they would not have practiced before, with individuals having reported in the past that barriers to participating in yoga included lack of childcare and inconvenient studio locations (Quilty MT et al., 2013).

Implications for Practice

Due to the increase in the online presence of yoga studios as classes are held online, the Yoga Studio Audit Tool can help guide public health workers in evaluating studios to recommend to their participants without having to go in person (both during the pandemic and afterwards). As the culture of yoga and yoga studios continues to evolve online, yoga studios may also take note of factors within the website review to ensure they have promoted on their website the diversity, welcomeness, and other core aspects of their studio. Increasing the information available on their websites will help the studios increase visibility, and also develop a standard of information available about the studios, promoting usability for potential participants who are comparing studios. With

the new themes of ‘traditional’ and ‘modern’ studios, those themes may be coded for in future iterations. Continued online classes may also necessitate evaluation of the different video streaming platforms used (i.e. Zoom, etc.).

Conclusion

Yoga has a growing following of interested participants who wish to increase their mindfulness and/or their fitness. During the pandemic, yoga studios have had to adapt and utilize technology and social media in new ways to meet continued demand for stress relief and anxiety reducing practices. Utilizing the abbreviated yoga studio audit tool, studios in different regions across the country can be assessed by public health workers based on their websites, as well as brief interactions whether in person or via technology. Participants can be directed towards studios that follow traditional philosophies of the 8 limbs and spiritual growth, or those that ascribe to a more modern ‘yoga as fitness’ approach based on the best fit need for the participant. Encouraging yoga studios to increase their online presence and providing basic information on class times, inclusivity efforts, and studio culture will also enhance the recognition and usability of studio websites.

References

Alliance, Y. J. a. Y. (2016). *The 2016 Yoga in America Study Conducted by Yoga Journal and Yoga Alliance*. I. P. Affairs. https://www.yogaalliance.org/Portals/0/2016%20Yoga%20in%20America%20Study%20RESULTS.pdf

Bishop, F. L., & Holmes, M. M. (2013). Mixed Methods in CAM Research: A Systematic Review of Studies Published in 2012. *Evidence Based Complementary Alternative Medicine, 2013*, 187365. https://doi.org/10.1155/2013/187365

Brems, C. (2015). A Yoga Stress Reduction Intervention for University Faculty, Staff, and Graduate Students. *International Journal of Yoga, 25*.

Brenes G, Diver J, Miller M, & Danhauer S. (2018). A Randomized Preference Trial of Cognitive-Behavioral Therapy and Yoga for the Treatment of Worry in Anxious Older Adults. *Contemporary Clinical Trials Communications*, 169-187. https://doi.org/https://doi.org/10.1016/j.conctc.2018.05.002

Brownson, R. C., Eyler, A. A., Harris, J. K., Moore, J. B., & Tabak, R. G. (2018). Getting the Word Out: New Approaches for Disseminating Public Health Science. *Journal of Public Health Management and Practice, 24*(2), 102-111. https://doi.org/10.1097/phh.0000000000000673

Derman, R. J., & Jaeger, F. J. (2018, Jun 22). Overcoming challenges to dissemination and implementation of research findings in under-resourced countries. *Reprod Health, 15*(Suppl 1), 86. https://doi.org/10.1186/s12978-018-0538-z

Dunifon, R., Duttweiler, M., Pillemer, K., Tobias, D., & Trochim, W. (2004). Evidence-Based Extension. *Journal of Extension, 42*(2). https://www.joe.org/joe/2004april/a2.php

Educational and Community-Based Programs. (October 8, 2020). Office of Disease Prevention and Health Promotion. Retrieved December 6, 2020 from https://www.healthypeople.gov/2020/topics-objectives/topic/educational-and-community-based-programs

Haber, D. (2018). Yoga as a Preventive Health Care Program for White and Black Elders: An Exploratory Study. *International Journal of Aging and Human Development, 17*(3), 169-176. https://doi.org/10.2190/HU5C-32FH-APVU-N6FY

Hamrick I, Mross P, Christopher N, & Smith P. (2017). Yoga's Effect on Falls in Rural, Older Adults. *Complementary Therapies in Medicine*, 57-63. https://doi.org/http://dx.doi.org/10.1016/j.ctim.2017.09.007

Jasti N, B. H., George S, Varambally S, Gangadhar BN. (2020). Tele-yoga for Stress Management: Need of the Hour During the COVID-19 Pandemic and Beyond? *Asian Journal of Psychiatry, 54*. https://doi.org/10.1016/j.ajp.2020.102334

Mohanty S, Sharma P, & Sharma G. (2020). Yoga for Infirmity in Geriatric Population Amidst COVID-19 Pandemic. *Asian Journal of Psychiatry, 53*. https://doi.org/0.1016/j.ajp.2020.102199

Nagendra, H. (2020). Yoga for COVID-19. *International Journal of Yoga, 13*(2), 87-88. https://doi.org/10.4103/ijoy.IJOY_27_20

New River Valley Map & Population. New River Valley Regional Commission. Retrieved August 29 from http://nrvrc.org/datadashboard/population.html

Quick Facts Los Angeles, California. United States Census Bureau. Retrieved August 29 from https://www.census.gov/quickfacts/fact/table/losangelescountycalifornia,CA/PST045219

Quilty MT, Saper RB, Goldstein R, & SB, K. (2013). Yoga in the Real World: Perceptions, Motivators, Barriers, and Patterns of Use. *Global Advanced in Health and Medicine, 2*(1), 44-49. https://doi.org/10.7453/gahmj.2013.2.1.008

Rajkumar, R. P. (2020). COVID-19 and mental health: A review of the existing literature. *Asian Journal of Psychiatry, 52*, 102066-102066. https://doi.org/10.1016/j.ajp.2020.102066

Roland, K., Jakobi, J., & Jones, G. (2011). Does Yoga Engender Fitness in Older Adults? A Critical Review. *Journal of Aging and Physical Activity, 19*, 62-79.

Smith B, L. M., Esat G. (2019). Yoga Kernels: A Public Health Model for Developing and Disseminating Evidence-Based Yoga Practices. *International Journal of Yoga Therapy, 29*.

Teachers. Yoga Alliance. Retrieved May 1 from https://www.yogaalliance.org/Credentialing/Credentials_for_Teachers

Thomas, J. D., Flay, B. R., & Cardinal, B. J. (2018, 2018/10/02). Are Physical Activity Resources Understandable as Disseminated? A Meta-Analysis of Readability Studies. *Quest, 70*(4), 492-518. https://doi.org/10.1080/00336297.2018.1463269

Watkins, D. (2017). Rapid and Rigorous Qualitative Data Analysis: The 'RADaR' Technique for Applied Research. *International Journal of Qualitative Methods*. https://doi.org/10.1177/1609406917712131

Appendix 1

YOGA STUDIO STUDY CODING

*All moderators can be given a 999 as well if information was missing
*Leave 'describe' cell (in excel doc) blank if answer to previous question was '0: no' (e.g., If website does not mention exercising for health, write '0' under **Exercise for Health** column and leave cell empty under **describe** column… if it does mention exercising for health, you would, write '1' under **Exercise for Health** and 'yoga is a great exercise to improve health' under **describe** column)
*Identify any mixes of variables with an 'x' and then the combination of numbers (If website included a an online schedule and a downloadable schedule, denote this by coding as 'x12')
*Identify any exceptions with a new number and then a description (e.g., if coding has '0' or '1', code exceptions as '2: [description]'; if coding has '0', '1', '2', or '3', code exceptions as '4: [description]'; etc). For example, if **Yoga Style** was something not listed, code as '5:surfing yoga'

Reviewer:

1: Anna
2: Jake
3: Samantha

Year Established

Actual year
999: Not reported

Google Reviews

Actual Number of Google Reviews

Google Review Stars

Actual number for star rating

Yelp Reviews

Actual number of Yelp Reviews

Yelp Review Stars

Actual number for star rating

Chain

0: No

1: Yes

Studio Type:

1: gym

2: boutique

Studio Style:

0: No

1: Yes, they specifically mention an overarching style (doesn't matter what kind)

Describe studio style, i.e. Bikram

Registered with Yoga Alliance?

0: No

1: Yes

2: Other

Describe other

Studio_Awards/Certifications

0: No

1: Yes

2: Other

COVID_Offering classes online?

0: No

1: Yes

2: Unsure

COVID_Message_Copy Directly

999 Not available

Diversity- Race/Ethnicity:

0: No

1: Yes, multiple ethnicities shown in a photo

2: Yes, discussed in text

3: Yes, in both text and photo

Diversity- Age:

0: No

1: Yes, multiple ages shown in a photo

2: Yes, discussed in text

3: Yes, in both text and photo

Diversity- Body type:

0: No

1: Yes, multiple body types shown in a photo

2: Yes, discussed in text

3: Yes, in both text and photo

Diversity- Gender:

0: No

1: Yes, multiple genders shown in a photo

2: Yes, discussed in text

3: Yes, in both text and photo

Early morning classes:

0: No

1: Yes

2: No schedule available

Morning classes:

0: No

1: Yes

2: No schedule available

Afternoon classes:

0: No

1: Yes

2: No schedule available

Evening classes:

0: No

1: Yes

2: No schedule available

Night classes:

0: No

1: Yes

2: No schedule available

Total number of classes, reported by studio

999 not reported

Actual number

Total number of classes, calculated by reviewer

999

Counted by coder

Private_Class: Private classes available/supported

0: No

1: Yes

Private_Class_Cost

999

Actual $

Type of schedule:

1: available online, you do not have to download it to see the full schedule

2: you have to download the schedule

3: call for schedule

4: no schedule available or unsure

Type of classes- yoga style:

Yoga Style_Hatha

0: No

1: Yes

Yoga Style: Power

0: No

1: Yes

Yoga Style: Ashtanga

0: No

1: Yes

Yoga Style: Kundalini

0: No

1: Yes

Yoga Style: Bikram

0: No

1: Yes

Yoga Style: Barkan

0: No

1: Yes

Yoga Style: Hot

0: No

1: Yes

Yoga Style: Aerial

0: No

1: Yes

Yoga Style: Flow- general

0: No

1: Yes

Yoga Style: Yoga combined with another class (yogalites (yoga+pilates), yoga kickboxing, etc)

0: No

1: Yes

Yoga Style: Animal yoga (goat yoga, pig yoga, dog yoga, etc)

0: No

1: Yes

Yoga Style: Prenatal

0: No

1: Yes

Yoga Style: Older adult

0: No

1: Yes

Yoga Style: Other

0: No

1: Yes

Describe other

8 Limbs

0: No

1: Yes, they mention “Yoga Limbs” and discuss or label only one limb

2: Yes, they mention “Yoga Limbs” and discuss or label 2-7 limbs of yoga

3: Yes, they mention all “8 limbs of yoga”

Temperatures Reported

0: no

1: yes

Room_Temperature_62-68

0: no

1: yes

Room_Temperature_68.1-88

0: no

1: yes

Room_Temperature_88.1-100

0: no

1: yes

Room_Temperature_>100

0: no

1: yes

Describe style if “other”

Length_20 mins

0: No

1: Yes

Length_30 mins

0: No

1: Yes

Length_45 mins

0: No

1: Yes

Length_60 mins

0: No

1: Yes

Length_75 mins

0: No

1: Yes

Length_Other

0: No

1: Yes

Describe other

Pay per Bundle:

# of classes per $ amount

Karma Donation/Exchange

0: No, you have to pay using money

1: Yes, you can attend classes for free or reduced price if you can't pay

2: Yes, you can donate your time/labor in exchange for classes

Locked Before Class

0: No, the door is not locked before class

1: Yes, the door is locked before/when class starts

999: No mention of door locking

Newsletter:

0: No, they have no newsletter

1: Yes, they have a newsletter/listerv

Blog:

0: No, they have no blog

1: Yes, they have a blog online accessible to anyone

Blog Last Updated:

Year of last update for blog

Facebook_Account

0: No

1: Yes

Facebook_Number of Followers

Twitter Account

0: No

1: Yes

Twitter Number of Followers

Instagram account

0: No

1: Yes

Instagram Number of Followers

Competitions/Prizes:

0: There are no competitions or prizes

1: Yes, there are competitions or prizes

Total instructors listed on website

200RYT Certified

Number of 200RYT certified instructors, use 999 if there are no instructors listed at all

500RYT Certified

Number of 500RYT certified instructors, use 999 if there are no instructors listed at all

Degree/other certifications

0: No instructor has any certifications other than RYT

1: Yes, *at least one* instructor has a degree or certification other than RYT listed

999: No instructors listed

Describe other certifications

Exercise for Health:

0: No mention of health benefits from exercise

1: Yes, they mention health benefits

Describe the exercise for health language

Nutrition:

0: No mention of nutrition

1: Yes, they mention nutrition in any form

Describe the nutrition language they use – supplement, detox tea, healthy diet, etc.

Meditation:

0: No mention of benefits of meditation

1: Yes, they mention meditation as being beneficial

Describe what they state the benefits of meditation are

Offer Teacher Training:

0: No they do not offer teacher training

1: Yes, they offer teacher training

Describe what training they offer

Appendix 2:Yoga Studio Coding Companion Sheet - Further Explanations/Definitions

Yoga Studio or Gym Name	Self-explanatory
City	Self-explanatory
Zip Code	Self-explanatory
Year Opened	Self-explanatory
Studio Capacity	Number of students allowed per class
# of yoga rooms	Advertised number of rooms utilized for yoga. Example: a hot yoga room and separate studio; "studio A" and "studio B" mentioned on class schedule or other pages
Studio Type (gym vs boutique)	*Gym*: facility that has yoga offered along with weights, cardio equipment, is open outside of class time, etc. Example: YMCA, university wellness centers *Boutique*: facility that offers only classes, yoga or other group fitness classes, is only open during class times. Example: In Balance Yoga
Studio Style	Do they mention on the website a specific style/theme for the whole studio such as 'hot yoga studio', Bikram studio, meditation studio, etc.
Registered with Yoga Alliance	Are they registered with yoga alliance? Are they additionally registered/affliated with any other group?
Studio Awards/Certifications	Does the studio have any other awards or certifications? For example, a Best Small Business in the city, Best Yoga Studio in the city, etc.
COVID-19 Classes	Are offering COVID-19 classes online?
COVID-19 Message	Is there a statement/message about COVID-19 on the site?
Diversity-Race/Ethnicity	Photos on their website display a variety of ethnicities
Diversity- Age	Photos on their website display a variety of ages from young adults to seniors

Diversity- Body Type	Photos on their website display a variety of body types from small to large
Diversity- Body Ability	Photos on their website display participants using props (blocks, straps, extra mats, chairs) or prosthetic limbs, etc
Diversity- Gender	Photos on their website display a variety of genders
Early Morning Classes	Classes scheduled from 5:00am- 8:00am
Morning Classes	Classes scheduled from 8:01am-12:00pm
Afternoon Classes	Classes scheduled from 12:01pm-4:00pm
Evening Classes	Classes scheduled from 4:01pm-7:00pm
Night Classes	Classes scheduled from 7:01pm-midnight
Total number of studio reported classes	Does the studio state a number of classes they have available per week?
Total number of reviewer calculated classes	Count the number of classes available in the first 7 days of the month.
Private Classes	Private/individual classes can be set-up through the studio.
Private class cost	Cost in dollar per hour for a private class
Type of schedule- online, have to download, not available	Online: Schedule is available embedded into the website Download: Schedule is in .pdf or other format that you click a link and it downloads onto your computer Not available: No schedule on website/or 'call for schedule'
Type of classes- Yoga Style	At least one class available in each of the styles as stated on the schedule of classes or somewhere on the website. This is based on what the studio labels the class as, not reviewer interpretation. If they do not use one of the key words, code it under 'other' and describe.
Temperature Reported	Is studio temperature reported anywhere on the website?
Room Temp 62-68	At least one class listed as in a temperature range of 62-68 degrees

Room Temp 68.1-88	At least one class listed as in a temperature range of 68.1-88 degrees
Room Temp 88.1- 100	At least one class listed as in a temperature range of 88.1-100 degrees
Room Temp >100	At least one class listed as in a temperature range >100 degrees
Length of Class	Length in Minutes
Cost per Class	If available to pay on a class by class basis, cost in dollars per single class
Cost per Month	If available to pay for a month of classes, cost in dollars per month
Pay per Bundle	Yes or no, if they have bundle options (attend 5 classes, 6th one is free, etc.)
Pay at door	Can you pay at the time of the class, or do you have to purchase a pass/membership online
Cash or Card	Can you pay by cash, gift card, or credit card
Newsletter	Do they have a newsletter for members/people on their listserv
Social Media Account	Do they have a twitter, tumblr, facebook, snapchat, instagram, tiktok or other social media account?
Social Media Followers	Add up all the followers the studio has across all social media accounts that the studio utilizes.
Competitions/Prizes	Are there prizes for attending the most classes, competitions through apps or their website for tracking workouts, etc.
Number of Instructors	How many instructors are listed on the website
200RYT Certified	How many instructors listed on the website are 200RYT certified
500RYT Certified	How many instructors listed on the website are 500RYT certified

Degree/other certifications	Do any instructors have listed other relevant degrees or certifications, for example, a BS in exercise physiology or an AFAA group fitness certification
Exercise for Health	Does the website mention the benefits of exercise for health? Examples: ‘come to class to feel healthier’ ‘yoga is part of a healthy lifestyle’
Nutrition	Does the website mention any nutritional recommendations or push any nutrition products? (evidence based products or detox teas, etc.)
Meditation	Does the website mention meditation as an avenue for a better life/health? Examples: ‘people who meditate deal with stress better’ ‘people who practice mindfulness sleep better’

Appendix 3: Qualitative Themes Resulting from Analysis of Semi-Structured Interviews

Studio	Studio Open Date	Studio Goal	Website Reflection	Social Media Recruitment	Popularity Tracking	What Makes a class Popular	Most Popular Class Time
Breathing Space	1999	End Suffering	Pleased	None	No Tracking	--	Morning / Evening
Just Breathe	2008	Spread yoga to new people	Needs Tweaks	--	No Tracking	Individ-ualized Attention	Morning
Studio 221	2017	Spread yoga to new people	Needs Tweaks	Facebook, Instagram	Attendance	Teacher and Timing	Morning
Vita-Zen	2010	Spread yoga to new people	Pleased	Facebook, Instagram, Twitter	Attendance	Teacher, Class Type	Afternoon
Uttarra	--	Spread yoga to	Pleased	Facebook,	Attendance	Time, Teacher	Morning

		new people		Instagram			
Yoga Circle Downtown	1999	Spread yoga to new people	Needs Tweaks	Not important	Attendance	Time, Teacher	Evening
	What Class Style is Most Popular	**How do you make attendees feel welcome**	**Diversity-Staff**	**Diversity-Students**	**8 Limbs and/or Sanskrit**	**Minimum Teacher Qualification**	
Just Breathe	--	Relationship	Age	--	Both	--	
Studio 221	Iyengar	Relationship	--	age	Yes	200 RYT	
Vita-Zen	Adaptive Gentle	Relationship	None	Body Ability	Only Sanskrit	200 RYT	
Uttarra	Ageless Yoga	Relationship	None	Body Size, age, race	Both	200 RYT	
Yoga Circle	Relationship	Diverse	Diverse	Both	Unsure, No minimum	--	

Downtown							
Breathing Space	Relationship	Age, Ethnicity, Gender	--	Both	Experience/ hard certification	--	

Appendix 4

Name of person rating the studio _____
Name of the studio_____
Location of the studio_____

Would or Would Not Recommend

Yoga Studio Audit Form

Use this form to audit yoga studios in your area to help you determine if the studio is right for your participant group. For example, if you interact with older adults, do they offer classes more suitable for some older adults like chair yoga? If you interact most with families with young children, do they offer kids' yoga or prenatal yoga?

1. **What time frames do they have classes? Select all that apply.**
   - ☐ Early morning (5am-9am)
   - ☐ Morning (9am-12pm)
   - ☐ Afternoon (12pm-4pm)
   - ☐ Evening (5pm and later)
2. **Do they have diverse class types? (examples listed below)**
   - ☐ Vinyasa (*typically participants are moving the whole class*
   - ☐ Flow/Power *(typically participants are moving the whole class)*
   - ☐ Older adults/chair/gentle yoga (*suitable for older adults or those with difficulty moving)*
   - ☐ Restorative *(suitable for any age who want an experience more focused on stretching and relaxing)*
   - ☐ Aerial *(yoga that incorporates silks and other apparatus to lift the body off the ground)*
   - ☐ Hot *(classes held in heated rooms, may not be suitable for those with some health conditions)*
3. **Do they have any awards or certifications? (i.e. Best Small Business awards, etc.)**
   a. Yes. What is the award _____
   b. No
4. **Do their instructors have their certifications listed? (i.e. 200RYT, 500RYT)**
   a. Yes
   b. No
5. **What is the cost for a single class?** _____
6. **Do they offer class bundles or monthly passes for a lower rate?**
   a. Yes
      i. What is their pass rate?_____
   b. No
7. **Do they offer private or small group classes?**
   a. Private classes (cost_____)
   b. Small group classes (cost_____)

After Attending a Class at the Studio	Circle: **YES** or **NO**
Studio seems clean	**YES** or **NO**
Studio seems appropriately lit	**YES** or **NO**
Instructor introduces themselves	**YES** or **NO**
Instructor explains the class (name, format, etc)	**YES** or **NO**
Did you feel safe in the class? (i.e., instructor explained alignment and movements well)	**YES** or **NO**
Did the class start on time?	**YES** or **NO**
Did the class end on time	**YES** or **NO**

Conclusion

Physical activity, mindfulness, self-care, our jobs, and our personal life all intertwine to enable us to flourish. This dissertation examined just a few of the methods and mechanisms to incorporate more physical activity and mindfulness into not only an individual's life, but to bring that knowledge to the broader public and promote a more flourishing community. Starting with the desire to get the community more active, followed by investigations into both the mindfulness and physical practices of yoga, and ending with a potential tool to promote yoga as an accessible method for public health and program engagement; this dissertation advances practical questions regarding how physical activity and mindfulness can be accessible to a variety of participants.

Embracing online micro-credentialings that include group dynamics, adult-centered learning, and competency-based education may be helpful to educate diverse, remote, and large groups of people on a variety of topics. The PACE program (Chapter 1) showed how these micro-credentialings can be successful with physical activity and Cooperative Extension as the two main components. However, limiting the micro-credentialing to Cooperative Extension also limited others' understanding of the work as many public health professionals, including those at land grant institutions do not know what Cooperative Extension is. Future work may examine other wellness topics and groups of public health workers.

Cooperative Extension was also the main focus of the employee wellness and mindfulness programs described above (Chapter 2), but the lessons learned may be extrapolated to other employee groups or situations. Utilizing online video communication and other online training tools, like those used in the first two studies in this dissertation, have become more ubiquitous during the pandemic. However, the online nature of these trainings and tools has both benefits and challenges, with the reach being expanded past geographical and transportation barriers, but being hampered by poor connectivity and internet access issues in more rural areas. Those tools, resources, and trainings can also be improved upon by looking at them through the RE-AIM framework.

Just as newer technology can continue to evolve and grow, older traditions can be examined in new light and with new appreciation. Yoga is an ancient practice with cultural roots in India. As more is known and studied about the mental and emotional

benefits of yoga, researching how yoga can meet the Physical Activity Guidelines for Americans aerobic recommendations for adults and older adults can be expanded. This study was unfortunately limited by small cohort sizes related to COVID-19 precautions. However, by examining both heart rate and rate of perceived exertion in multiple different styles of yoga, more evidence has been complied that yoga can be recommended for not only the mental benefits, but also the physical benefits that it might provide (Chapter 3).

Recommendations for using yoga as a form of physical activity might come from a variety of healthcare providers or public health workers. Healthcare providers and public health workers can now have another resource at their disposal in the yoga studio audit tool. This tool was crafted from the results of examining many different yoga studios through the lens of the pandemic, and can help guide choosing the right yoga studio fit for each person (Chapter 4). Future iterations of the tool might be developed outside of the pandemic for more wide-reaching effects.

As this dissertation was conducted throughout the COVID-19 pandemic, the ways that studies were designed and implemented were responsive to not only university and state requirements, but participant and researcher needs as well. The lessons learned will continue to shape the way the discussion and work around the promotion of physical activity, mindfulness, and flourishing. A flourishing life is different for each individual. Through the promotion of physical activity and mindfulness, whether through yoga or other interventions and programs, some aspects of flourishing can be enhanced and lives improved.