OPTA RESEARCH IN ACTION

A NEWSLETTER BROUGHT TO YOU BY THE OPTA'S RESEARCH COMMITTEE

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WHO ARE WE?

RESEARCH COMMITTEE LEADERSHIP

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RESEARCH IN ACTION: CONTENTS

RESEARCH WEBINAR – RESEARCH ANALYSIS

THURSDAY, MAY 26, 7 – 8:30PM

CONTENT LEADER -

Ashley Simons, PT, DPT, PhD, OCS

The OPTA Research Committee presents another **free** webinar in its series to assist researchers and clinicians learn more about the research process.

Do *you* remember everything there is to know about research from physical therapy school? Neither do we! In this lecture, Dr. Simons will provide participants with an overview of statistical analysis in research. Participants will be able to use components from this lecture to immediately choose an appropriate statistical analysis, interpret the findings of an analysis, and dive deeper into more savvy statistical methods. No prior knowledge is needed. Participants will be presented with basic information and provided with advanced clinically applicable tools. Whether you are new to research and data analysis, want a refresher course, or are wondering how to improve your analysis methods for publications, this lecture is for you!

This course is approved for 1.5 CEUs; only attendees of the live webinar will be eligible to earn CEUs and registration is requested.

LEAP PROPOSALS BEING ACCEPTED THROUGH MAY 31

LEAP 2022 will be held in-person in September. The Conference Committee is accepting proposals for LEAP Talks, poster presentations and student platform presentations through **Tuesday, May 31**.

Do you have a research project you'd like to discuss in depth? Submit your LEAP Talk proposal- https://bit.ly/3a8vdPp

Interested in having a poster presentation? Submit your poster abstract proposal - https://bit.ly/3MnpyTz

Students - share your research thesis or capstone project. Submit your proposal for a platform presentation - https://bit.ly/3FTF5Ip

RESEARCH GRANT APPLICATIONS WILL BE ACCEPTED JUNE 1 – JULY 31

The Research Committee will be accepting grant applications for the 2022-2023 funding cycle from **June 1 – July 31.**

The Grant Application is posted on the Research page of the OPTA website; you can also view the projects awarded funding last year.

For more information about the Grant Application, contact the Research Committee at opta.research.committee@gmail.com.

THE EFFECTS OF A FOUR WEEK HOME YOGA PROGRAM ON THE CORE STRENGTH AND ENDURANCE OF HEALTHY ADULTS

RESEARCHERS/AUTHORS

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ABSTRACT

Funding: This project was funded by an Ohio Physical Therapy Association Research Grant

Study Design: Non-blinded Randomized Controlled Trial

Purpose and significance: Over 55% of physical therapists report using some form of yoga as an alternative means of strengthening[1]. While prior research has identified core muscle activity via electromyography in various yoga positions[2,3], there is insufficient evidence to indicate that a yoga program will increase core strength and endurance. Therefore, the purpose of this study was to determine if a four-week home yoga program improves core strength and endurance in a healthy adult population.

Subjects and Methods: Fifty-three healthy adults, mean age of 28.32 ± 10.33 years; 44 females and 9 males, were recruited from a small rural university. All subjects were cleared for participation in light to moderate exercise per the American College of Sports Medicine preparticipation health screen[4] and randomly assigned into an exercise (n=28) or a control group (n=25). After clearance and randomization, all subjects participated in baseline assessments of upper and lower abdominal strength and core endurance. Abdominal strength was assessed using the manual muscle testing procedures for upper and lower abdominals[5] and core endurance was assessed via the partial curl-up test for endurance[6]. Subjects assigned to the exercise group were instructed in the use of a home yoga program via the *Yoga Studio: Mind and Body* application. Yoga classes were performed at an appropriate intensity level which corresponded to the subject's current fitness level as outlined by National Strength and Conditioning Association exercise prescription guidelines. Subjects assigned to the control group did not perform the yoga program and were instructed to continue their current exercise program, but not to change, or add to, their current program for the duration of study participation. Following the four-week intervention, subjects returned for follow-up assessments of upper and lower abdominal strength and core endurance.

Data Analysis and Results: A mixed between-within analysis of variance (ANOVA) revealed a significant effect ($\alpha \leq 0.05$) for a time variable (pre- and post-training) for core endurance ($p = 0.005$), lower abdominal strength ($p = 0.007$), and upper abdominal strength ($p = 0.01$). However, the main effect comparing the exercise and control group was not significant for endurance ($p = 0.07$), lower abdominal strength ($p = 0.44$), or upper abdominal strength ($p = 0.595$).

Discussion and Conclusion: The results of this study suggest that a four-week home yoga program does not appear to cause an increase in core strength and endurance as compared to a control. While there was improvement in core strength and endurance during this time, it was not significantly different from the control group. There are several potential confounding factors in this study including: a lack of control over the subject's own exercise routine in the control group, the insensitivity of manual muscle testing in detecting a small change, and a limited statistical power. It is also possible that a four-week period is an insufficient length to obtain measurable strength gains under the conditions present in this study, however, a recent study has revealed significant improvements in strength are possible within this timeframe[7].

Clinical Merit: The majority of physical therapists utilize some form of yoga as an alternative means for strengthening[1]. However, based on the results of this study, yoga is not an effective intervention to increase core strength and endurance in four weeks, a typical timeframe for a usual physical therapy plan of care. The results of this study, under the potential constraints discussed above, should be used to guide physical therapy selection of core strengthening interventions.

References:

1. Tapley H, Dotson M, Hallila D, et al. Participation in strength training activities among US physical therapists: a nationwide survey. *Int. J. Ther. Rehabil*. 2015; 22: 79-85.
2. Beazley D, Patel S, Davis B, Vinson S and Bolgla L. Trunk and hip muscle activation during yoga poses: Implications for physical therapy practice. *Compl. Ther. Clin. Pract.* 2017; 29: 130-135.
3. Ni M, Mooney K, Harriell K, Balachandran A and Signorile J. Core muscle function during specific yoga poses. *Compl. Ther. Med*. 2014; 22:235-243.
4. Riebe D, Franklin BA, Thompson PD, et al. Updating ACSM's recommendations for exercise preparticipation health screening. *Med. Sci. Sports Exerc*. 2015; 47 (11): 2473-9.
5. Kendall FP, McCreary EK, Provance PG. *Muscles Testing and Function*. 5th ed. Baltimore, MD: Williams and Wilkens; 2005.
6. Haff G, Triplett N. *Essentials of Strength Training and Conditioning*. 4th ed. Champaign, IL: Human Kinetics; 2015.
7. Sato S, Yoshida R, Murakoshi F, Sasaki Y, Yahata K, Nosaka K, and Nakamura M. Effect of daily 3-s maximum voluntary isometric, concentric, or eccentric contraction on elbow flexor strength. *Scand. J. Med. Sci. Sport*. 2022; 32(5): 833-843.

WHAT IS A P-VALUE?

AUTHOR

Abraham D. Lee, PT, PhD

Statistical thinking is an important process for clinicians to obtain new knowledge available in the body of literature and apply it for a patient care. This involves collections of necessary pieces of information related to descriptive, inferential, and contextual evidence. This demands clinicians understand the basics of research design, data collection, and the statistical analysis and interpretation of the results of studies.

To this end, the definition of the P-value and common misinterpretations of the P-value are presented below. The P-value, which serves as an index of statistical significance of data, is involved in the process of data analysis and interpretation in several different statistics such as t-test, regression analysis, and null hypothesis significance test. Unfortunately, the concept of a P-value is not easily grasped. There are plenty misunderstandings and misinterpretations about P-values among investigators.

The purpose of this article is to facilitate a learning process for clinicians to be acquainted with the concept of the P-value by introducing the definition of it, its interpretation with an example, and several misinterpretations of P-values.

Definition of P-value. A P-value is defined as the probability of obtaining an effect at least equal to or more extreme than what was actually observed in a data set with an assumption that a null hypothesis (i.e., there is no difference between untreated and treated conditions) is true. The concept of the P-value, developed by Karl Pearson but popularized by Ronald Fisher in the early part of the 20th century, has been used in testing statistical significance of a set of data in which P-value serves as a measure of evidence against the null hypothesis.

To make this statement clear, let us assume that you have read a research article where an investigator reported a change in maximal aerobic capacity (VO2max) in sedentary old individuals after 8-week aerobic exercise training at a moderate level. There was 15% improvement in VO2max with statistical significance (P=0.02), which is smaller than a significant threshold of P≤0.05. What does this mean? The result suggests that exercise training-induced improvement in VO2max by 15% or greater occurs by random chance 2 out of 100 different sample analyses from identical population under an assumption of the null hypothesis being true (there is no difference in VO2max between untrained and trained conditions). The null hypothesis is saying that there is a very rare chance of VO2max being higher (15% or greater) with exercise training compared with that without training. An investigator who conducted this study less likely accepts this null hypothesis since the P-value of 0.02 is smaller than a threshold significance (P≤0.05). This means that the null hypothesis is not plausible, leading the investigator to the rejection of the null hypothesis and taking a favorable view of the probability of an increase in VO2max being caused by exercise training. Considering the role of the P-value in measuring evidence against a null hypothesis as mentioned above, one can see that a low P-value is better than a high value. That is, the smaller P-value, the greater the strength of evidence against a null hypothesis.

It is worthwhile to mention the threshold significance, P≤0.05. Ronald Fisher advocated P≤0.05 as a standard level for concluding that there is significant evidence against the null hypothesis though not as an absolute rule. P-values range

from 0 to 1. Fisher considered that there is no suspicion on the null hypothesis being false with P-values in the range of 0.1-0.9 while he believed that the null hypothesis is likely not true with a P-value <0.02.

Misinterpretations of P-value. There are many misinterpretations of a P-value available in literature. Most of the misinterpretations about a P-value shown below were extracted from an article by Greenland et al (ref. #2).

1. **A P-value is the probability that the null hypothesis is true. For an example, if a P-value is 0.01, a null hypothesis has only a 1% chance of being true.** It is incorrect. The P-value assumes the null hypothesis is true.

2. **A statistical significance indicates that a scientifically or substantially important relation has been detected**. It is incorrect. Statistical significance itself does not inform you anything about new scientific discovery or clinical importance.

3. **A P-value is the chance of our data occurring if the null hypothesis is true. For example, P = 0.05 means that the observed association would occur only 5% of the time under the test null hypothesis.** It is incorrect. A P-value refers to what we observed as well as to extreme observation than what one observed. It also requires other assumptions such as randomness in sampling and treatment assignment.

4. **A statistical significance is a property of the phenomenon being studied, and thus statistical tests detect significance.** It is incorrect. "Statistical significance" is not determined by properties of any objects or populations studied but by statistical properties such as effect size (i.e., mean difference between control and experimental groups), data variations, and sample size.

5. **A P-value is a Type I Error.** It is incorrect. A P-value is calculated from a set of data after a test statistic such as t-test has been computed. As mentioned above, it is defined as the probability of obtaining an effect at least equal to or more than what was actually observed with an assumption that a null hypothesis (i.e., there is no difference between two groups compared) is true. A Type I Error being associated with Neyman-Pearson null hypothesis significance test occurs when one incorrectly rejects the null hypothesis (H_0) and accepts alternative hypothesis (H_1) based on α level. Typically, α level is set ahead of data collection at P ≤ .05 or ≤ .01. If the P-value of a data set were .05 or less than .05, an alternative hypothesis is accepted with rejecting a null hypothesis. With conducting many more studies for replications of the results, an investigator accepts a correct null hypothesis sometimes and reject it other times, committing 5% Type I Error. Thus, overall a P-value is different from Type 1 Error.

References:

1. R. Hubbard and M.J. Bayarri, "Confusion Over Measures of Evidence (p's) Versus Errors (a's) in Classical Statistical Testing," *The Am. Statistician,* 2003, 57: 171-182
2. S. Greenland, S.J. Senn, Kenneth J. Rothman, John B. Carlin, Charles Poole Steven N. Goodman, Douglas G. Altman, "Statistical tests, P values, confidence intervals, and power: a guide to misinterpretations," *Eur. J Epidemiol*., 2016, 31:337-350.
3. Denes Szucs and John P. A. Ioannidis, "When Null Hypothesis Significance
4. Testing Is Unsuitable for Research: A Reassessment," *Front. Hum. Neurosci*. 2017, 11*:390.*
5. Steven Goodman," A Dirty Dozen: Twelve P-Value Misconceptions," *Semi. Hematol*., 2008, 45:135-140

OTHER RESEARCH RESOURCES – WEBINARS TO ASSIST YOU WITH YOUR RESEARCH PROJECT

Last year, the Research Committee hosted two webinars to assist clinicians and researchers develop research projects; the recordings are posted on OPTA's YouTube page.

Formulating A Researchable Question: Where do I Begin?

How to Win An OPTA Research Grant and Influence Practice!

WANT TO CONTRIBUTE AN ARTICLE TO OUR NEXT NEWSLETTER?

Submissions for upcoming newsletters can be submitted online – all topics welcome – article reviews, research projects, case reviews, etc.

UPCOMING RESEARCH COMMITTEE MEETINGS

Join us for one of our committee meetings in 2022 - email opta.research.committee@gmail.com for connection information and agenda; all meetings are held from 7-8 PM.

Thursday, July 14
Thursday, September 8
Thursday, November 10

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